Boneyard Flat Diversion Facilities Plan
Washoe County, Nevada

DRAFT Technical Memorandum

Prepared for

Washoe County
Department of Comprehensive Planning
1001 E. Ninth Street
Reno, Nevada 89520

HLA Project No. 33852

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February 15, 1996

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1.0 INTRODUCTION

Project Area Description

Boneyard Flat is a hydrologically closed basin in the northern part of Spanish Springs Valley, north of Sparks, Nevada. The Valley is bordered by mountains ranging from 5,000 to 6,000 feet on the west and the Pah Rah Range on the east, with a maximum elevation slightly over 7000 feet. The entire Spanish Springs Valley watershed covers an area of 64 square miles and Griffith Canyon, the focus of this investigation, is a 15 square mile subwatershed that drains part of the west flank of the Pah Rah Range into Spanish Springs Valley. The location of the project area is shown on Figure 1. Griffith Canyon accounts for approximately twenty-five percent (25%) of the runoff generated by Spanish Springs Valley watershed.

The unconsolidated valley soils are poorly graded loamy sand with clay layers and consolidated rock makes up the bounding mountain ranges. On the west side of the Valley, the rock is predominantly granitic while the Pah Rah Range on the east is volcanic. Annual precipitation is between 8-12 inches and generally falls as snow on the higher parts of the Pah Rah Range.

Griffith Canyon drainage has two main branches with different flow characteristics. The southern branch is well incised in a narrow canyon and produces the larger of the flows and greater sediment loads, while the northern branch has lower gradients and lower sediment loads, which are much finer grained. Flow from Griffith Canyon, prior to the construction of Calle de la Plata, went mostly to Boneyard Flat with occasional high flows going to the south toward the Truckee River. Construction of drainage improvements associated with Sky Ranch Airport and construction of Calle de la Plata has altered the location of the low flow channel sending most of the flows to the south toward the Truckee River. By diverting the runoff from Griffith Canyon into the Boneyard Flat, a greater degree of flood control will be achieved benefiting Spanish Springs Valley and the City of Sparks.

Purpose

The objective of this technical memorandum is to present the primary alternatives considered as a part of the first phase of the Boneyard Flat Diversion Facilities Plan for review with the Project Sponsors. The facilities presented are intended to accomplish the following four goals:

1. A debris basin is needed to control the volume of sediment from the Griffith Canyon watershed during the design event as well as frequent events, so that runoff can be conveyed in the proposed channel without excessive sediment accumulation,
2. The channel alignment must be hydraulically efficient and convey the 100 year runoff event,
3. The channel alignment should also minimize the impacts to existing properties and minimize the need for right-of-way; and
4. Infiltration facilities should maximize percolation, minimize size, and not degrade existing ground water quality.

2.0 TECHNICAL APPROACH

Literature Review

A number of hydrologic studies have been conducted in the Spanish Springs area over the last 20 years. The first Federal Emergency Management Agency (FEMA) Flood Insurance Study was initiated in the late 1970's and completed in 1980. During this same time period, the U.S. Army Corps of Engineers (COE) was performing a hydrologic evaluation of the Truckee River watershed for a proposed project on the Truckee River. Both of these studies included approximate studies for the Spanish Springs Area. The COE study estimated a 100-year peak discharge entering the City of Sparks from Spanish Springs Valley of 510 cfs. This estimate was based upon a statistical analysis using estimated flow rates that were based on the memories of a rancher that lived near the North Truckee Drain. Based on this estimate, the City of Sparks proceeded with the design and construction of drainage improvements for the North Truckee Drain. These improvements were constructed in 1985.

In 1984 Boyle Engineering initiated a FEMA Flood Insurance Re-Study for the Spanish Springs Valley. The preliminary hydrology report and floodplain mapping for this Re-Study was released by Boyle in October 1985 to the City of Sparks and Washoe County for review and comment. The floodplain mapping was prepared using 1"=400' scale (4' contour interval) mapping, which was useful for this project since it include the majority of the Boneyard Flat Diversion Facility study area. Boyle had prepared a hydrologic model of the Spanish Springs Valley in order to estimate 100-year peak flow rates at various points within the Valley. This study recommended a 100-year discharge estimate in the North Truckee Drain at the City of Sparks corporate boundary of almost 5,000 cfs, as compared to the COE estimate of 510 cfs. Washoe County and the City of Sparks expressed concern regarding the magnitude of these estimates.

In February 1986, widespread flooding occurred in much of Northern Nevada and California. Record flows were observed in, and from, the Spanish Springs Valley. At the Sparks City limit, the flow in the North Truckee Drain was estimated to be approximately 1,500 cfs. This event caused significant flooding in areas adjoining the newly constructed improvements to the North Truckee Drain channel within the City of Sparks. The flooding in the lower reach of the North Truckee Drain was compounded by the high stage of the Truckee River which submerged the North Truckee Drain culverts under Interstate 80 and the railroad embankment. This high stage in the Truckee River prevented the North Truckee Drain from discharging to the River.

In October 1986, a Flood Insurance Study Appeal was prepared by Nimbus Engineers on behalf of Washoe County and the City of Sparks. This Appeal proposed to revise the Boyle hydrology using the Spanish Springs Flood Insurance Re-Study. The Appeal refined the Boyle hydrology and replaced many of the hydrologic routing parameters and methods used in the model. The revised hydrologic model was also tested using the February 1986 precipitation data for model verification and found to produce reasonable results as compared to the observed flows. FEMA accepted the Appeal and directed Boyle Engineers to revise the floodplain mapping based on the discharges developed by Nimbus Engineers.

In 1987, the City of Sparks proceeded with the design and construction of a detention basin in the central Spanish Springs Valley. This detention basin was designed by Harding Lawson Associates (HLA) to detain the 100-year peak discharges from the northern portion of the Spanish Springs Valley, based upon existing watershed conditions. Resource Concepts, Inc. (RCI) prepared the hydrologic and hydraulic analysis to support the design. The RCI analysis was based upon the FEMA Appeal hydrology prepared by Nimbus Engineers.

In 1987, Washoe County and the City of Sparks jointly funded the preparation of a Flood Control Master Plan for Spanish Springs Valley. Since the Spanish Springs Detention Basin was designed for existing watershed conditions and future development would result in increased peak flows and volumes, it was necessary to evaluate the impact of future development in the Spanish Springs Valley on downstream peak discharges entering the City of Sparks. The Nimbus study (1990) identified the possibility of directing runoff from Griffith Canyon into Boneyard Flat. The Nimbus study recommended that the Boneyard Flat diversion be accomplished with the construction of a berm in conjunction with a shallow channel. Nimbus estimated the construction cost associated with this improvement to be $449,000. This estimate does not include the cost of drainage structures at Calle de la Plata or Pyramid Highway.

In 1988, a groundwater investigation was conducted by a University of Nevada student as a Master's Thesis. This study was performed in cooperation with the Washoe County Utilities Division (Hadiaras, 1988).

In 1991, a drainage master plan was prepared by SEA for the southern portion of the Spanish Springs Valley to address the impacts of a planned development in that area. This master plan considered a number of options for the design of the drainage features within the planned development with and without the Boneyard Flat diversion.

A Concept Level Flood Control Master Plan was prepared by Kennedy/Jenks/Chilton. This plan was prepared under the direction of a Technical Advisory Committee that included the Public Works and Planning Directors (or appointees) from Washoe County and the Cities of Sparks and Reno. This plan was initiated in 1989 and completed in 1991. The plan evaluated the flood control needs within these three jurisdictions, identified the major flood control facility needs (conceptual level), estimated the program costs and identified potential institutional/financial mechanisms for implementing a flood control program. The study recommended that a detailed flood control master plan be prepared as a part of the next phase of the program to evaluate optimal flood control solutions for each area and establish feasible alignments. The second phase has not yet been initiated. The Concept Level Flood Control Master Plan included the Boneyard Flat Diversion Facility in the plan and estimated the approximate construction cost at $3.3 million.

The U.S. Geological Survey is currently performing a ground-water modeling investigation of Spanish Springs Valley. This study has not been completed and only limited data is currently available.

Preliminary Field Studies

On December 12, 1995 a visual inspection of most of the Griffith Canyon drainage was made to determine historic high water marks, characterize debris loads and potential for debris movement, note natural/unnatural channel conditions that may alter the flow/sediment regime and note logical channel sites for potential debris and recharge basins.

Hydrology and Hydraulics: The drainage patterns in the northern branch of Griffith Canyon have been altered more by the roads and development, relative to the southern branch. This limited urbanization contributes to greater runoff and greater erosion than under predevelopment conditions. The southern branch of Griffith Canyon is still undeveloped by comparison to the northern branch and channel slope, dimensions, and roughness are noticeably different between the two branches. The northern branch has a wider channel, lower roughness due to smaller sediment size, and milder slopes than the southern branch, which has the higher elevations, the greater abundance of outcrops of bedrock, and is well incised.

Sediment/ Debris Conditions: The southern branch of Griffith Canyon is transporting much larger sediment than the northern branch caused in part by the higher, steeper drainage area and the greater exposure of bedrock. Therefore the potential for larger debris loads is greater from the southern branch and there is ample evidence of historic debris and sediment deposits to support this premise.

Ground Water Levels: The soils in Griffith Canyon have moderate permeability and infiltration is rapid. No evidence of springs were seen. The water table ranges from well over 100 feet below land surface at the junction of the Griffith drainages to about 40 to 50 feet under Boneyard Flat. Boneyard Flat itself has water on the surface as a result of a gravel plant's washing operations.

Ground-water recharge: Primary ground-water recharge for Spanish Springs Valley occurs from precipitation falling on the mountain blocks bounding the valley. The melting snow and rain water infiltrates the thin soil cover over the bedrock and enters through fractures and cracks in the rock. The water moves downward through the rock and ultimately enters the unconsolidated ground-water system of valley-fill sediments. The Pah Rah Range, which has the higher elevations, contributes the most ground-water recharge.

Secondary ground-water recharge in the southern part of the valley is provided by leakage from the Ore Ditch and agriculture irrigation; valley wide landscape irrigation and infiltration from septic systems contribute to secondary recharge. A low ground-water divide, caused by recharge from the Ore Ditch, separates the southern part of the basin from the northern part where Boneyard Flat is located.

Interviews

On December 7, 1995 a meeting was held with the State Engineer, Mr. Mike Turnipseed, to discuss the Boneyard Flat diversion facilities plan. Mr. Turnipseed appeared supportive of the project and indicated permits may be required for detention structures depending on final design and a permit would be required for artificial recharge. Mr. Turnipseed stated he did not know how the recharge permit would be received in terms of the Truckee River negotiated settlement, nor did he offer advise on how to approach the Pyramid Lake Tribe. Based upon a review of the groundwater map, and

advise on how to approach the Pyramid Lake Tribe. Based upon a review of the groundwater map, and photos from 1957, 1977, and 1995, with the State Engineer, it appears that historically the low to medium flows went to Boneyard Flat and high flows alternated between Boneyard Flat and the North Truckee Drain.

On December 13, 1995 a meeting was held with Mr. Gary Hall, General Manager for HAWCO, since they are the single largest landowner affected by the project. HLA described the overall concepts of the project to him and attempted to obtain input concerning improvements that may be sited on their property. Basically their suggestion was to minimize impacts to HAWCO and place the improved channel as far north as possible so they may also use it to discharge storm runoff from their future projects. Mr. Hall also informed us that the homeowners along Calle de la Plata prefer to have the channel parallel to Calle de la Plata and within the road right-of-way with Washoe County in turn improving the existing roadway and taking over maintenance. HAWCO is currently developing a specific plan for their property adjacent to Boneyard Flat west of Pyramid Highway.

Runoff Volume

The runoff volume to Boneyard Flat needed to be estimated to determine the area of potential inundation with and without the Boneyard Flat diversion channel. This estimate is needed to determine the additional area impacted by the flood pool and for evaluation of potential recharge sites within the area that would be considered undevelopable. The estimates that were developed are approximate only. At the time of final design, more detailed methods of analysis should be employed. These estimates are for planning purposes only.

The runoff volume to Boneyard Flat was evaluated for two types of events. The first event is the 24 hour event which is commonly used for estimation of peak discharges from larger watershed. The second event is the 10-day event which is the event that is more appropriate in this instance since the maximum runoff volume rather than maximum peak discharge is more important for determining the elevation of the flood pool for a closed basin.

A stage-area and stage-storage relationship was developed using survey data compiled for this study and the 7.5 minute USGS quadrangles. Under current conditions, there is a 10 square mile drainage area contributing directly to Boneyard Flat. There is a subwatershed that is 1.6 square miles in size that has contributed to Boneyard Flat under natural conditions. Diversions in recent years have directed the flow more toward the south. This project would divert an additional 15.4 square miles to Boneyard Flat (see Appendix A).

The volume of runoff for a 24 hour, 100 year event from Griffith Canyon was estimated using the hydrologic models developed for the Spanish Springs Valley (Nimbus, 1986, RCI, 1988). Based upon the volume of runoff generated by the models for Griffith Canyon, a 100-year, 24 hour event produces approximately 50 acre-ft/square mile. Therefore, Boneyard Flat would receive approximately 500 to 600 acre-feet under current conditions which inundates approximately 140 acres. With the Boneyard Flat diversion, the playa would receive approximately 1350 acre feet which would inundate approximately 250 acres (Appendix A).

The estimates of the runoff volume from a 10-day event are based upon calibration studies performed using the runoff from the 1986 event for the FEMA Flood Insurance Study for the Lemmon Valley playa (Nimbus, 1987). Based on these studies, approximately 33% of the rainfall was expressed as runoff. Applying this ratio to an approximate 100-year, 10 day precipitation depth of 6 inches would result in approximately 107 acre feet/square mile. This estimate produces a volume of 1,100 to 1,300 acre-ft under current conditions and approximately 2,900 acre feet with the diversion. The resulting flood pool would expand from 250 acres to 350 acres.

For planning purposes, the 100-year, 10 day estimate was used. Based on these approximations, the Boneyard Flat diversion would result in an additional area of inundation around the playa of approximately 100 acres.

Sediment Volume

The volume of sediment from Griffith Canyon must be analyzed to determine the size of the debris basin. Using the Pacific Southwest Interagency Committee's Sediment Yield Method (1974), to estimate the amount of sediment available for transport indicates that 7.5 to 15 acre feet of sediment may be produced from this watershed. Table 1 presents the parameters and estimate for determining the sediment yield. A 2 acre sediment basin 3 feet deep should control the expected sediment volume with proper maintenance.

Table 1 PSIC Sediment Yield		
Griffith Canyon Watershed	Area: 15 sq.mi.	
Factors	**Sediment Yields**	**Rating**
A. Surface Geology	Moderately weathered	5
B. Soils	Medium texture	5
C. Climate	Storms of several day duration	10
D. Runoff	High peaks per unit area	10
E. Topography	Moderate upland slopes	10
F. Ground Cover	Cover < 20%	10
G. Land Use	< 50% graded	0
H. Upland Erosion	No apparent sign of erosion	0
I Channel Erosion	Moderate depths and vegetation	10
PSIC Sediment Rating	Total	60
Classification 3	0.5-1.0 acre-feet/sq.mi.	7.5 to 15 acre-feet

An analysis of relative channel stability can be made by evaluating the incipient motion of the sediment. Using Shield's relation (Eq. 1) indicates that material 2.5 to 3 feet in diameter can be moved downstream under 100 year flow conditions in the channel. There is also evidence of this in the Griffith Canyon southern channel.

$$Dc = T/0.047(Ys-Y) \quad \text{Eq. 1}$$

Dc is the diameter of the sediment particle for conditions of incipient motion
T is the boundary shear stress (Eq. 2),
Ys and Y are the specific weights of sediment and water, respectively.

$$T = fp(v2)/8 \quad \text{Eq. 2}$$

T is the boundary shear stress,
f is the Darcy-Weisbach friction factor (Eq. 3),
p is the density of water,
v is the flow velocity

$$f = 116.5(n2)/r1/3 \quad \text{Eq. 3}$$

f is the Darcy Weisbach friction factor,
n is a roughness coefficient,
r is the hydraulic radius

Although the channels are capable of transporting large material during an extreme event the majority of sediment is sand and cobble size (1mm to 10 cm). The volume of sediment transported during a 100 year event was analyzed based upon a variation of the Meyer-Peter-Muller equation (1948). The advantage of the MPM equation (Eq.'s 4,5) is that it can be used for graded sediment under flow conditions that produces dunes and other bed forms. Its' limitations for application in this case are, the range of unit discharge (10-200 cfs/ft), and particle size (<10mm). The results indicate that approximately 1.5 to 2 acre feet of sediment is transported during the 100 year event. These results are somewhat nebulas since the methods of analysis are empirically based

$$Qs = ay^{bv^{c}} \quad \text{Eq. 4}$$

Qs is the bed material discharge in cubic feet per second per unit width,
y is hydraulic depth,
v is the average velocity

$$Qs = 0.0064 (n^{1.77}v^{4.32}G^{0.45}/y^{0.3}d50^{0.61}) \quad \text{Eq. 5}$$

n is Manning's roughness coefficient
G is the gradation coefficient,
d50 is the median diameter of the sediment,
all other parameters the same as in Equation 4.

The estimated volume of sediment available for transport on an annual basis of 7.5 to 15 acre-feet is significantly greater than the channels capability to transport sediment, estimated at 1.5 to 2 acre feet. This is consistent with geomorphological processes associated with active alluvial fans. Since there is abundant material available for transport, evidence of bank erosion is limited to channels disturbed by road crossings, and channel migrations caused by the volume

of sediment reducing channel conveyance. The difference in sediment volume available and transported can be attributed to differences between the methods of analysis and their application. Their use here is intended to provide a magnitude of order scale from which to select sediment basin sizes. Based on this information it is assumed that a sediment/debris basin with a minimum volume of 5 acre-feet should be part of the Boneyard Flat Diversion Facilities.

Channel Conveyance

There are some important design considerations to make for a channel to divert runoff from a 100 year event. The first is the existing channel slope. Under existing conditions the runoff rarely flows at unstable critical velocities because it spreads out across a broad natural channel. However, restricting the flow to a much narrower channel results in supercritical flow with the existing slopes of 1 1/2 to 2 percent. A narrower channel, in addition to the removal of sediment at the debris basin, will create erosive flows. Consequently, the channel will need some sort of lining for protection. Ideally a wide gently sloped channel would minimize the force available to a flood event for causing damage. The most direct route from Griffith Canyon to Boneyard Flat reduces the cost of construction for a channel, but would split parcels. Keeping a channel within road right-of-way requires the channel to make 90 degree turns to reach Boneyard Flat. This increases the cost of construction for hydraulic structures capable to force the turn.

Artificial Recharge

Ground water has become a vital component of most agency planning efforts, not only as a source of supply for primary, secondary, or peaking purposes, but also as a storage component through the process of artificially recharging underground water reservoirs using surface water.

As part of the flood control aspect for the Boneyard Flat project it is proposed to store the flood runoff from Griffith Canyon in a below land surface basin and allow the runoff to infiltrate to the water table. The size of the infiltration, or recharge basin is estimated to be about 100 acres in surface area and about 5-8 ft deep. This volume would easily contain the estimated annual runoff of 500-800 acre-feet and would also contain the volume of runoff from the estimated 100 year flood of 740 acre-feet. Preliminary data indicate reasonable infiltration rates of two to three feet per day per acre might be achieved just upgradient and to the southeast of Boneyard Flat. Depth to water in this area is about 40-60 ft and there is some uncertainty about the quality of the ground water. An initial round of limited sampling showed high nitrates exceeding safe drinking water standards in one well, which will be resampled (Appendix B). The recharge of surface runoff to the ground-water system may actually improve the quality of the native ground water depending on the source of the nitrates.

Existing county wells in Spanish Springs Valley could be identified as recovery wells for the artificial recharge project because the ground-water system under Boneyard Flat (northern part of Spanish Springs Valley) is in hydraulic continuity with the ground-water system in the southern part of the valley.

An artificial recharge, storage, and recovery permit is required from the agency operating the project by the Nevada State Engineer and an injection (infiltration) permit is required by the Nevada Division of Environmental Protection.

An alternative method of estimating the annual runoff is described by Hedman and Osterkamp (1982) and is based on the measurement of certain channel-geometry characteristics termed active channel width. The technique is applied to ungaged streams and ephemeral drainages and uses the empirical development of equations to estimate a discharge value from channel-geometry and channel-sediment data. Limited data for the north and south drainage's of Griffith Canyon gave a combined total of about 750 acre-feet of annual runoff.

3..0 IMPROVEMENT OPTION COMPONENTS

As a part of the preliminary evaluation of alternatives, the full range of improvement options and components needed to be considered within the guidelines provided. Options which would result in flow from Griffith Canyon being directed south and ultimately into the Truckee River have not been considered since the result would conflict with the project objectives. The potential improvements components considered include:

1. Construction of a detention basin to reduce the magnitude of peak flow to either serve as an option to the diversion or to reduce the size of the channel improvements needed to convey the flows.

2. Debris basin at the upstream end of the project to capture the sediment and debris entrained in the flows from the contributing watershed,

3. Channel improvements to convey the flow to Boneyard Flat playa or any related features such as infiltration basins, and

4. Infiltration basins to capture and infiltrate the captured flood flows to supplement groundwater recharge.

Detention Basin Options

The use of detention was considered to be uneconomical and/or undesirable. Because of the magnitude of the design event (approximately 750 acre feet), the size of the dam and basin required to accomplish the needed detention, would be significant. The dam would have a significant visual impact and the cost associated with the basin may not be offset by the benefits.

Debris Basin

A debris basin is necessary to control the deposition of sediment being transported from the basin. Without the debris basin, downstream channel improvements will require considerably more maintenance, and culvert crossings may become blocked during a runoff event due to sediment and debris accumulation.

Channelization

Channelization is a common improvement component to all project alternatives. The width and depth of the channel varies depending upon the slope along the proposed alignment and desired configuration. Figure 3 shows two preliminary typical channel sections. The second typical section includes a recreation path within the channel section so that the channel has a recreational benefit as well.

Infiltration Basins

The use of infiltration basins as a part of the project design provides a secondary benefit for the project. Incorporation of infiltration would allow the diverted flood waters to be put to beneficial use rather than having a large portion of the flow being impounded in Boneyard Flat and lost to evaporation. This additional groundwater recharge may be considered by the State Engineer as an augmentation to the resource which could, in part, be recovered by Washoe County.

Several potential infiltration basin sites have been identified. Two of the sites are located east of Pyramid Highway. These sites are considered less feasible because of their proximity to existing residential areas and high cost of land acquisition. The other two sites are Boneyard Flat itself and a site just upstream of the playa bottom. These sites are shown on Figure 2 and will be discussed further in the following section.

4.0 ANALYSIS OF OPTIONS

Figure 2 shows the potential channel alignments and locations for the debris basin and infiltration basin. The options that are considered at this preliminary stage of the project to be most feasible are distinguished from those that are least feasible. In order to evaluate the project and the merits of each option, several factors need to be considered.

Project Benefits

Floodplain Impacts

In order to determine the benefits associated with reduced floodplain depths and areas of inundation, the adopted FEMA hydrologic and hydraulic data were used. The hydrologic analysis used to determine the 100 year regulatory flow (HEC-1) for Spanish Springs was modified to divert out flow from Griffith Canyon. This modified discharge value was then used as input to the hydraulic analysis (HEC-RAS) used to determine the 100 year floodplain elevations. The results of these analyses are contained in Appendix C.

The 100 year peak discharge from Griffith Canyon is 2,637 cubic feet per second (cfs). By diverting this flow to Boneyard Flat the regulatory floodplain from the canyon is removed, and the width of the regulatory floodplain west of Pyramid Highway is reduced. Figure 4 shows the portion of the existing 100-year floodplain that is eliminated by the Boneyard Flat Diversion. The project reduces the floodplain area by approximately 800 acres.

In addition to reduced floodplain widths, the depth and velocity of flow has also been significantly reduced. Four cross sections were selected to demonstrate the reduction in depth of flow and floodplain width. These cross sections are plotted as Figures 5 through 8 and the locations are shown on Figure 4.

5.0 PUBLIC WORKSHOP

Input/Issues

Approximately 30 homeowners attended a noticed workshop held on December 20, 1995 at the Alyce Taylor Elementary School in Spanish Springs Valley. The purpose of the meeting was to seek the communities input and identify issues which should be considered in planning the project. Written comments are contained in Appendix D.

Results

Comments from the public workshop generally were favorable towards the project. There were those in close proximity to facilities who expressed concern over potential impacts. The consensus was to place the channel on the north side of Calle de Plata and avoid existing developed properties as best as possible. Many expressed opposition to an infiltration basin near existing residential lots.

The residents of the Spanish Springs Ranches area are interested in having Washoe County also accept maintenance responsibility for Calle de la Plata.

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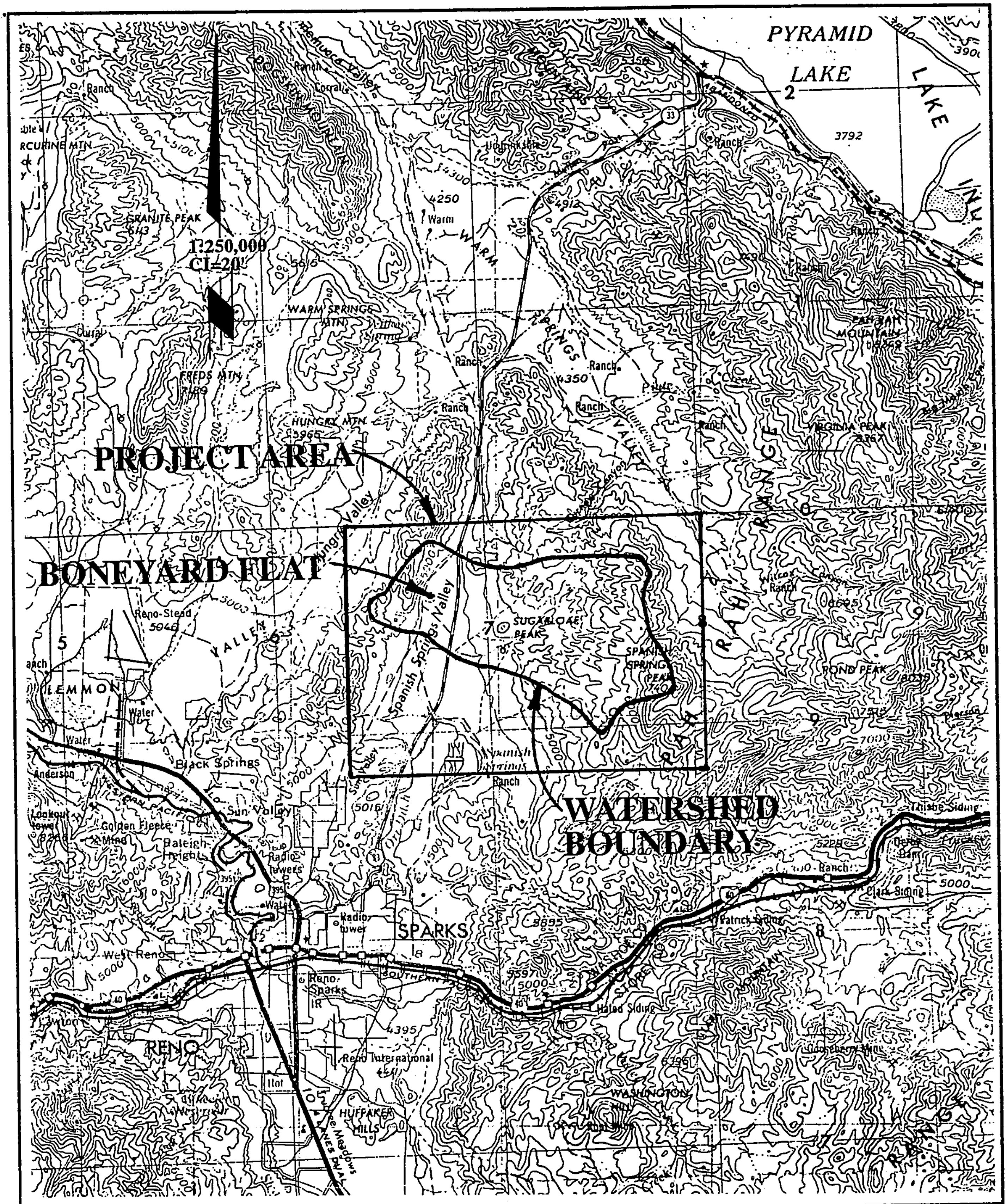

HARDING LAWSON ASSOCIATES Engineering and Environmental Services	SITE MAP BONEYARD FLAT DIVERSION FACILITIES PLAN WASHOE COUNTY, NEVADA		FIGURE 1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
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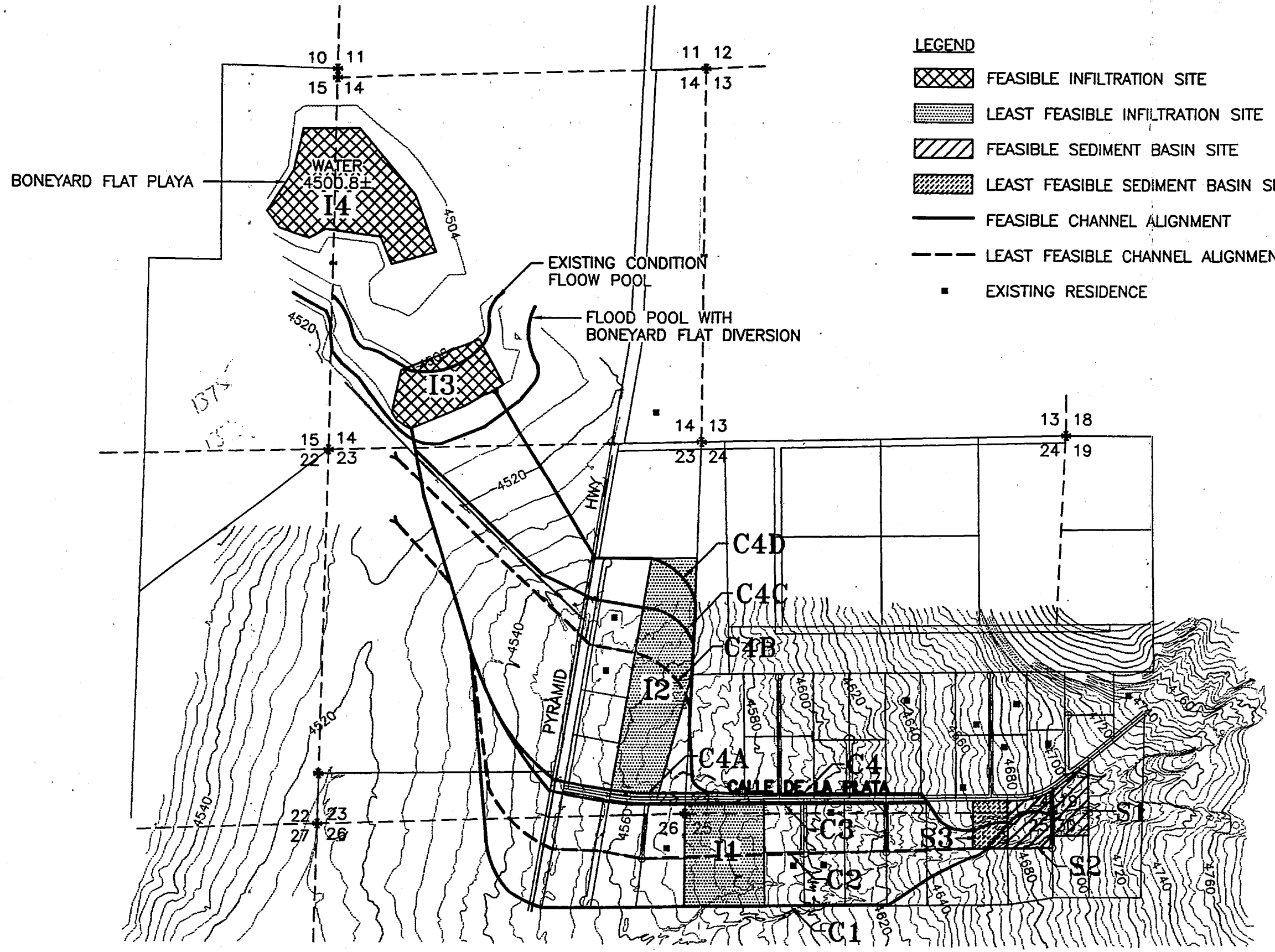

HARDING LAWSON ASSOCIATES
Engineering and Environmental Services

IMPROVEMENT OPTIONS
BONEYARD FLAT DIVERSION
FACILITIES PLAN
WASHOE COUNTY, NEVADA

FIGURE 2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
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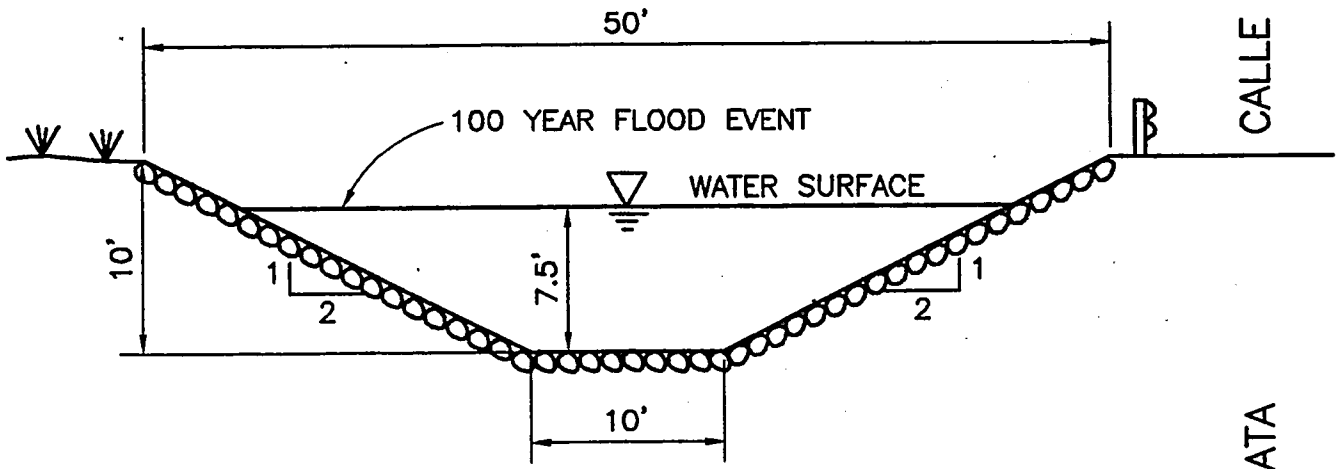

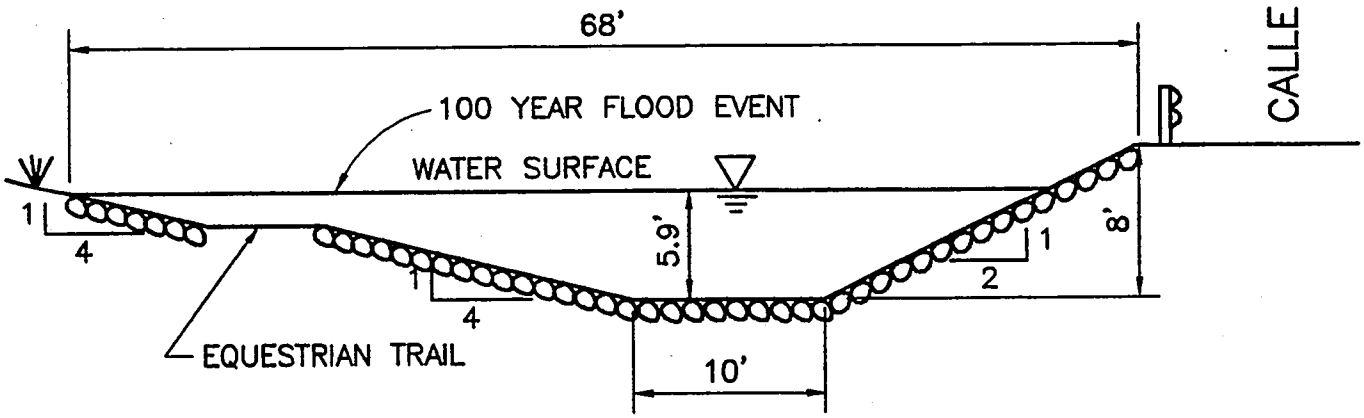

HARDING LAWSON ASSOCIATES
Engineering and Environmental Services

TYPICAL CHANNEL SECTIONS
BONEYARD FLAT DIVERSION
FACILITIES PLAN
WASHOE COUNTY, NEVADA

FIGURE 3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
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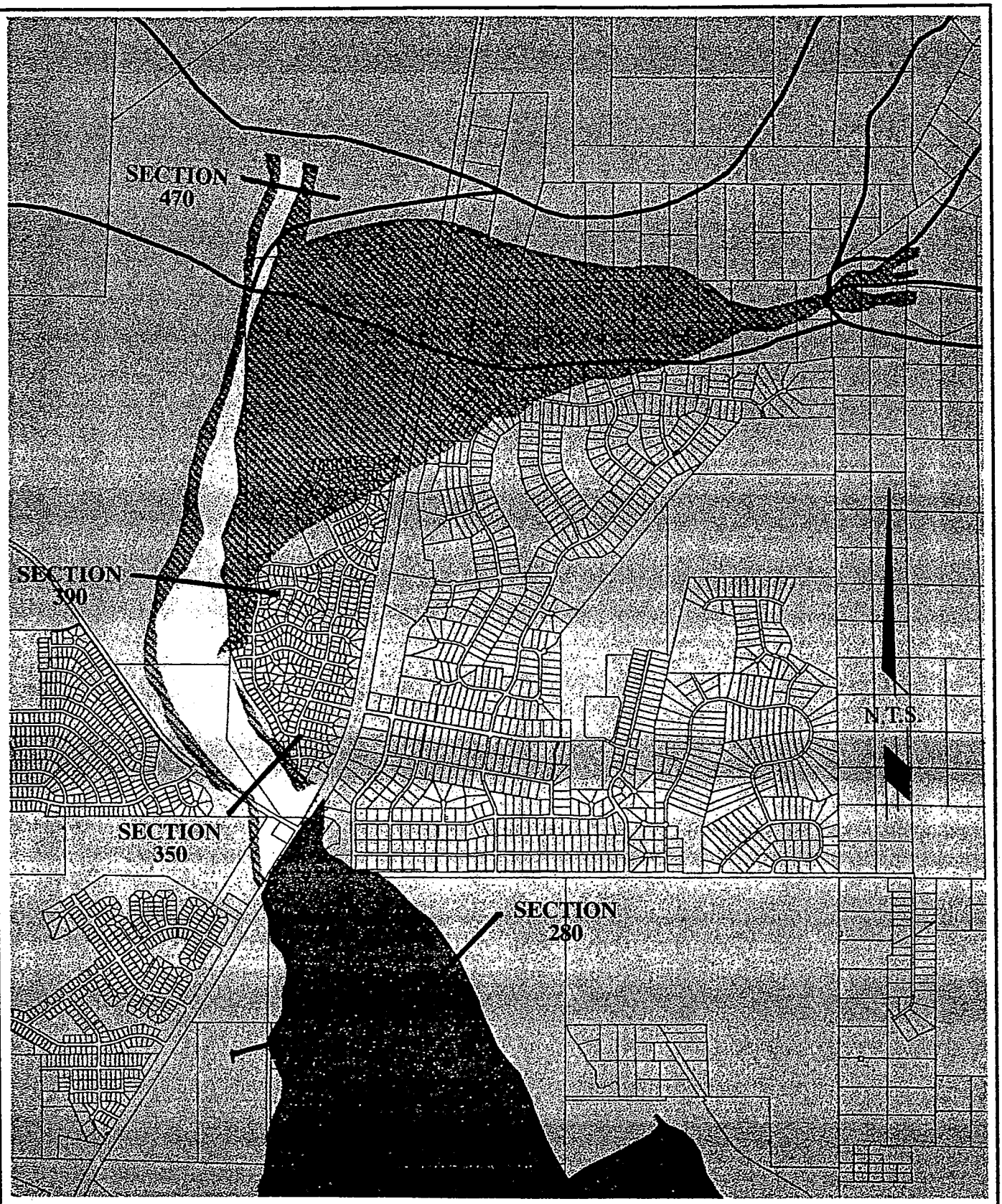


HARDING LAWSON ASSOCIATES
Engineering and
Environmental Services

100-YEAR FLOODPLAIN MAP
BONEYARD FLAT DIVERSION
FACILITIES PLAN
WASHOE COUNTY, NEVADA

FIGURE
4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RLR	33852.1		2-15-96		

Figure 5
FEMA Cross Section 470

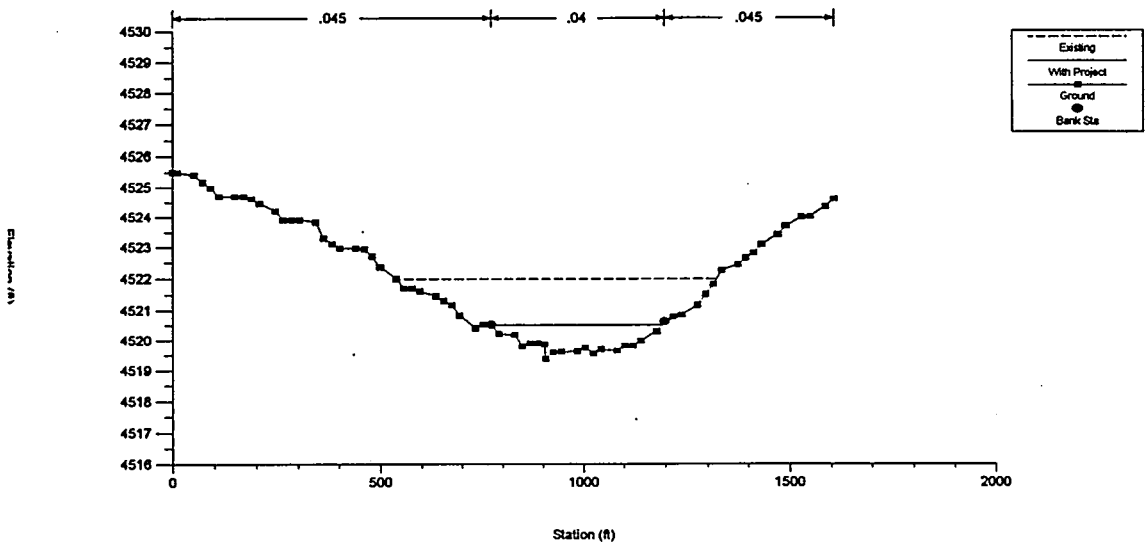
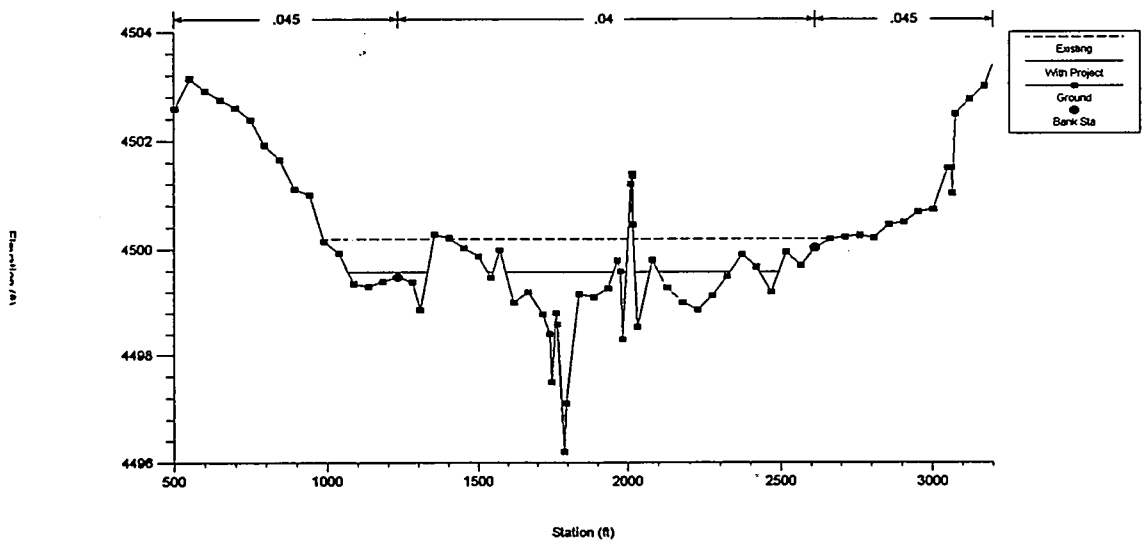


Figure 6
FEMA Cross Section 390



Harding Lawson Associates
Infrastructure Inc.
Alpha Engineering Group
961 Matley Lane Suite 110
Reno, Nevada 89502 - (702) 329-6123
FAX (702) 322-9380

Figure 7
FEMA Cross Section 350

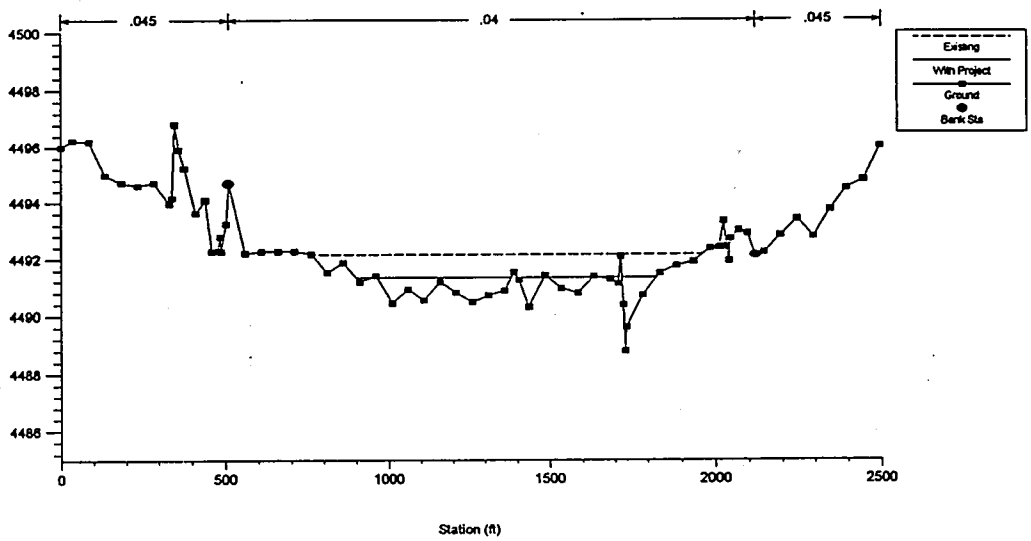
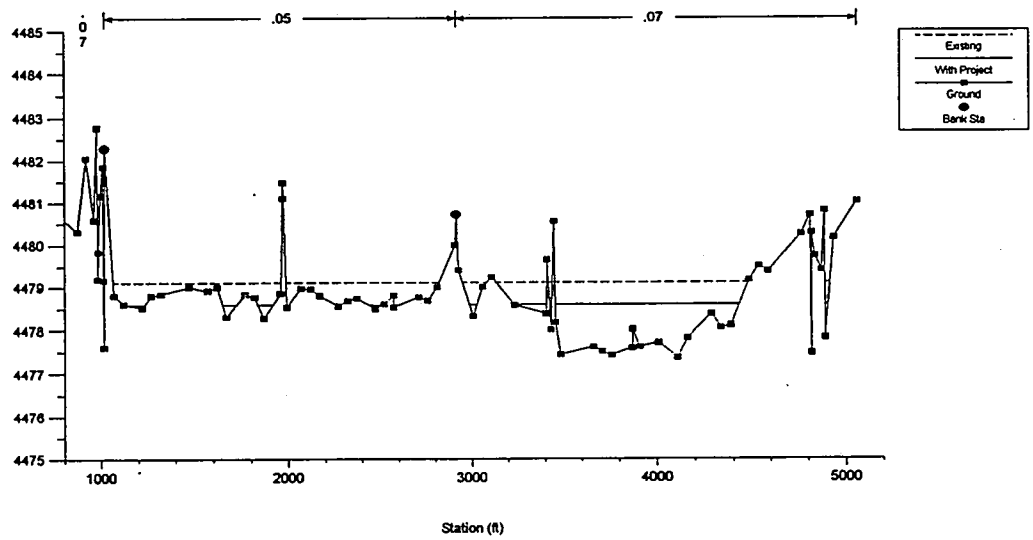


Figure 8
FEMA Cross Section 280



Harding Lawson Associates
Infrastructure Inc.
Alpha Engineering Group
961 Matley Lane Suite 110
Reno, Nevada 89502 - (702) 329-6123
FAX (702) 322-9380

Boneyard Flat Playa
Estimate of 100-year Flood Pool Elevations

Stage-Storage Relationship of the Boneyard Flat Playa:

Elevation	Area (acres)	Volume (ac-ft)
4497	0	0
4500	61	61
4504	108	395
4508	243	1079
4511	275	1855
4527	780	9952

V=h/3(A1+A2+(A1*A2)^.5)
V = incremental volume between elevations (ac-ft)
A1 = Area at lower elevation (acres)
A2 = Area at upper elevation (acres)
h = difference in elevation between A1 and A2

Approximate Runoff Volumes based on 24 Hour Event:

Estimate of runoff volume/area relationship:

	Watershed Area	Runoff Volume	Ac-ft/sq mi
Griffith Canyon Watershed	15.39	767	49.84

Using 50 ac-ft/sq mile for other watersheds:

Boneyard Flat Watershed	10	500
Watershed 8	1.6	80
Total:		***1347***

Approximate Runoff Volumes based on 10 Day Event:

Using Silver Lake FIS Study: (NIMBUS, 1987)

For Lemmon Valley Playa

Basin Average Rainfall = 10.04 inches
Rainfall Excess = 3.31 inches
Ratio of Excess to Total Rainfall = 0.33

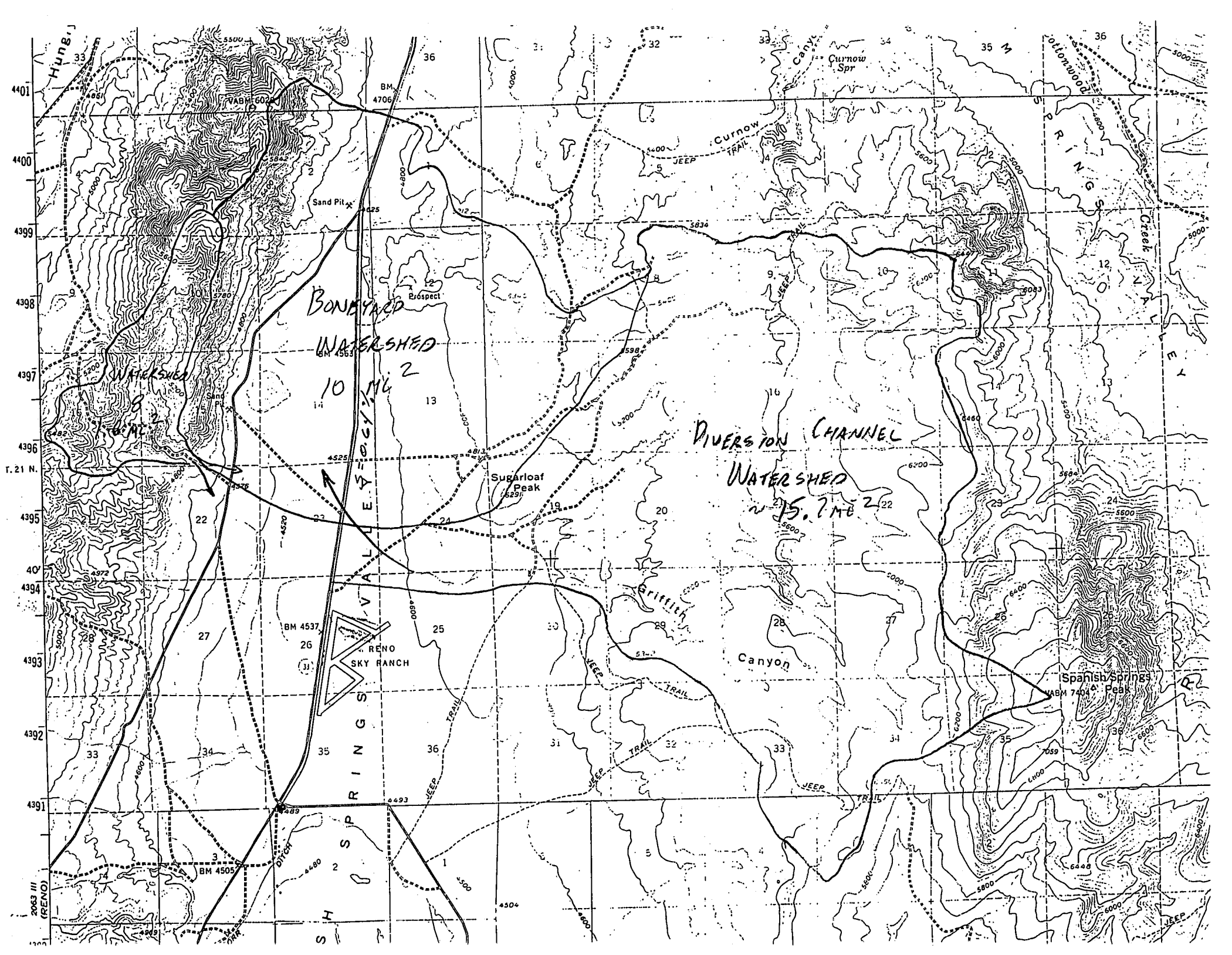
For Boneyard Flat:

Basin Average Rainfall = 6 inches (approx)
Rainfall Excess (inches) = 1.98 (APPROX)
Runoff/square mile = 107 ac-ft/square mile

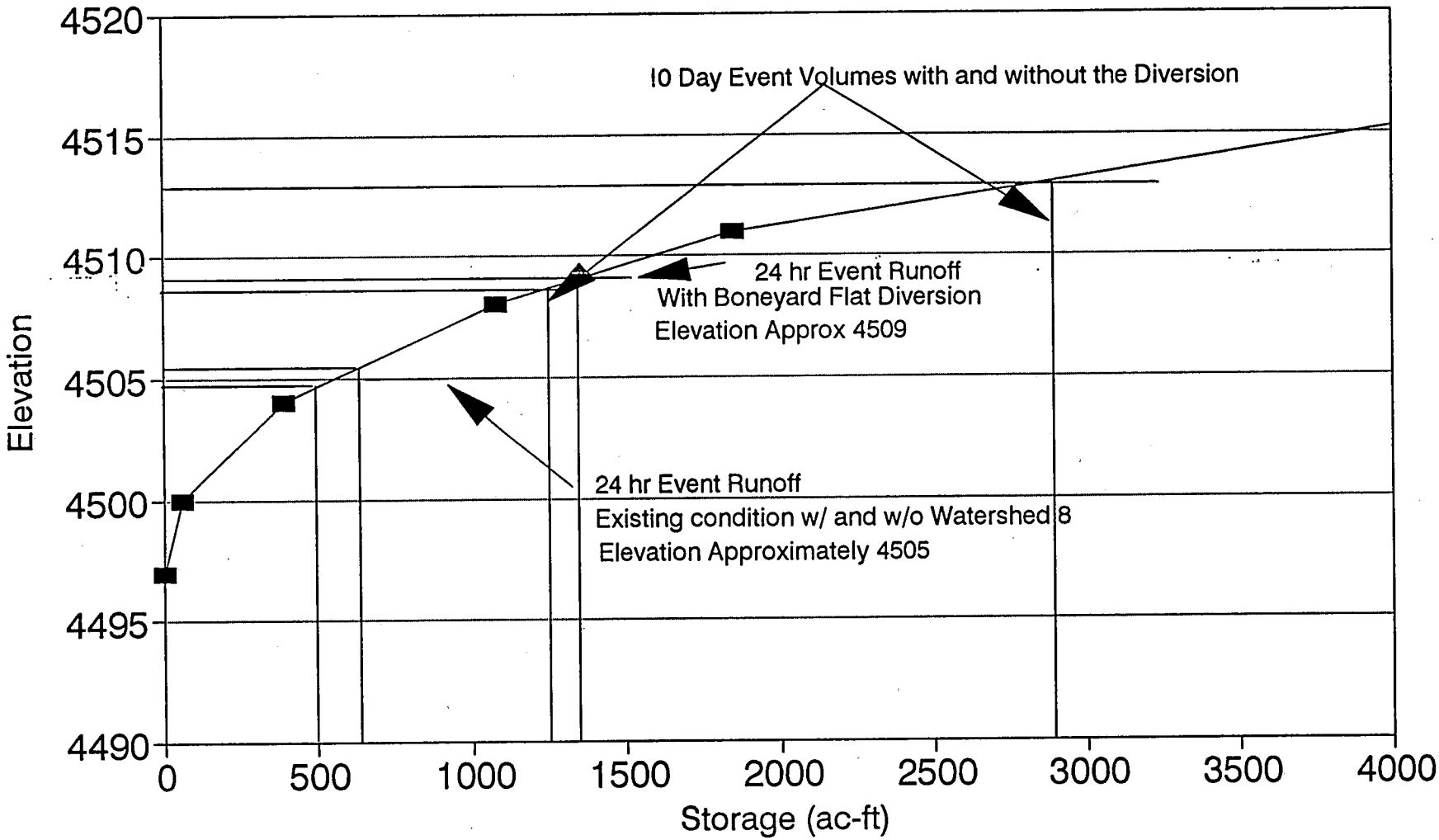
Estimate of runoff volume:

	Watershed Area	Runoff Volume
Griffith Canyon Watershed	15.39	1647
Boneyard Flat Watershed	10	1070
Watershed 8	1.6	171
Total:		***2888***

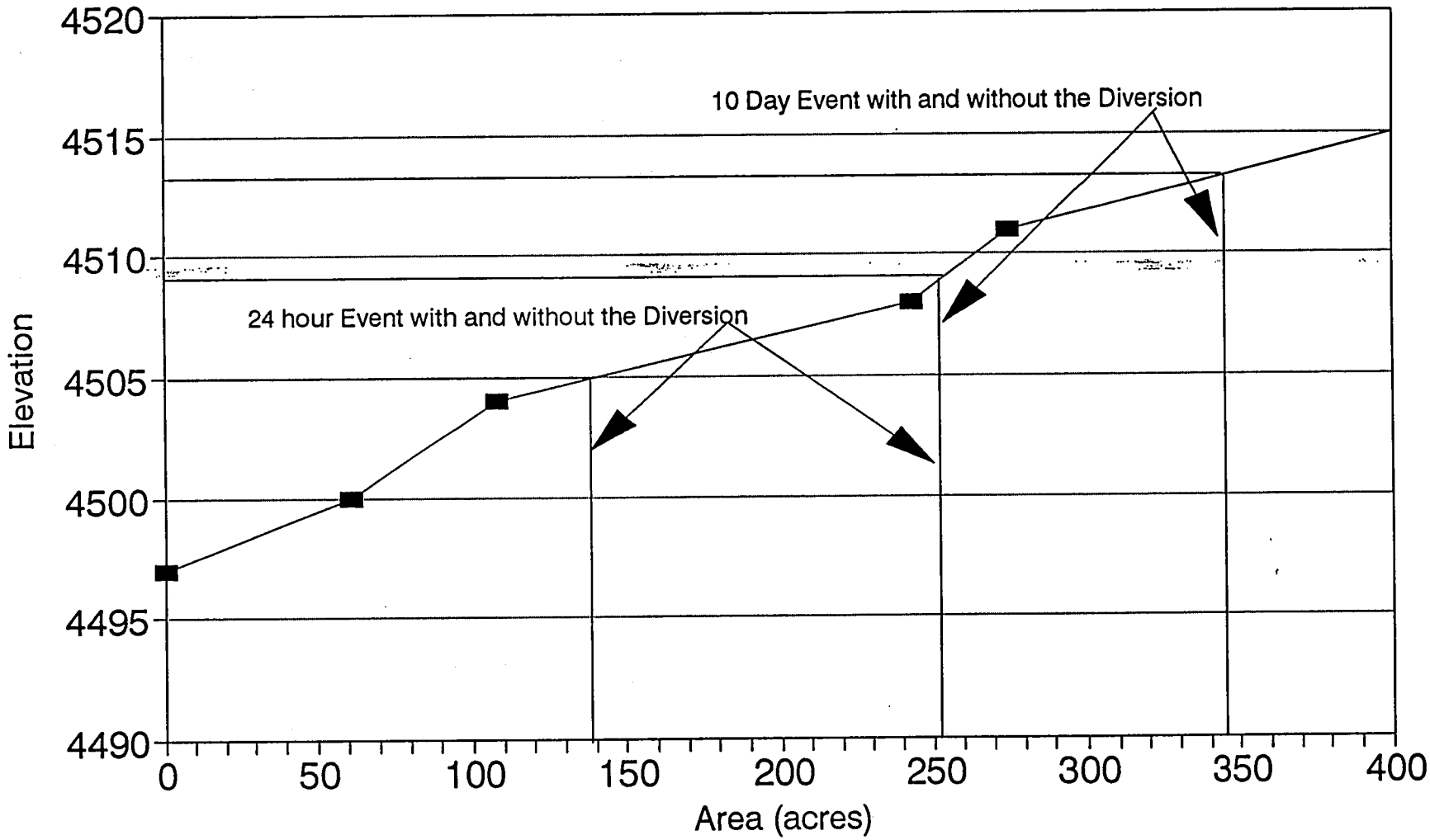
BY: MEF
7/14/96

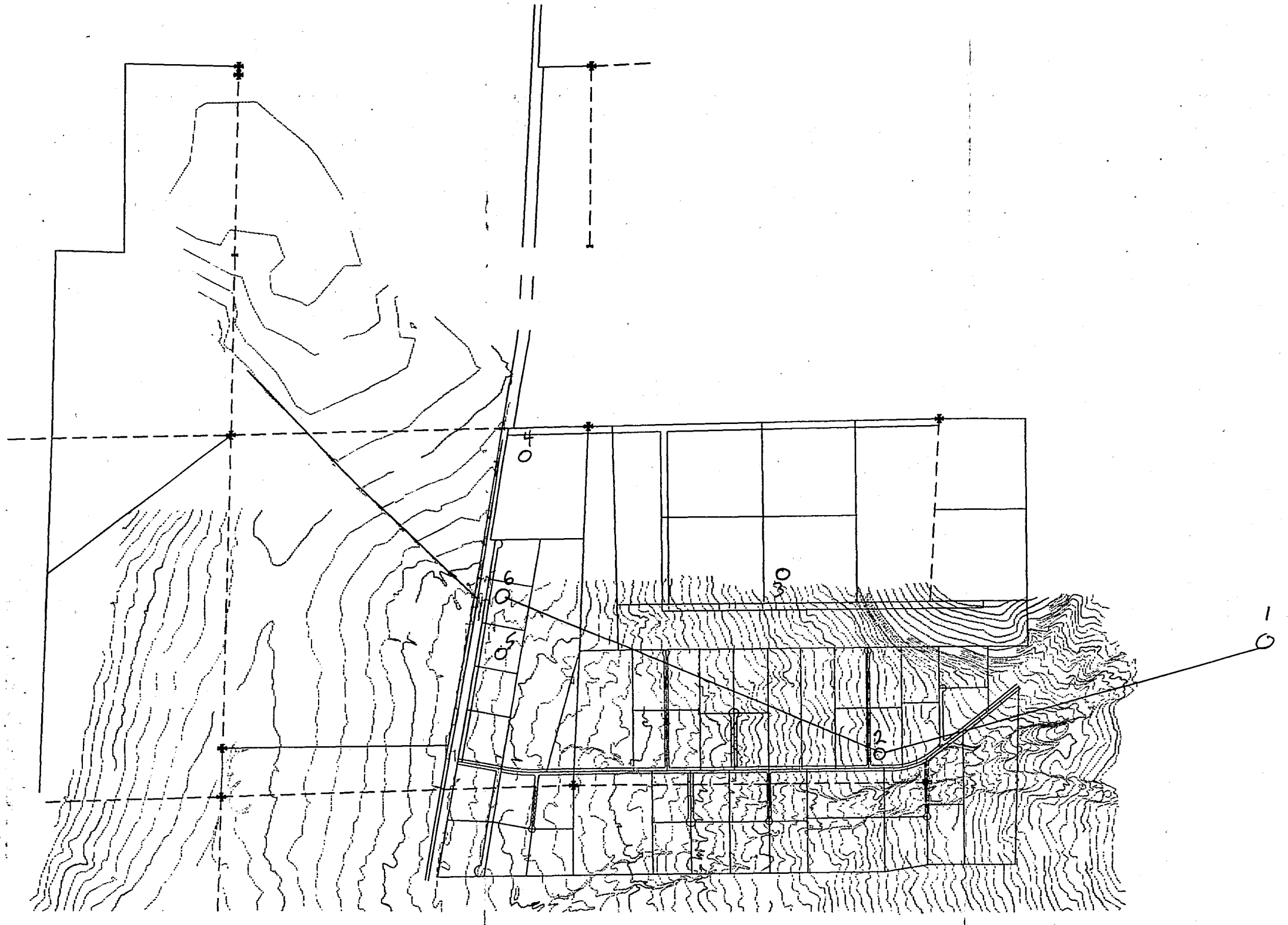

BONEYARD
WATERSHED
10 MI 2
WATERSHED
6 MI 2
DIVERSION CHANNEL
WATERSHED
15.7 MI 2
Sand Pit
Prospect
Sugarloaf Peak
5291
BM 4706
VABM 6024
BM 4563
BM 4537
BM 4505
RENO
SKY RANCH
Curnow Spr
Curnow
JEEP TRAIL
Griffith
Canyon
Spanish Springs Peak
VABM 7404
SPANISH SPRINGS VALLEY
Creek
T. 21 N.
2063 III (RENO)

Approximate Elev-Storage Relationship For Boneyard Flat Playa



Approximate Elev-Area Relationship For Boneyard Flat Playa

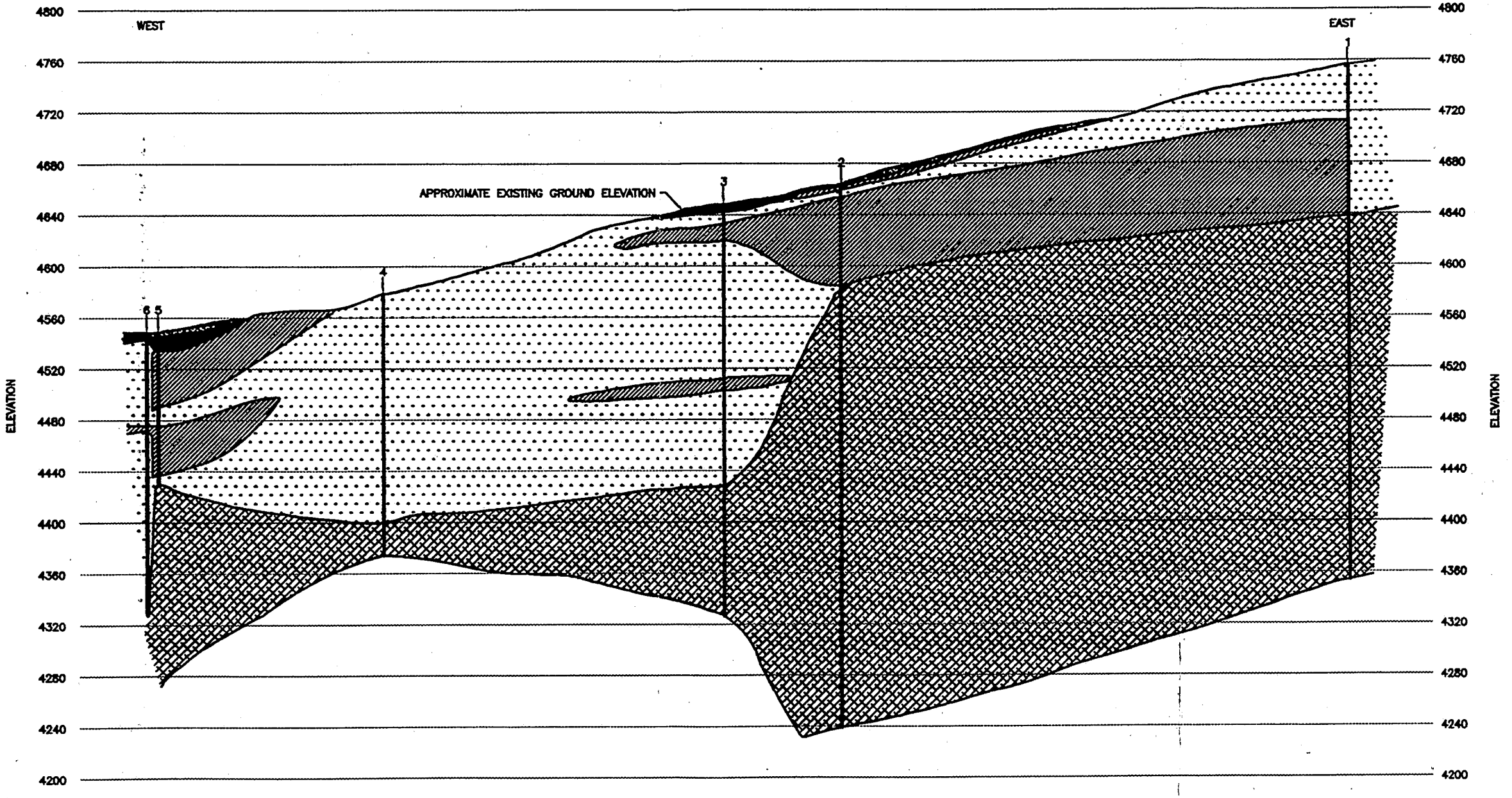




HARDING LAWSON ASSOCIATES
Engineering and
Environmental Services

WELL LOG PROFILE LOCATION

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE



LEGEND:

- TOPSOIL
- HARDPAN
- CLAY
- POORLY GRADED SAND
- BEDROCK WITH FRACTURES
- APPROXIMATE SOIL BOUNDARY

VERTICAL: 40 0 40 80 160
1"=40'

HORIZONTAL: 400 0 400 800 1600
1"=400'
SCALE IN FEET

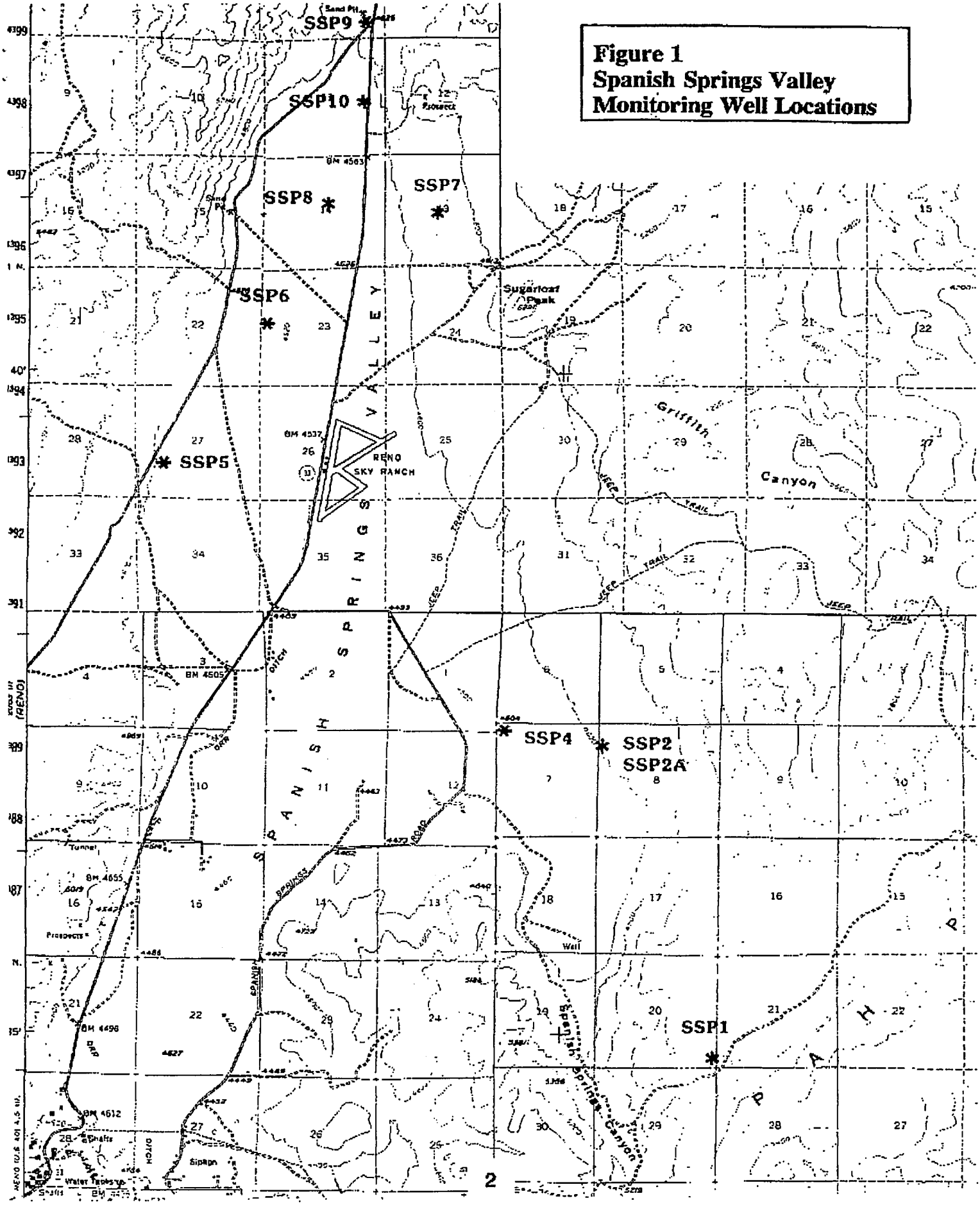


Figure 1
Spanish Springs Valley
Monitoring Well Locations

Laboratory Analysis Report

Sierra Environmental Monitoring, Inc.

WASHOE COUNTY UTILITY DIV.
ED EVANS
P.O. BOX 11130
RENO NV 89520

Date : 1/17/96
Client : WAS-314
Taken by: CLIENT-E. EVANS
Report : 15327
PO# : 017333/017334

Sample	Collected Date	Time	ALKALINITY MG/L CACO3	PH S.U.	TOTAL DISSOL. SOLIDS MG/L	NITRATE-N MG/L	ARSENIC AA HYDRIDE MG/L	BARIUM ICP MG/L
SSP5	1/04/96	10:05	136B	7.73	340	6.3N	0.064	0.06
SSP6	1/04/96	11:10	124B	7.70	334	3.3N	0.018	< 0.01
SSP8	1/04/96	14:30	96B	7.74	446	22N	0.039	0.02
SSP10	1/04/96	13:30	96B	7.65	326	5.3N	0.033	0.05

Sample	Collected Date	Time	CALCIUM ICP MG/L	CHROMIUM ICP MG/L	COPPER, ICP MG/L	IRON, ICP MG/L	MAGNESIUM ICP MG/L	MANGANESE ICP MG/L
SSP5	1/04/96	10:05	19	< 0.02	< 0.02	0.02	3.0	< 0.01
SSP6	1/04/96	11:10	57	< 0.02	< 0.02	0.03	9.4	< 0.01
SSP8	1/04/96	14:30	62	< 0.02	< 0.02	< 0.02	15	< 0.01
SSP10	1/04/96	13:30	35	< 0.02	< 0.02	< 0.02	9.2	< 0.01

Sample	Collected Date	Time	MERCURY AA COLD VAPOR MG/L	NICKEL ICP MG/L	POTASSIUM ICP MG/L	SELENIUM AA HYDRIDE MG/L	SODIUM ICP MG/L	ZINC ICP MG/L
SSP5	1/04/96	10:05	<0.0005	< 0.04	4.0	<0.001	86	0.94
SSP6	1/04/96	11:10	<0.0005	< 0.04	6.8	<0.001	27	6.0
SSP8	1/04/96	14:30	<0.0005	< 0.04	7.5	<0.001	33	0.75
SSP10	1/04/96	13:30	<0.0005	< 0.04	5.0	<0.001	45	0.79

Sample	Collected Date	Time	LEAD AA FURNACE MG/L	CADMIUM AA FURNACE MG/L	SILVER AA FURNACE MG/L	CHLORIDE MG/L	FLUORIDE MG/L	SULFATE MG/L
SSP5	1/04/96	10:05	0.003	<0.0002	<0.0005	24	1.8	49
SSP6	1/04/96	11:10	0.007	<0.0002	<0.0005	35	0.2	50
SSP8	1/04/96	14:30	<0.002	<0.0002	<0.0005	49	0.2	42
SSP10	1/04/96	13:30	<0.002	<0.0002	<0.0005	31	0.4	66

Sample	Collected Date	Time	THALLIUM AA FURNACE MG/L	BERYLLIUM AA FURNACE MG/L	ANTIMONY AA FURNACE MG/L
Continued on Next Page					

JAN 23 1996

Approved By: John Seher

This report is applicable only to the sample received by the laboratory. The liability of the laboratory is limited to the amount paid for this report. This report is for the exclusive use of the client to whom it is addressed and upon the condition that the client assumes all liability for the further distribution of the report or its contents.

William F. Pillsbury
President

1135 Financial Blvd.
Reno, NV 89502
Phone (702) 857-2400
FAX (702) 857-2404

John C. Seher
Manager

Laboratory Analysis Report

Sierra Environmental Monitoring, Inc.

WASHOE COUNTY UTILITY DIV.
ED EVANS
P.O. BOX 11130
RENO NV 89520

Date : 1/17/96
Client : WAS-314
Taken by: CLIENT-E. EVANS
Report : 15327
PO# : 017333/017334

Sample	Collected Date	Time	THALLIUM AA FURNACE MG/L	BERYLLIUM AA FURNACE MG/L	ANTIMONY AA FURNACE MG/L			
SSP5	1/04/96	10:05	<0.0005	<0.0002	<0.002			
SSP6	1/04/96	11:10	<0.0005	<0.0002	<0.002			
SSP8	1/04/96	14:30	<0.0005	<0.0002	<0.002			
SSP10	1/04/96	13:30	<0.0005	<0.0002	<0.002			

Approved By: _____

William F. Pillsbury
President

1135 Financial Blvd.
Reno, NV 89502
Phone (702) 857-2400
FAX (702) 857-2404

John C. Seher
Manager

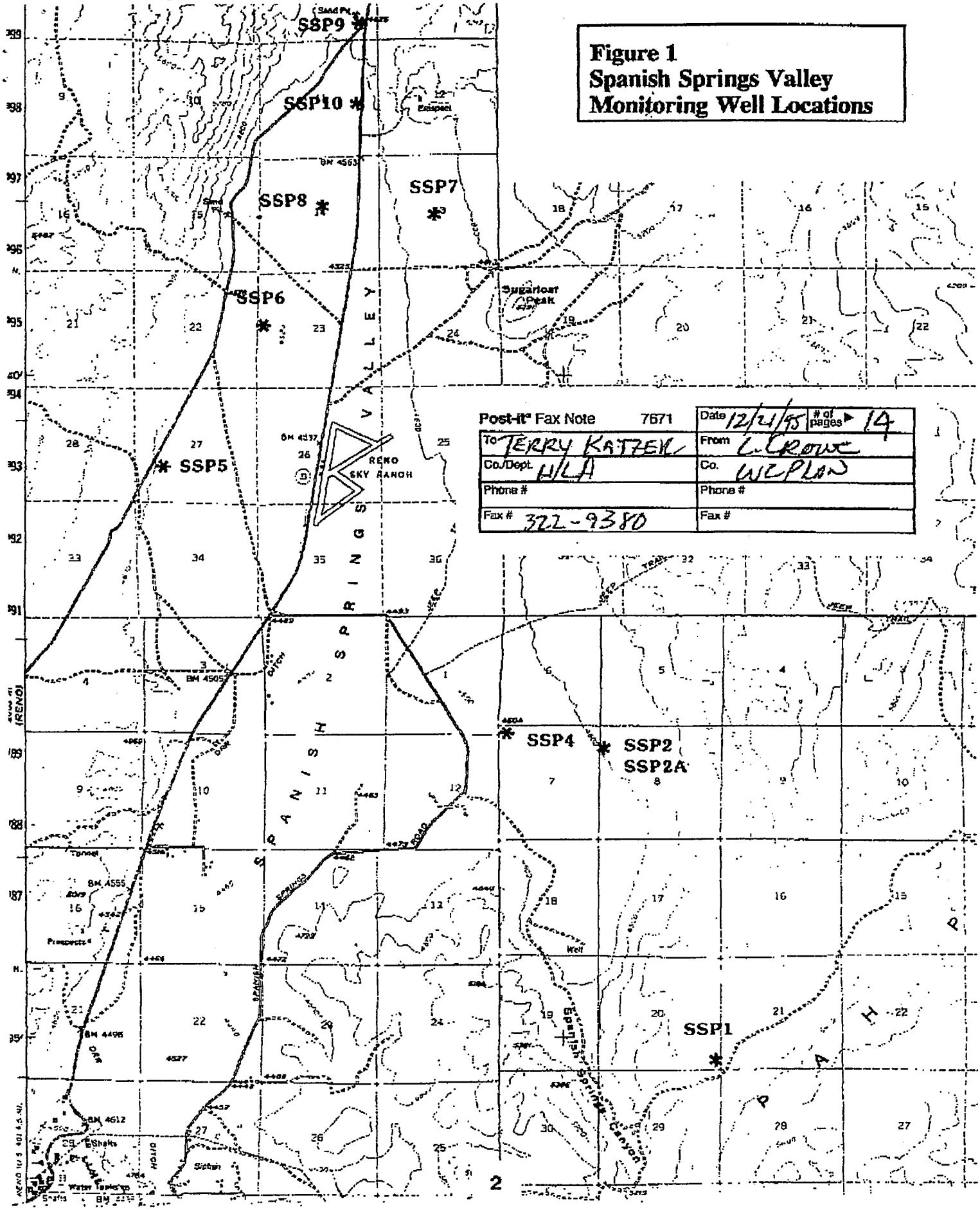


Figure 1
Spanish Springs Valley
Monitoring Well Locations

Post-it® Fax Note 7671	Date 12/21/95	# of pages ▶ 14
To TERRY KATZEK	From L. CROWE	
Co./Dept. H/LA	Co. WCPLAN	
Phone #	Phone #	
Fax # 322-9380	Fax #	

WHITE–DIVISION OF WATER RESOURCES
CANARY–CLIENT'S COPY
PINK–WELL DRILLER'S COPY

PRINT OR TYPE ONLY
DO NOT WRITE ON BACK

STATE OF NEVADA
DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

Please complete this form in its entirety in accordance with NRS 534.170 and NAC 534.340

OFFICE USE ONLY
Log No.
Permit No.
Basin

NOTICE OF INTENT NO. 24092

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520

ADDRESS AT WELL LOCATION
Spanish Springs
SSP 10

2. LOCATION NE ¼ SE ¼ Sec. 11 T. 21 N/S R. 20 E. Washoe County

PERMIT NO. (Issued by Water Resources) | Parcel No. | Subdivision Name

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Coarse sand		0	20	20
Silt, sand & gravel		20	30	10
Granitic-volcanic sand		30	50	20
Brown silty clay		50	62	12
Granitic sand		62	82	20
Brown silty clay		82	91	9
Tan rhyolite/tuff		91	150	59
Tan-green clay/sand		150	190	40
Quartz sand		190	200	10
Tan-green clay/sand		200	220	20
Quartz/clay		220	238	18
Green clay		238	260	22

Date started September 17, 19 93
Date completed September 20, 19 93

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not measure		air lift 2 hrs.

8. WELL CONSTRUCTION
Depth Drilled 260 Feet Depth Cased 252 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	260 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2		galvanized	+2	105

Perforations:
Type perforation Slotted
Size perforation 1/8 X 2 1/2
From 105 feet to 252 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 58'
Placement Method: ☒ Pumped ☐ Poured

Seal Type:
☒ Neat Cement
☐ Cement Grout
☐ Concrete Grout

Gravel Packed: ☒ Yes ☐ No
From 58 feet to 252 feet

9. WATER LEVEL
Static water level 95.08' feet below land surface
Artesian flow G.P.M. P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.

Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 89446
Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller 1914
Signed C. O. Cole (By driller performing actual drilling on site or contractor)
Date 12-7-93

(Rev. 3-91) USE ADDITIONAL SHEETS IF NECESSARY 10-627

WHITE—DIVISION OF WATER RESOURCES
CANARY—CLIENT'S COPY
PINK—WELL DRILLER'S COPY

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STATE OF NEVADA
DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

Please complete this form in its entirety in accordance with NRS 534.170 and NAC 534.340

OFFICE USE ONLY
Log No.
Permit No.
Basin

NOTICE OF INTENT NO. 24091

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520

ADDRESS AT WELL LOCATION
Spanish Springs Site #9

2. LOCATION SE ¼ SE ¼ Sec. T. 21 N/S R. 20 E Washoe County

PERMIT NO. NA (Issued by Water Resources) | NA (Parcel No.) | NA (Subdivision Name)

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Decomposed granite		0	15	15
Granite sand/gravel		15	27	12
Gray volcanic tuff		27	70	43
Tan volcanic tuff		70	140	70
Gray volcanic tuff		140	157	17
Brown/gray clay		157	190	33
Tan clay		190	225	35
Blue-gray clay		225	240	15
Brown/gray/red clay		240	370	130
volcanic sand		370	375	5
White tuff clay		375	405	30
Gray volcanic tuff		405	440	35

8. WELL CONSTRUCTION
Depth Drilled 440 Feet Depth Cased 420 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	420 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2"		Galvanized	+2	231

Perforations:
Type perforation Slotted
Size perforation 1/8 x 2½
From 231 feet to 420 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 52'
Placement Method: ☒ Pumped ☐ Poured
Seal Type: ☒ Neat Cement ☐ Cement Grout ☐ Concrete Grout

Gravel Packed: ☒ Yes ☐ No
From 52 feet to 420 feet

9. WATER LEVEL
Static water level 178.14' feet below land surface
Artesian flow G.P.M. P.S.I.
Water temperature cold °F Quality good

Date started September 15, 19 93
Date completed September 17, 19 93

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not measure		Air lift

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.

Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 89446
Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources (the on-site driller) WW-1195-1
Signed C. O. Cyller (By driller performing actual drilling on site or contractor)
Date 11-1-93

(Rev. 3-91)

USE ADDITIONAL SHEETS IF NECESSARY

(0)-627

WHITE—DIVISION OF WATER RESOURCES
CANARY—CLIENT'S COPY
PINK—WELL DRILLER'S COPY

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STATE OF NEVADA
DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

Please complete this form in its entirety in accordance with NRS 534.170 and NAC 534.340

OFFICE USE ONLY
Log No.
Permit No.
Basin

NOTICE OF INTENT NO. 24093

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520
ADDRESS AT WELL LOCATION Spanish Springs Site #8

2. LOCATION SW ¼ NE ¼ Sec. 14 T 21 N/S R 20 E Washoe County
PERMIT NO. NA (Issued by Water Resources) | NA (Parcel No.) | NA (Subdivision Name)

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Silt & clay		0	5	5
Granite & clay		5	20	15
Brown clay		20	50	30
Brown clay/fine sand		50	77	27
Granitic sand/clay		77	90	13
Brown clay/sand		90	98	8
Hard brown clay		98	103	5
Brown clay/sand		103	123	20
Granitic sand		123	130	7
Tan clay		130	153	23
Tan clay/sand		153	192	39
Brown clay		192	200	8
Granitic sand		200	218	18
Tan clay		218	222	4
Granitic sand		222	226	4
Brown clay/sand		226	240	14

Date started September 13 19 93
Date completed September 14 19 93

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not measure		air on rig

8. WELL CONSTRUCTION
Depth Drilled 240 Feet Depth Cased 230 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	240 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2		Galvanized	+2	105

Perforations:
Type perforation Slotted
Size perforation 1/8 X 2½
From 105 feet to 230 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 57'
Placement Method: ☒ Pumped ☐ Poured
Seal Type: ☒ Neat Cement ☐ Cement Grout ☐ Concrete Grout

Gravel Packed: ☒ Yes ☐ No
From 57 feet to 240 feet

9. WATER LEVEL
Static water level 58.17 feet below land surface
Artesian flow G.P.M. P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.
Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 89446
Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller T-1195-1
Signed (By driller performing actual drilling on site or contractor)
Date 11-1-93

(Rev. 5-91) USE ADDITIONAL SHEETS IF NECESSARY (01-627)

WHITE—DIVISION OF WATER RESOURCES
CANARY—CLIENT'S COPY
PINK—WELL DRILLER'S COPY

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STATE OF NEVADA
DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

Please complete this form in its entirety in accordance with NRS 534.170 and NAC 534.340

OFFICE USE ONLY
Log No.
Permit No.
Basin

NOTICE OF INTENT NO. 24094

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520

ADDRESS AT WELL LOCATION
Spanish Springs Site #7

2. LOCATION NE ¼ SW ¼ Sec. 13 T. 21 (N)S R 20 E Washoe County

PERMIT NO. NA (Issued by Water Resources) | NA (Parcel No.) | NA (Subdivision Name)

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Fine sand & silt		0	5	5
Coarse granite sand		5	52	47
Granitic sand/clay		52	64	12
Brown silty clay/sand		64	72	8
Brn/red silty clay		72	85	13
Tan silty clay/sand		85	95	10
White sand/clay		95	105	10
Decomposed granodiorite		105	190	85
Granodiorite/white clay		190	250	60
Lost circulation		250	270	20
Granodiorite		270	330	60
Granodiorite/white clay		330	360	30

Date started August 29, 19 93
Date completed September 1, 19 93

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did	←	did not Test
		Air on Rig

8. WELL CONSTRUCTION
Depth Drilled 360 Feet Depth Cased 360 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	360 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2		Galvanized	+2	169

Perforations:
Type perforation Slotted pipe
Size perforation 1/8 X 2½
From 169 feet to 360 feet
From ____ feet to ____ feet
From ____ feet to ____ feet
From ____ feet to ____ feet
From ____ feet to ____ feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 60
Placement Method: ☒ Pumped ☐ Poured
Seal Type: ☒ Neat Cement ☐ Cement Grout ☐ Concrete Grout

Gravel Packed: ☒ Yes ☐ No
From 60 feet to 360 feet

9. WATER LEVEL
Static water level 314.62' feet below land surface
Artesian flow ____ G.P.M. ____ P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.
Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 89446
Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller T-1195-1
Signed (By driller performing actual drilling on site or contractor)
Date 11-1-93

(Rev. 3-91) USE ADDITIONAL SHEETS IF NECESSARY (0)-427

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STATE OF NEVADA
DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

Please complete this form in its entirety in accordance with NRS 534.170 and NAC 534.340

OFFICE USE ONLY
Log No.
Permit No.
Basin

NOTICE OF INTENT NO. 24096

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520
ADDRESS AT WELL LOCATION Spanish Springs Site #6 SSP

2. LOCATION SW ¼ NW ¼ Sec. 23 T. 21 (N)S R 20 (E)W Washoe County
PERMIT NO. NA (Issued by Water Resources) | NA (Parcel No.) | NA (Subdivision Name)

3. WORK PERFORMED: ☒ New Well ☐ Replace ☐ Recondition ☐ Deepen ☐ Abandon ☐ Other
4. PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ Test ☐ Municipal/Industrial ☒ Monitor ☐ Stock
5. WELL TYPE: ☐ Cable ☒ Rotary ☐ RVC ☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Fine sand/silt		0	16	16
Brown clay		16	20	4
Granite/volcanic sand		20	26	6
Brown silty clay		26	32	6
Granitic sand		32	40	8
Brown silty clay		40	46	6
Granitic sand/clay		46	52	6
Brown clay/sand		52	90	38
Granitic sand		90	98	8
Brown clay		98	108	10
Granitic sand		108	130	22
Granitic sand/clay		130	138	8
Brown clay		138	143	5
Granitic sand/clay		143	170	27
Compacted granitic sand		170	210	40

Date started August 26, 19 93
Date completed August 28, 19 93

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☑ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not measure		air on Rig

8. WELL CONSTRUCTION
Depth Drilled 210 Feet Depth Cased 210 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	210 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2"		Galvanized	+2	126

Perforations:
Type perforation Slotted pipe
Size perforation 1/8 X 2½ 4 per foot
From 126 feet to 310 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 61'
Placement Method: ☒ Pumped ☐ Poured
Seal Type: ☒ Neat Cement ☐ Cement Grout ☐ Concrete Grout

Gravel Packed: ☒ Yes ☐ No
From 61 feet to 210 feet

9. WATER LEVEL
Static water level 62.86 feet below land surface
Artesian flow G.P.M. P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.
Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 89446
Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller T-1195-1
Signed (By driller performing actual drilling on site or contractor)
Date 11-1-93

(Rev 3-91) USE ADDITIONAL SHEETS IF NECESSARY (01-627)

DEC-21-1995 09:08 COMPREHENSIVE PLANNING 702 3283648 P.06/11

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DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

Please complete this form in its entirety in accordance with NRS 534.170 and NAC 534.340

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NOTICE OF INTENT NO. 24098

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520

ADDRESS AT WELL LOCATION
Spanish Springs Site #5

2. LOCATION NE ¼ SW ¼ Sec. 27 T 21 N R 20 E Washoe County

PERMIT NO. NA (Issued by Water Resources) | NA (Parcel No.) | NA (Subdivision Name)

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Fine sand/silt		0	5	5
Granitic sand		5	46	41
Granitic sand/sm gravel		46	65	19
Granitic sand/brn clay		65	70	5
Granitic sand		70	75	5
Brown clay/sand		75	80	5
Granitic sand		80	96	16
Granitic sand/brn clay		96	125	29
Granitic sand		125	144	19
Granitic sand/brn clay		144	205	61
Granitic sand		205	210	5
Granitic sand/brn clay		210	222	12
Granitic sand		222	240	18
Granitic sand/brn clay		240	250	10

Date started August 23, 1993
Date completed August 25, 1993

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not measure		pump broke

8. WELL CONSTRUCTION
Depth Drilled 250 Feet Depth Cased 235 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	250 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2"		galvanized	+2	130

Perforations:
Type perforation Slotted pipe
Size perforation 1/8 X 2¾ 4 per foot
From 130 feet to 235 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 60'
Placement Method: ☒ Pumped ☐ Poured

Seal Type:
☒ Neat Cement
☐ Cement Grout
☐ Concrete Grout

Gravel Packed: ☒ Yes ☐ No
From 60 feet to 235 feet

9. WATER LEVEL
Static water level 109.95 feet below land surface
Artesian flow G.P.M. P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.

Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 89446
Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller T-1195-1
Signed (Driller performing actual drilling on site or contractor)
Date 11-1-93

(Rev. 3-91) USE ADDITIONAL SHEETS IF NECESSARY (01-627)

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STATE OF NEVADA

DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

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NOTICE OF INTENT NO. 24095

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520

ADDRESS AT WELL LOCATION
Spanish Springs SSP4

LOCATION SE ¼ NW ¼ NE ¼ NW ¼ Sec. 12 T. 20 N/S R. 20 21 E. Washoe County

PERMIT NO. (Issued by Water Resources) Parcel No. Subdivision Name

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Fine sand		0	18	18
Coarse sand		18	26	8
Green clay w/sand		26	28	2
Granitic sand		28	47	19
Gray silty clay		47	50	3
Granitic sand/small gravel		50	76	26
Tan clay		76	96	20
Coarse volcanic sand		96	105	9
Tan silty clay		105	112	7
Granitic sand		112	118	6
Brown clay		118	126	8
Gray/brown clay		126	265	139
Gray clay w/sand		265	275	10
Blue/gray clay		275	418	143
Brown silty clay		418	425	7
Brown clay w/basalt sand		425	435	10
Red cinder w/red clay		435	457	22
Fractured coarse basalt		457	465	8
Red cinder		465	487	22
Basalt		487	498	11
Red cinder w/red clay		498	519	21
Weathered basalt		519	565	46

Date started October 27, 19 93
Date completed October 30, 19 93

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not measure		air on rig 2 hrs

8. WELL CONSTRUCTION
Depth Drilled 565 Feet Depth Cased 546 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	565 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2		galvanized	+2	252

Perforations:
Type perforation Slotted
Size perforation 1/8 X 2 1/2 4 per foot
From 252 feet to 546 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 55'
Placement Method: ☒ Pumped ☐ Poured
Seal Type: ☐ Neat Cement ☐ Cement Grout ☐ Concrete Grout

Gravel Packed: ☒ Yes ☐ No
From 55 feet to 546 feet

9. WATER LEVEL
Static water level 21.24' feet below land surface
Artesian flow G.P.M. P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.

Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 89446

Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller 1914

Signed C. C. Eyle (By driller performing actual drilling on site or contractor)
Date 12-7-93

(Rev. 3-91) USE ADDITIONAL SHEETS IF NECESSARY (6)-027

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STATE OF NEVADA
DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

Please complete this form in its entirety in accordance with NRS 534.170 and NAC 534.340

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NOTICE OF INTENT NO. 24110

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520

ADDRESS AT WELL LOCATION
Spanish Springs SSP2A

2. LOCATION NW ¼ NW ¼ Sec. 8 T 20 N/S R 21 E Washoe County

PERMIT NO. (Issued by Water Resources) | Parcel No. | Subdivision Name

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Coarse sand		0	5	5
Volcanic sand & gravel		5	18	13
Sand w/brown clay		18	25	7
Volcanic/granitic sand		25	36	11
Brown clay w/sand		36	42	6
Granitic/volcanic sand		42	48	6
Brown clay w/sand		48	55	7
Coarse sand		55	58	3
Brown silty clay		58	69	11
Volcanic sand		69	74	5
Tan clay w/sand		74	82	8
Volcanic/granitic sand		82	98	16
Brown clay w/sand		98	107	9
Sand w/gray clay		107	118	11
Tan/brown clay		118	184	66
Weathered brown basalt		184	185	1

Date started October 23, 19 93
Date completed October 25, 19 93

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not measure		are in Rig 2hrs

8. WELL CONSTRUCTION
Depth Drilled 185 Feet Depth Cased 185 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	185 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2		galvanized	+2	101

Perforations:
Type perforation Slotted
Size perforation 1/8 X 2 1/2 4 per foot
From 101 feet to 185 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 67
Placement Method: ☒ Pumped ☐ Poured

Seal Type:
☒ Neat Cement
☐ Cement Grout
☐ Concrete Grout

Gravel Packed: ☒ Yes ☐ No
From 67 feet to 185 feet

9. WATER LEVEL
Static water level 136.15' feet below land surface
Artesian flow G.P.M. P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.

Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P O Box 590 (Contractor)
Winnemucca, NV 89446

Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller 1914

Signed C. C. Eyler (By driller performing actual drilling on site or contractor)
Date 12-7-93

(Rev. 3-91) USE ADDITIONAL SHEETS IF NECESSARY (O)-427

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DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

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NOTICE OF INTENT NO. 24097

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520

ADDRESS AT WELL LOCATION
Spanish Springs SSP2

2. LOCATION NE ¼ NE ¼ Sec. 12 T. 20 N/S R 20 E/W Washoe County

PERMIT NO. (Issued by Water Resources) | Parcel No. | Subdivision Name

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Coarse sand		0	5	5
Volcanic sand & gravel		5	15	10
Sand w/brown clay		15	20	5
Volcanic/granitic sand		20	33	13
Brown clay w/sand		33	38	5
Granitic/volcanic sand		38	50	12
Brown clay w/sand		50	58	8
Brown silty clay		58	67	9
Tan clay w/sand		67	86	19
Volcanic/granitic sand		86	94	8
Brown clay w/sand		94	100	6
Volcanic sand		100	106	6
Tan/brown clay		106	187	81
Weathered black basalt		187	205	18
Red cinder w/red clay		205	213	8
Gray basalt		213	225	12
BRown clay w/basalt		225	235	10
Gray basalt		235	277	42
Red cinder w/red clay		277	285	8
Gray basalt		285	310	25
Tan clay w/basalt fragments		310	378	68
Red/brown cinder w/clay		378	425	47
Black scoriated basalt		425	550	125

Date started October 25, 1993
Date completed October 27, 1993

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not test		Air on rig 2hr.

8. WELL CONSTRUCTION
Depth Drilled 550 Feet Depth Cased 490 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	350 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2		galvanized	+2	252

Perforations:
Type perforation Slotted
Size perforation 1/8 X 2 1/2 4 per foot
From 252 feet to 490 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 215'
Placement Method: ☒ Pumped ☐ Poured
Seal Type: ☒ Neat Cement ☐ Cement Grout ☐ Concrete Grout
Gravel Packed: ☒ Yes ☐ No
From 215 feet to 490 feet

9. WATER LEVEL
Static water level 124.85' feet below land surface
Artesian flow G.P.M. P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.
Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 889446
Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller 1914
Signed (By driller performing actual drilling on site or contractor)
Date 12-7-93

(Rev. 3-91) USE ADDITIONAL SHEETS IF NECESSARY 10-677

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DIVISION OF WATER RESOURCES

WELL DRILLER'S REPORT

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NOTICE OF INTENT NO. 24099

1. OWNER Washoe County Utility Division
MAILING ADDRESS P.O. Box 11130
Reno, NV 89520

ADDRESS AT WELL LOCATION
Spanish Springs Site# SSP1

2. LOCATION SE ¼ SE ¼ Sec. 20 T. 20 N/S R. 21 E. Washoe County

PERMIT NO. (Issued by Water Resources) | Parcel No. | Subdivision Name

3. WORK PERFORMED
☒ New Well ☐ Replace ☐ Recondition
☐ Deepen ☐ Abandon ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test
☒ Municipal/Industrial ☐ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC
☐ Air ☐ Other

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Dry red silty clay		0	10	10
Red clay/red volcanic		10	40	30
Red/brown basalt		40	85	45
Red basalt/red clay		85	95	10
Red/brown basalt		95	250	155
Red volcanic tuff/clay		250	260	10
Orange tuff clay		260	283	20
Red/brown basalt		283	295	12
Weathered brown basalt		295	485	190
Red basalt		485	635	150
Black basalt		635	665	30

Date started October 20, 19 93
Date completed October 22, 19 93

7. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☐ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
did not measure		Air not big enough

8. WELL CONSTRUCTION
Depth Drilled 665 Feet Depth Cased 651 Feet

HOLE DIAMETER (BIT SIZE)

	From	To
7 7/8 Inches	0 Feet	665 Feet
Inches	Feet	Feet
Inches	Feet	Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
2		galvanized	+2	336

Perforations:
Type perforation Slotted pipe
Size perforation 1/8 X2 1/2 4 per foot
From 336 feet to 651 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Surface Seal: ☒ Yes ☐ No
Depth of Seal 50'
Placement Method: ☒ Pumped ☐ Poured

Seal Type:
☒ Neat Cement
☐ Cement Grout
☐ Concrete Grout

Gravel Packed: ☐ Yes ☒ No
From feet to feet

9. WATER LEVEL
Static water level 535' feet below land surface
Artesian flow – G.P.M. – P.S.I.
Water temperature cold °F Quality good

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.

Name Humboldt Drilling & Pump Co., Inc. (Contractor)
Address P.O. Box 590 (Contractor)
Winnemucca, NV 89446

Nevada contractor's license number issued by the State Contractor's Board 015234
Nevada driller's license number issued by the Division of Water Resources, the on-site driller 1195

Signed C. C. Ogden (By driller performing actual drilling on site or contractor)
Date 12-7-93

(Rev. 3-91)

USE ADDITIONAL SHEETS IF NECESSARY

(O)-627

732

QUALITY OF GROUND WATER

SPANISH SPRINGS VALLEY

The following sites are shown in figure 35.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

STATION NUMBER				STATION NAME	DATE	TIME	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)
393713119450001	83	N20	E20 18AACB1	USGS LAKY 5A	08-15-94	1245	4475
393717119403701	68	N20	E20 17AAAA1	USGS WASHOE COUNTY	01-13-94	1100	4506
393700119411201	83	N20	E20 17DDAD1	WINGFIELD 1	09-06-94	1245	4479
393651119411601	85	N20	E20 12CAAB1	WINGFIELD 2	09-06-94	1530	4478
393559119431902	85	N20	E20 15DBBB1	USGS KILEY 4A	08-11-94	1530	4459
393559119431902	85	N20	E20 15DBBB1	USGS KILEY 4A	08-16-94	1230	4459
393714119393501	85	N20	E21 08BACB1	SSVI WASHOE COUNTY	01-13-94	1310	4610
393812119424401	85	N20	E21 35CCCC2	PARK WELL	08-11-94	1300	4466

DATE	DEPTH OF WELL, TOTAL (FEET) (72008)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	HARDNESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DISSOLVED (MG/L AS CA) (00915)
08-15-94	32.8	317	8.1	14.5	650	0.9	9	52	14
01-13-94	565.0	365	8.0	17.0	675	0.2	2	5	1.1
09-06-94	65.0	218	8.5	21.5	655	2.8	27	38	8.9
09-06-94	--	229	8.4	23.0	655	2.7	27	40	8.9
08-11-94	27.0	564	7.8	18.0	645	2.2	22	128	30
08-16-94	17.0	541	7.8	15.5	647	1.0	12	89	22
01-13-94	550.0	288	8.6	21.0	675	--	--	26	6.5
08-11-94	43.0	3980	7.5	16.0	644	8.6	99	2200	540

DATE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CARBONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKALINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)
08-15-94	4.2	58	3	2.9	168	--	138	9.6	6.3
01-13-94	0.45	61	12	1.0	104	17	115	12	8.4
09-06-94	3.9	31	2	3.3	102	--	84	12	8.8
09-06-94	4.2	33	2	3.5	102	--	84	12	7.9
08-11-94	17	91	3	3.4	283	--	232	33	8.7
08-16-94	8.3	92	4	1.2	317	--	260	14	5.9
01-13-94	2.3	53	5	5.2	192	12	186	25	10
08-11-94	200	66	0.6	6.5	193	--	158	1300	420

DATE	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L) (70301)	SOLIDS, DISSOLVED (TONS PER AC-FT) (70303)	H-2 / H-1 STABLE ISOTOPE RATIO PER MIL (82082)	O-18 / O-16 STABLE ISOTOPE RATIO PER MIL (82085)	TRITIUM TOTAL (PCI/L) (07000)	TRITIUM 2 SIGMA WATER, WHOLE, TOTAL (PCI/L) (75985)
08-15-94	0.30	55	224	225	0.30	-83	-10.7	31	2.0
01-13-94	0.10	29	176	181	0.24	-125	-16.8	<1.0	1.0
09-06-94	0.20	38	152	157	0.21	-117	-16.8	<1.0	1.0
09-06-94	0.20	35	150	155	0.20	-117	-14.8	<1.0	1.0
08-11-94	0.20	61	350	366	0.49	-92	-11.4	21	2.0
08-16-94	0.20	69	364	368	0.50	-84	-10.5	28	2.0
01-13-94	0.40	35	198	198	0.27	-118	-14.8	<1.0	1.0
08-11-94	0.10	56	3380	2660	4.57	-88	-10.5	13	1.8

(PLEASE PRINT OR TYPE)

NEVADA DIVISION OF HEALTH
1660 N. Virginia Street
Reno, Nevada 89503
(702) 688-1335

SAMPLE: SSP2

94 JAN 14 AM 9:28

110083

WATER CHEMISTRY ANALYSIS:

Attn: Fees may apply to some types of samples.

All of the information below must be filled in or the analysis will not be performed.

State NEVADA County WASHOE
Township 20 N Range 21E Section 8
General Location SPANISH SPRINGS VALLEY
Source Address 1 MILE EAST OF SPANISH SPRINGS ROAD

TYPE OF ANALYSIS:

☒ Check here for ROUTINE DOMESTIC ANALYSIS.
Circle the constituents needed for PARTIAL ANALYSIS.

SAMPLING INSTRUCTIONS:

The sample submitted must be representative of the source. Spring and surface water samples should be as free of dirt and debris as possible. Wells should be pumped thoroughly before sampling, changing the water in the casing at least three times. Product water from filters should be sampled after running for about ten (10) minutes.

Sampled by ED EVANS Date 1/13/94
Owner WASHOE COUNTY Phone 785-4743
Address P.O. BOX 11130
City RENO State NV

REASON FOR ANALYSIS:

- ☐ Loan
- ☐ Personal health reasons
- ☒ Purchase of the property
- ☐ Rental or sale of property
- ☐ Subdivision approval
- ☒ Other BASELINE H2O QUALITY

USE OF WATER:

- ☐ Domestic drinking water
- ☐ Geothermal
- ☐ Industrial or mining
- ☐ Irrigation
- ☒ Other MONITORING WELL
  Initials MONITORING WELL SS

REPORT TO:

Name ED EVANS; WASHOE COUNTY UTILITY DIV
Address P.O. BOX 11130
City RENO
State NV Zip 89520

SOURCE OF WATER:

Filter ☐ Yes ☒ No
Public ☐ Yes ☒ No
Spring ____ Well X Depth 560 ft.
Hot ____ Cold X
IN USE ☐ Yes ☒ No

Type ____
Name ____
Surface ____
Casing diameter 2 in.
Casing depth 490 ft.

The results below are representative only of the sample submitted to this laboratory.

FOR LABORATORY USE ONLY 0.0590 194 0.68 17.4 5.2 0.8 705.9 110083

Constituent	ppm	Constituent	ppm	Constituent	ppm	Constituent	S.U.	PRINT OTHER DESIRED CONSTITUENTS BELOW Constituent	ppm
T.D.S. @ 103° C.	203	Chloride	9	Iron	0.24	Color	17	Cd	<0.001
Hardness	30	Nitrate –N	1.4	Manganese	0.01	Turbidity	3.9	Cr	<0.005
Calcium	7	Alkalinity	104	Copper	0.00	pH	9.09	Pb	0.015
Magnesium	3	Bicarbonate	88	Zinc	0.08	EC	297	Hg	<0.0005
Sodium	54	Carbonate	19	Barium	0.02	SI@20C	0.42	Se	<0.001
Potassium	5	Fluoride	0.34	Boron	0.1			Ag	<0.00<
Sulfate	27	Arsenic	0.007	Silica	37				
				Gross Alpha	<3 Pci/l	Gross Radium		MBAS	<0.1
				Gross Beta	<7 Pci/l				

RECEIVED
FEB 28 1994
WATER POLLUTION PROTECTION SERVICES

Fee ____
Collected by ____ 1/21/94
PWS I.D. ____
SDWA—Pri. ____ Sec. ____
1st ____ 2nd ____ 3rd ____
Date Rec'd ____ Init. ____

ppm = parts per million, milligrams per liter
S.U. = Standard Units

Remarks PO# 137892 2/24/94 KR
1/26/94

0-15m (Rev. 4-92)

IN TRIPLICATE
(PLEASE PRINT OR TYPE)

NEVADA DIVISION OF HEALTH
1660 N. Virginia Street
Reno, Nevada 89503
(702) 688-1335

SAMPLE: SSP4

110084

WATER CHEMISTRY ANALYSIS:

Attn: Fees may apply to some types of samples.

All of the information below must be filled in or the analysis will not be performed.

State NEVADA County WASHOE
Township 20N Range 21E Section 7
General Location SPANISH SPRINGS VALLEY
Source Address 1/2 MILE EAST SPANISH SPRINGS ROAD

TYPE OF ANALYSIS:

☒ Check here for ROUTINE DOMESTIC ANALYSIS.
Circle the constituents needed for PARTIAL ANALYSIS.

SAMPLING INSTRUCTIONS:

The sample submitted must be representative of the source. Spring and surface water samples should be as free of dirt and debris as possible. Wells should be pumped thoroughly before sampling, changing the water in the casing at least three times. Product water from filters should be sampled after running for about ten (10) minutes.

Sampled by ED EVANS Date 1/13/94
Owner WASHOE COUNTY Phone 785-4743
Address P.O. BOX 11130
City RENO State NV

REASON FOR ANALYSIS:

☐ Loan
☐ Personal health reasons
☐ Purchase of the property
☐ Rental or sale of property
☐ Subdivision approval
☒ Other BASELINE H_2O QUALITY

USE OF WATER:

☐ Domestic drinking water
☐ Geothermal
☐ Industrial or mining
☐ Irrigation
☒ Other MONITORING WELL
Initials MONITORING WELL SSP4

REPORT TO:

Name ED EVANS : WASHOE COUNTY UTILITY DIV.
Address P.O. BOX 11130
City RENO
State NV Zip 89520

SOURCE OF WATER:

Filter ☐ Yes ☒ No
Public ☐ Yes ☒ No
Spring ____ Well X Depth 565 ft.
Hot ____ Cold X
IN USE ☐ Yes ☒ No

Type ____
Name ____
Surface ____
Casing diameter 2 in.
Casing depth 545 ft.

The results below are representative only of the sample submitted to this laboratory.

Constituent	ppm	Constituent	ppm	Constituent	ppm	Constituent	S.U.	PRINT OTHER DESIRED CONSTITUENTS BELOW: Constituent	ppm
T.D.S. @ 103° C.	175	Chloride	7	Iron	0.12	Color	5	Cd	<0.001
Hardness	7	Nitrate −N	0.0	Manganese	0.01	Turbidity	1.6	Cr	<0.005
Calcium	1	Alkalinity	114	Copper	0.00	pH	9.26	Pb	<0.005
Magnesium	1	Bicarbonate	95	Zinc	0.49	EC	271	Hg	<0.0005
Sodium	61	Carbonate	22	Barium	0.03	SI@20C	−0.20	Se	<0.001
Potassium	0	Fluoride	0.26	Boron	0.1	RECEIVED		Ag	<0.005
Sulfate	13	Arsenic	0.009	Silica	30	FEB 28 1994			
				GROSS ALPHA	K3 Pu/e	GROSS RADIOPROTECTION SERVICES		MBAS	<0.1
				GROSS BETA	K3 Pu/e				

FOR LABORATORY USE ONLY: 0.0228 | 178 | 0.65 | 13.9 | 5.7 | 0.9 | 1829 | 110084

Fee ____
Collected by ____
PWS I.D. ____
SDWA—Pri. ____ Sec. ____
1st ____ 2nd ____ 3rd ____
Date Rec'd ____ Init. ____

ppm = parts per million, milligrams per liter
S.U. = Standard Units

Remarks PO# 137892 Exp 2/24/94

1/26/94

O-1561 (Rev. 4-92)

TOTAL P.03

HEC-RAS Plan: Imported Pla Reach: 1 2/14/96

River Sta.	Q Total (cfs)	Min El (ft)	W.S. Elev (ft)	Max Chl Dpth (ft)	Top Width (ft)	Flow Area (sq ft)
130	956.00	4436.93	4439.37	2.44	1403.28	1092.67
130	3315.00	4436.93	4440.25	3.32	1690.64	2455.02
140	956.00	4441.40	4443.90	2.50	1281.49	930.33
140	3395.00	4441.40	4444.74	3.34	1885.04	2276.00
150	638.00	4442.33	4445.57	3.24	1097.78	983.15
150	3395.00	4442.33	4446.78	4.45	1373.90	2492.95
160	2016.00	4442.17	4446.91	4.74	501.58	934.25
160	3566.00	4442.17	4448.04	5.87	645.56	1566.80
170	2016.00	4446.80	4449.46	2.66	974.03	1195.76
170	3566.00	4446.80	4450.16	3.36	1461.32	2043.56
180	2016.00	4447.27	4450.54	3.27	1144.18	1967.36
180	3737.00	4447.27	4451.28	4.01	1236.43	2848.51
190	2016.00	4449.36	4451.86	2.50	1067.60	1232.03
190	3825.00	4449.36	4452.59	3.23	1788.93	2287.06
200	2016.00	4450.78	4454.01	3.23	2781.04	3036.95
200	3825.00	4450.78	4454.61	3.83	3028.66	4782.46
210	2016.00	4453.95	4455.45	1.50	1132.87	714.82
210	3915.00	4453.95	4455.96	2.01	1696.21	1422.16
220	2016.00	4456.98	4460.01	3.03	3007.97	2402.02
220	3915.00	4456.98	4460.42	3.44	3631.78	3783.24
230	1130.00	4460.60	4463.14	2.54	1111.25	487.08
230	3915.00	4460.60	4464.03	3.43	3011.93	2315.95
240	1130.00	4466.00	4468.27	2.27	4286.81	1630.19
240	3915.00	4466.00	4468.68	2.68	5849.28	3906.20
250	1130.00	4468.42	4470.20	1.78	4132.14	1835.18
250	3300.00	4468.42	4470.67	2.25	5373.56	4107.96
260	1130.00	4472.00	4472.88	0.88	3441.19	1302.98
260	3300.00	4472.00	4473.23	1.23	3991.52	2596.00
270	1130.00	4473.20	4475.68	2.48	3360.03	1650.19
270	3300.00	4473.20	4476.17	2.97	4178.91	3526.65

HEC-RAS Plan: Imported Pla Reach: 1 2/14/96 (continued)

River Sta.	Q Total (cfs)	Min El (ft)	W.S. Elev (ft)	Max Chl Dpth (ft)	Top Width (ft)	Flow Area (sq ft)
280	1130.00	4477.35	4478.58	1.23	1605.53	900.27
280	3300.00	4477.35	4479.11	1.76	3217.98	2259.96
290	1130.00	4480.36	4482.03	1.67	1910.13	1178.29
290	3300.00	4480.36	4482.63	2.27	2746.13	2662.32
300	700.00	4483.40	4486.56	3.16	881.21	466.22
300	3300.00	4483.40	4487.34	3.94	1556.60	1439.00
310	700.00	4486.50	4487.91	1.41	1126.08	707.61
310	3300.00	4486.50	4488.82	2.32	1651.67	2038.71
320	700.00	4488.86	4489.31	0.45	954.03	246.10
320	3300.00	4488.86	4489.72	0.86	1409.61	776.00
330	700.00	4486.60	4489.45	2.85	1954.22	2773.34
330	3300.00	4486.60	4490.06	3.46	2187.03	4035.00
340	615.00	4486.73	4489.52	2.79	588.67	448.36
340	3300.00	4486.73	4490.55	3.82	909.82	1240.25
350	615.00	4488.79	4491.32	2.53	838.67	410.15
350	1763.00	4488.79	4492.14	3.35	1213.21	1274.62
360	500.00	4491.62	4492.78	1.16	901.81	522.18
360	1763.00	4491.62	4493.22	1.60	1315.65	1012.87
370	500.00	4492.22	4494.39	2.17	1083.19	471.97
370	1915.00	4492.22	4495.09	2.87	1389.70	1340.07
371	500.00	4495.00	4495.77	0.77	981.68	523.58
371	1915.00	4495.00	4496.38	1.38	1263.32	1241.48
380	500.00	4495.03	4496.75	1.72	859.05	323.89
380	2050.00	4495.03	4497.36	2.33	1564.25	1096.74
390	500.00	4496.20	4499.58	3.38	1008.32	503.34
390	2050.00	4496.20	4500.19	3.99	1608.17	1302.43
400	330.00	4499.40	4501.20	1.80	263.45	211.98
400	2200.00	4499.40	4502.54	3.14	822.44	923.60
410	330.00	4502.90	4505.08	2.18	502.31	191.92
410	2200.00	4502.90	4505.96	3.06	1041.22	984.07

HEC-RAS Plan: Imported Pla Reach: 1 2/14/96 (continued)

River Sta.	Q Total (cfs)	Min El (ft)	W.S. Elev (ft)	Max Chl Dpth (ft)	Top Width (ft)	Flow Area (sq ft)
420	330.00	4505.36	4508.52	3.16	400.11	242.73
420	2361.00	4505.36	4509.41	4.05	1102.79	952.79
430	280.00	4506.71	4509.96	3.25	242.01	244.66
430	2361.00	4506.71	4511.82	5.11	567.86	961.79
440	192.00	4510.80	4512.36	1.56	48.88	37.97
440	2361.00	4510.80	4514.56	3.76	667.41	724.28
450	192.00	4513.57	4516.44	2.87	278.74	183.04
450	2361.00	4513.57	4518.22	4.65	621.26	965.33
460	192.00	4518.24	4518.91	0.67	344.32	120.50
460	2361.00	4518.24	4520.28	2.04	1021.86	1181.21
470	192.00	4519.38	4520.50	1.12	444.58	271.65
470	2361.00	4519.38	4521.98	2.60	784.38	1193.30
480	192.00	4520.16	4521.04	0.88	343.33	149.82
480	2361.00	4520.16	4522.63	2.47	942.56	1190.51

HEC-RAS Plan: Imported Pla Reach: 1 2/14/96

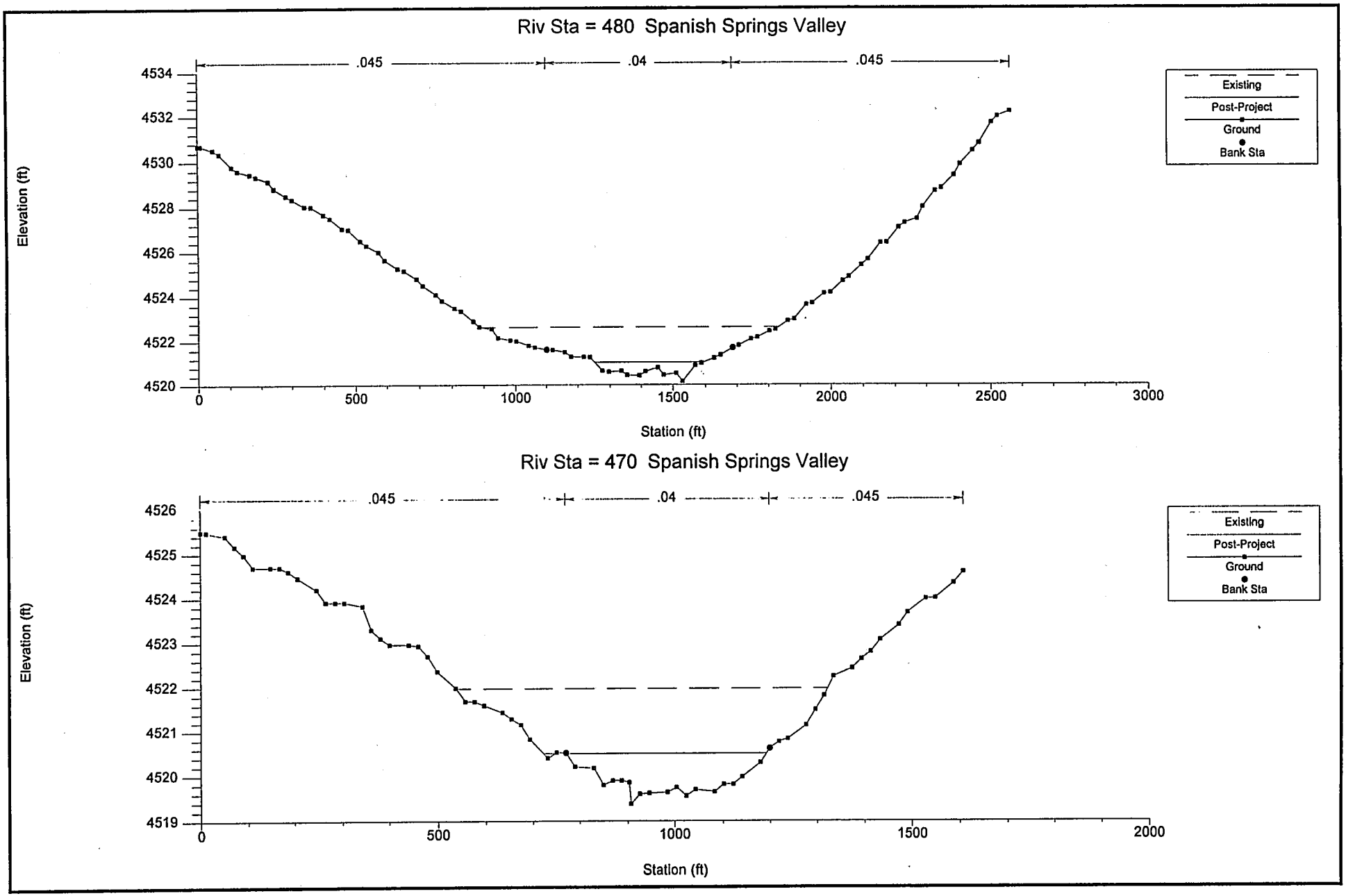
River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)
130	956.00	4438.52	4439.37	4438.52	4439.39	0.002000	0.97	1092.67	1403.28
130	3315.00	4438.52	4440.25	4439.12	4440.28	0.002003	1.72	2455.02	1690.64
140	956.00	4441.40	4443.90	4443.14	4443.92	0.002905	0.98	930.33	1281.49
140	3395.00	4441.40	4444.74	4443.73	4444.77	0.002825	1.58	2276.00	1885.04
150	638.00	4442.33	4445.57	4444.52	4445.58	0.000858	1.00	983.15	1097.78
150	3395.00	4442.33	4446.78	4445.35	4446.81	0.001511	1.89	2492.95	1373.90
160	2016.00	4442.17	4446.91	4445.62	4446.98	0.002138	2.21	934.25	501.58
160	3566.00	4442.17	4448.04	4446.04	4448.13	0.001512	2.46	1566.80	645.56
170	2016.00	4447.24	4449.46	4448.54	4449.51	0.003036	2.20	1195.76	974.03
170	3566.00	4447.24	4450.16	4448.96	4450.21	0.003034	1.87	2043.56	1461.32
180	2016.00	4447.27	4450.54	4449.14	4450.56	0.000734	1.19	1967.36	1144.18
180	3737.00	4447.27	4451.28	4449.44	4451.31	0.000800	1.57	2848.51	1236.43
190	2016.00	4449.73	4451.86	4450.91	4451.91	0.003248	1.80	1232.03	1067.60
190	3825.00	4449.73	4452.59	4451.30	4452.65	0.002605	2.04	2287.06	1788.93
200	2016.00	4452.25	4454.01	4452.83	4454.02	0.000618	0.87	3036.95	2781.04
200	3825.00	4452.25	4454.61	4453.10	4454.62	0.000621	1.12	4782.46	3028.66
210	2016.00	4454.11	4455.45	4455.21	4455.60	0.014840	3.39	714.82	1132.87
210	3915.00	4454.11	4455.96	4455.59	4456.12	0.010032	3.76	1422.16	1696.21
220	2016.00	4458.67	4460.01	4459.18	4460.02	0.001480	1.17	2402.02	3007.97
220	3915.00	4458.67	4460.42	4459.40	4460.44	0.001630	1.54	3783.24	3631.78
230	1130.00	4462.50	4463.14	4463.00	4463.24	0.023561	2.53	487.08	1111.25
230	3915.00	4462.50	4464.03	4463.55	4464.08	0.007607	2.58	2315.95	3011.93
240	1130.00	4466.00	4468.27	4467.54	4468.28	0.002241	0.32	1630.19	4286.81
240	3915.00	4466.00	4468.68	4467.95	4468.70	0.002728	0.92	3906.20	5849.28
250	1130.00	4468.89	4470.20	4469.65	4470.21	0.001752	0.69	1835.18	4132.14
250	3300.00	4468.89	4470.67	4469.95	4470.68	0.001454	0.94	4107.96	5373.56
260	1130.00	4472.00	4472.88	4472.60	4472.89	0.003043	1.01	1302.98	3441.19
260	3300.00	4472.00	4473.23	4472.82	4473.26	0.003444	1.53	2596.00	3991.52
270	1130.00	4474.44	4475.68	4474.99	4475.69	0.001544	0.68	1650.19	3360.03
270	3300.00	4474.44	4476.17	4475.37	4476.18	0.001552	1.05	3526.65	4178.91
280	1130.00	4478.27	4478.58	4477.98	4478.61	0.004778	0.38	900.27	1605.53
280	3300.00	4478.27	4479.11	4478.45	4479.15	0.004606	1.08	2259.96	3217.98
290	1130.00	4480.60	4482.03	4481.29	4482.04	0.002464	0.66	1178.29	1910.13
290	3300.00	4480.60	4482.63	4481.79	4482.65	0.002346	1.14	2662.32	2746.13

HEC-RAS Plan: Imported Pla Reach: 1 2/14/96 (continued)

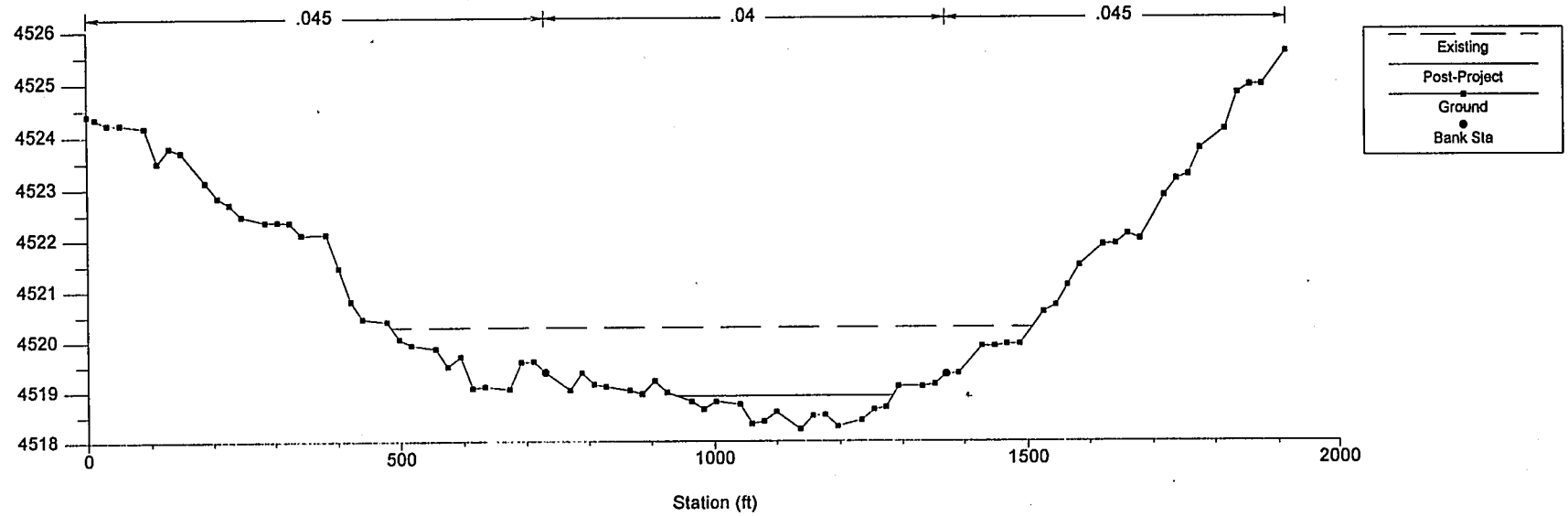
River Sta.	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)
300	700.00	4483.40	4486.56	4485.63	4486.59	0.003417	1.53	466.22	881.21
300	3300.00	4483.40	4487.34	4486.80	4487.44	0.003723	2.59	1439.00	1556.60
310	700.00	4486.50	4487.91	4487.24	4487.93	0.001318	0.99	707.61	1126.08
310	3300.00	4486.50	4488.82	4487.93	4488.86	0.001370	1.65	2038.71	1651.67
320	700.00	4488.86	4489.31	4489.31	4489.43	0.035701	2.84	246.10	954.03
320	3300.00	4488.86	4489.72	4489.72	4490.01	0.029046	4.25	776.00	1409.61
330	700.00	4486.60	4489.45	4487.39	4489.45	0.000028	0.27	2773.34	1954.22
330	3300.00	4486.60	4490.06	4488.09	4490.07	0.000198	0.88	4035.00	2187.03
340	615.00	4486.73	4489.52	4488.94	4489.55	0.001967	1.37	448.36	588.67
340	3300.00	4486.73	4490.55	4489.76	4490.66	0.003399	2.66	1240.25	909.82
350	615.00	4488.79	4491.32	4491.00	4491.36	0.004232	1.50	410.15	838.67
350	1763.00	4488.79	4492.14	4491.37	4492.17	0.001289	1.38	1274.62	1213.21
360	500.00	4491.62	4492.78	4492.29	4492.80	0.001377	0.96	522.18	901.81
360	1763.00	4491.62	4493.22	4492.67	4493.27	0.002726	1.80	1012.87	1315.65
370	500.00	4492.22	4494.39	4494.02	4494.41	0.002550	0.98	471.97	1083.19
370	1915.00	4492.22	4495.09	4494.43	4495.12	0.001658	1.48	1340.07	1389.70
371	500.00	4495.00	4495.77	4495.33	4495.78	0.001314	0.99	523.58	981.68
371	1915.00	4495.00	4496.38	4495.71	4496.42	0.001671	1.68	1241.48	1263.32
380	500.00	4495.03	4496.75	4496.51	4496.79	0.006344	1.54	323.89	859.05
380	2050.00	4495.03	4497.36	4496.95	4497.42	0.003688	1.90	1096.74	1564.25
390	500.00	4496.20	4499.58	4498.89	4499.60	0.001673	1.03	503.34	1008.32
390	2050.00	4496.20	4500.19	4499.60	4500.23	0.002309	1.63	1302.43	1608.17
400	330.00	4499.40	4501.20	4500.45	4501.24	0.002348	1.56	211.98	263.45
400	2200.00	4499.40	4502.54	4501.77	4502.63	0.003334	2.46	923.60	822.44
410	330.00	4502.90	4505.08	4504.79	4505.12	0.007729	1.69	191.92	502.31
410	2200.00	4502.90	4505.96	4505.49	4506.04	0.003740	2.37	984.07	1041.22
420	330.00	4505.36	4508.52	4507.76	4508.55	0.002611	1.36	242.73	400.11
420	2361.00	4505.36	4509.41	4508.99	4509.53	0.004641	2.86	952.79	1102.79
430	280.00	4506.71	4509.96	4508.85	4509.98	0.000938	1.14	244.66	242.01
430	2361.00	4506.71	4511.82	4510.44	4511.92	0.001628	2.54	961.79	567.86
440	192.00	4510.80	4512.36	4512.36	4512.76	0.026024	5.06	37.97	48.88
440	2361.00	4510.80	4514.56	4514.23	4514.75	0.006295	3.77	724.28	667.41
450	192.00	4513.57	4516.44	4515.22	4516.46	0.001404	1.05	183.04	278.74
450	2361.00	4513.57	4518.22	4517.10	4518.31	0.002323	2.45	965.33	621.26

HEC-RAS Plan: Imported Pla Reach: 1 2/14/96 (continued)

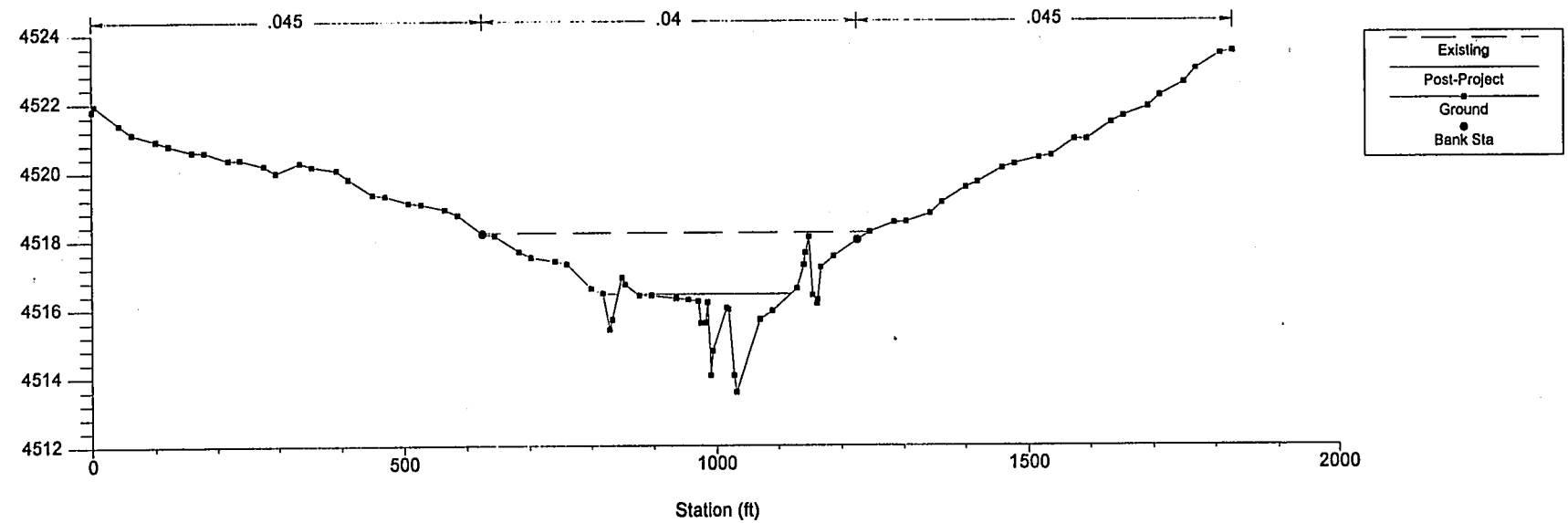
River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)
460	192.00	4518.24	4518.91	4518.74	4518.95	0.007460	1.59	120.50	344.32
460	2361.00	4518.24	4520.28	4519.55	4520.35	0.002155	2.22	1181.21	1021.86
470	192.00	4519.38	4520.50	4519.95	4520.51	0.000656	0.71	271.65	444.58
470	2361.00	4519.38	4521.98	4520.87	4522.05	0.001388	2.27	1193.30	784.38
480	192.00	4520.16	4521.04	4520.78	4521.07	0.003596	1.28	149.82	343.33
480	2361.00	4520.16	4522.63	4521.72	4522.70	0.001703	2.19	1190.51	942.56

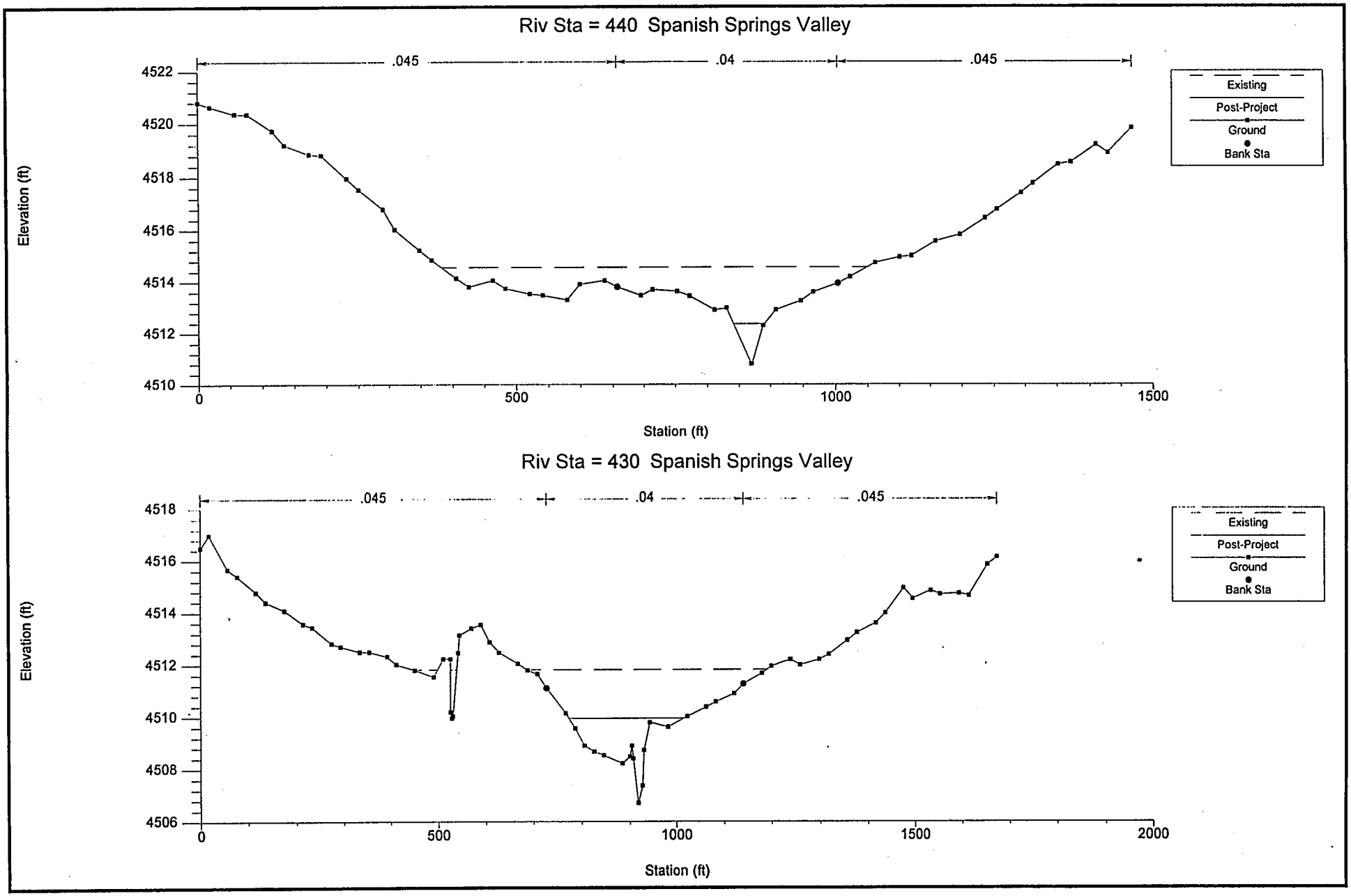

Riv Sta = 480 Spanish Springs Valley
.045
.04
.045
Existing
Post-Project
Ground
Bank Sta
Elevation (ft)
4534
4532
4530
4528
4526
4524
4522
4520
0
500
1000
1500
2000
2500
3000
Station (ft)
Riv Sta = 470 Spanish Springs Valley
.045
.04
.045
Existing
Post-Project
Ground
Bank Sta
Elevation (ft)
4526
4525
4524
4523
4522
4521
4520
4519
0
500
1000
1500
2000
Station (ft)

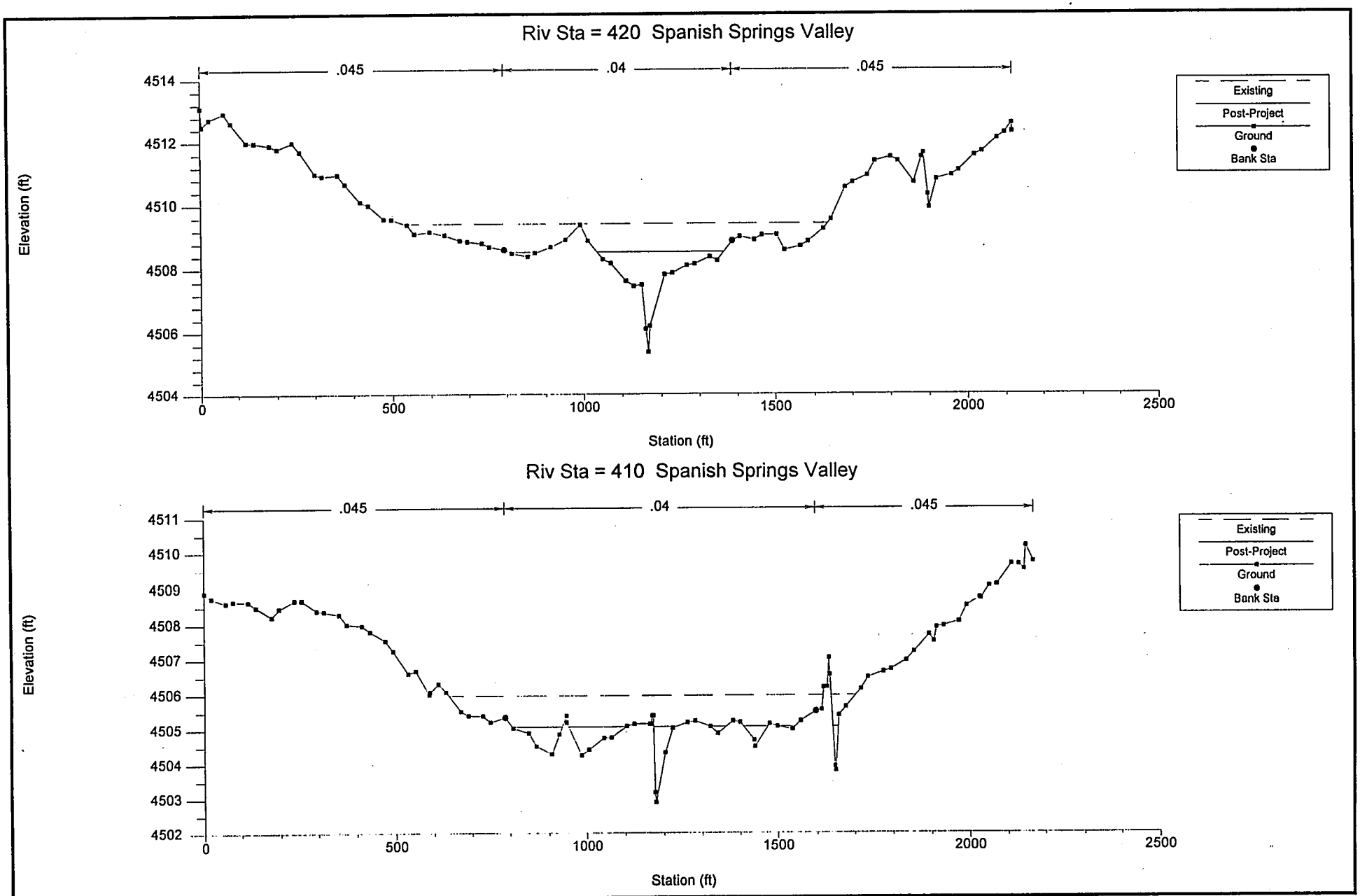
Riv Sta = 460 Spanish Springs Valley

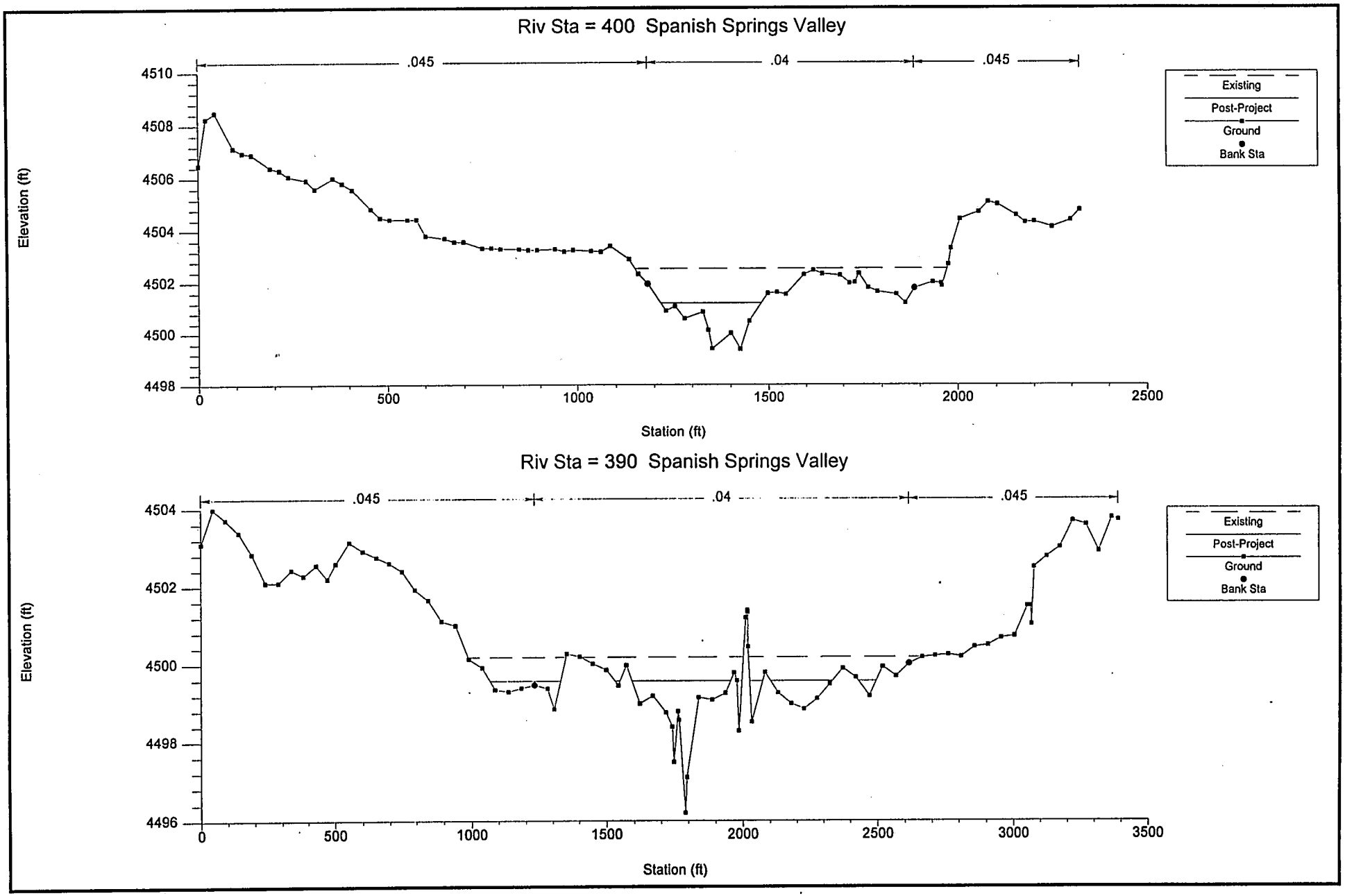


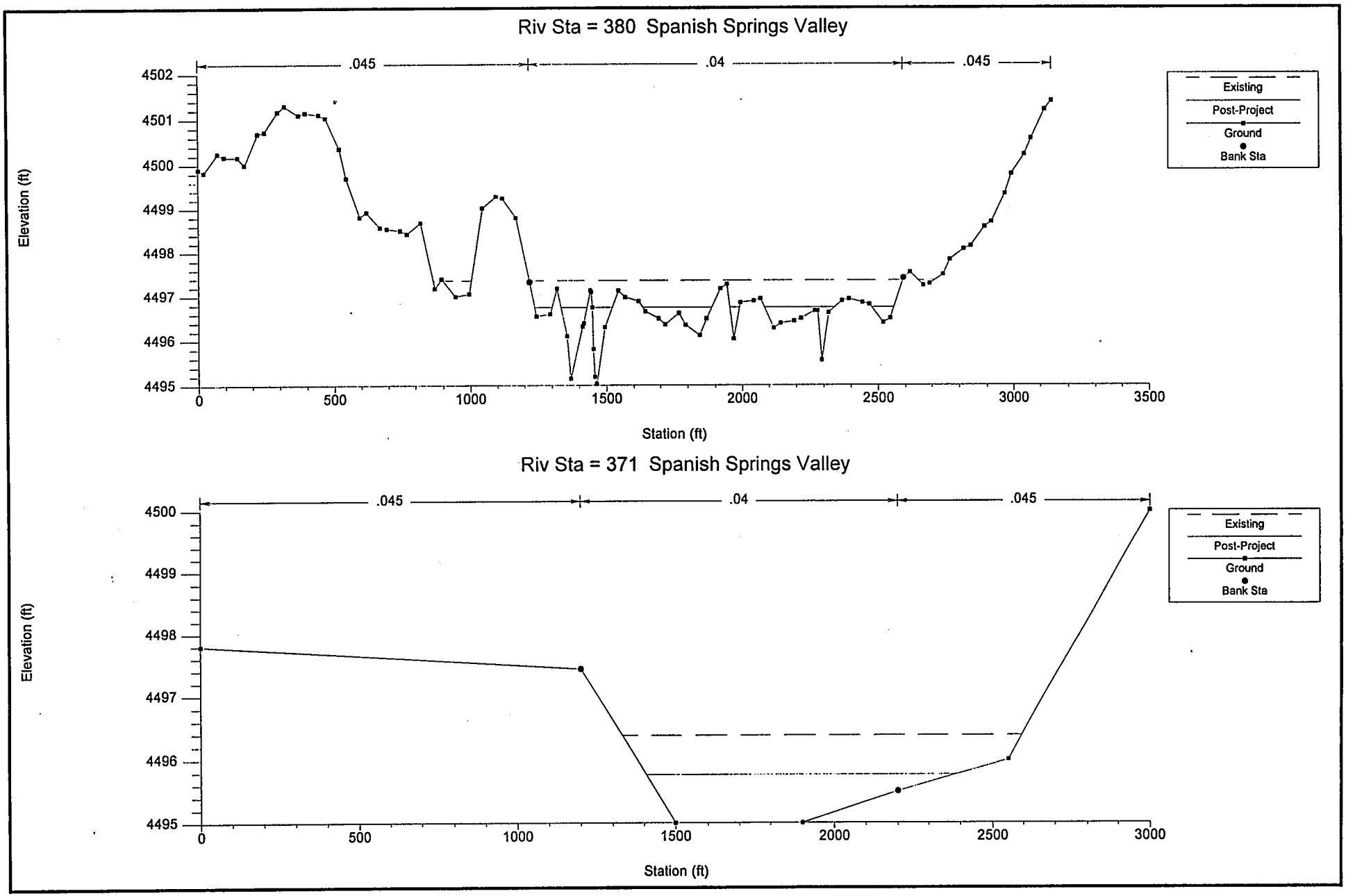
Riv Sta = 450 Spanish Springs Valley

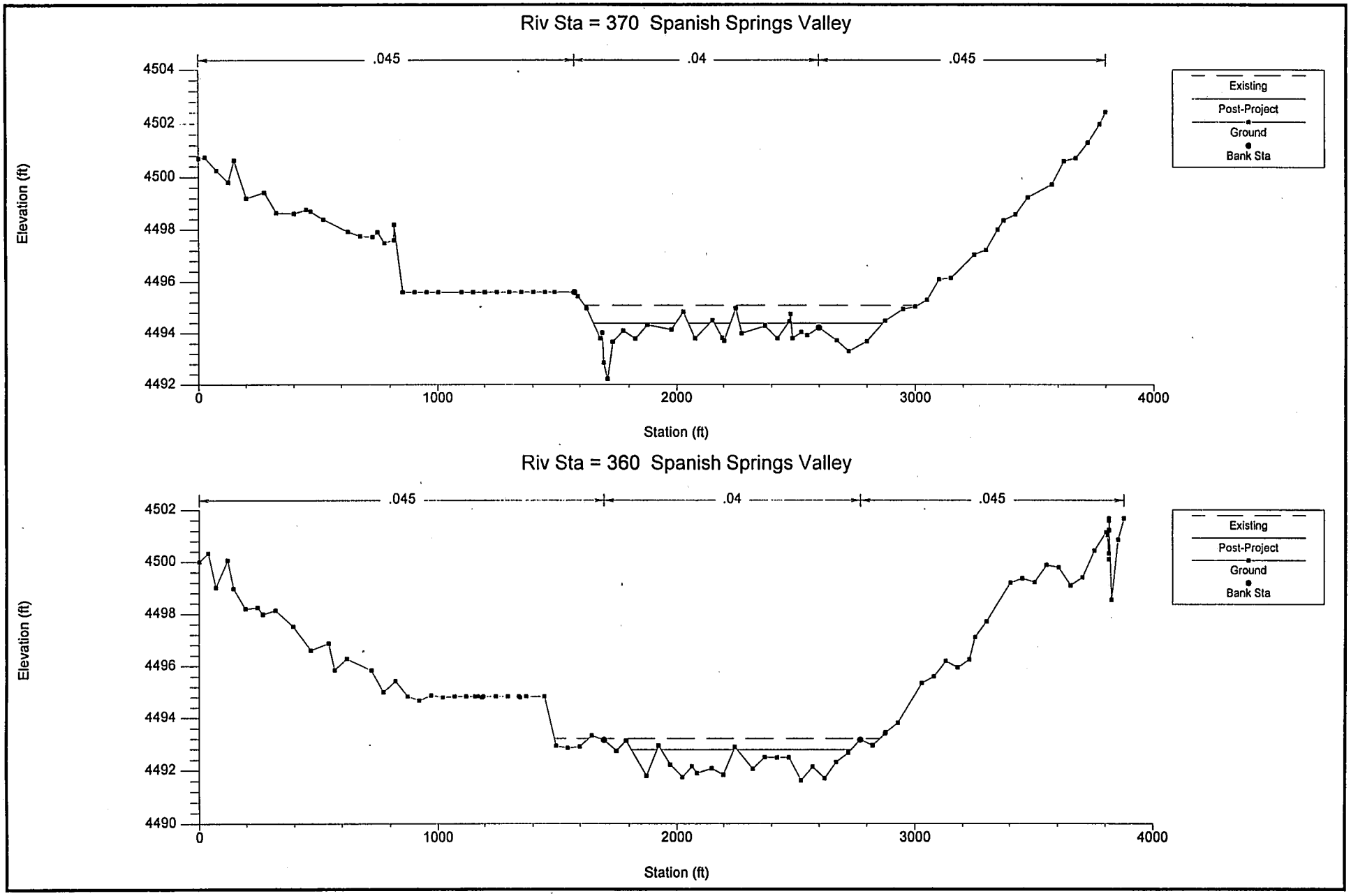


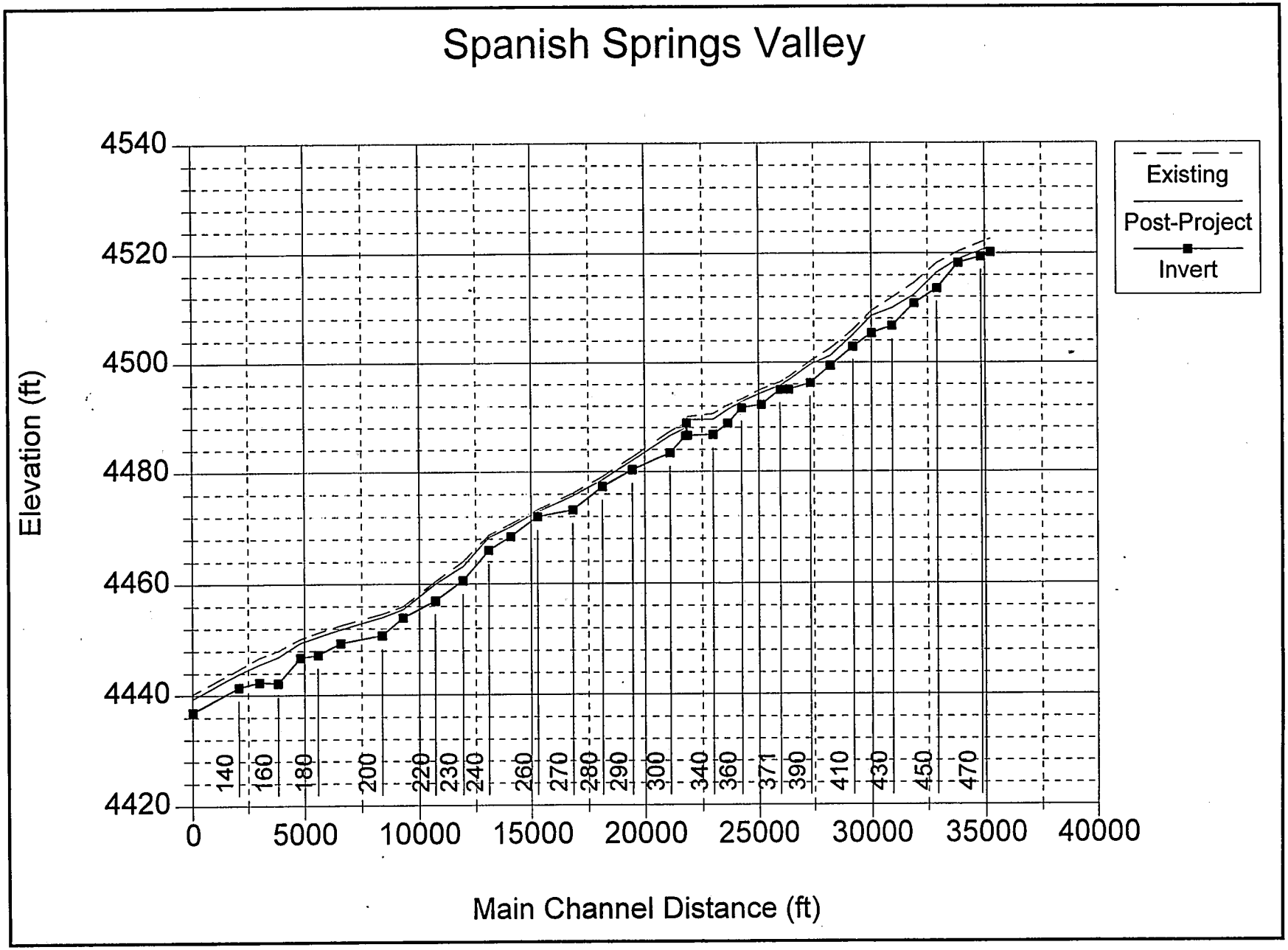

Riv Sta = 440 Spanish Springs Valley
.045
.04
.045
4522
4520
4518
4516
4514
4512
4510
Elevation (ft)
0
500
1000
1500
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 430 Spanish Springs Valley
.045
.04
.045
4518
4516
4514
4512
4510
4508
4506
Elevation (ft)
0
500
1000
1500
2000
Station (ft)
Existing
Post-Project
Ground
Bank Sta

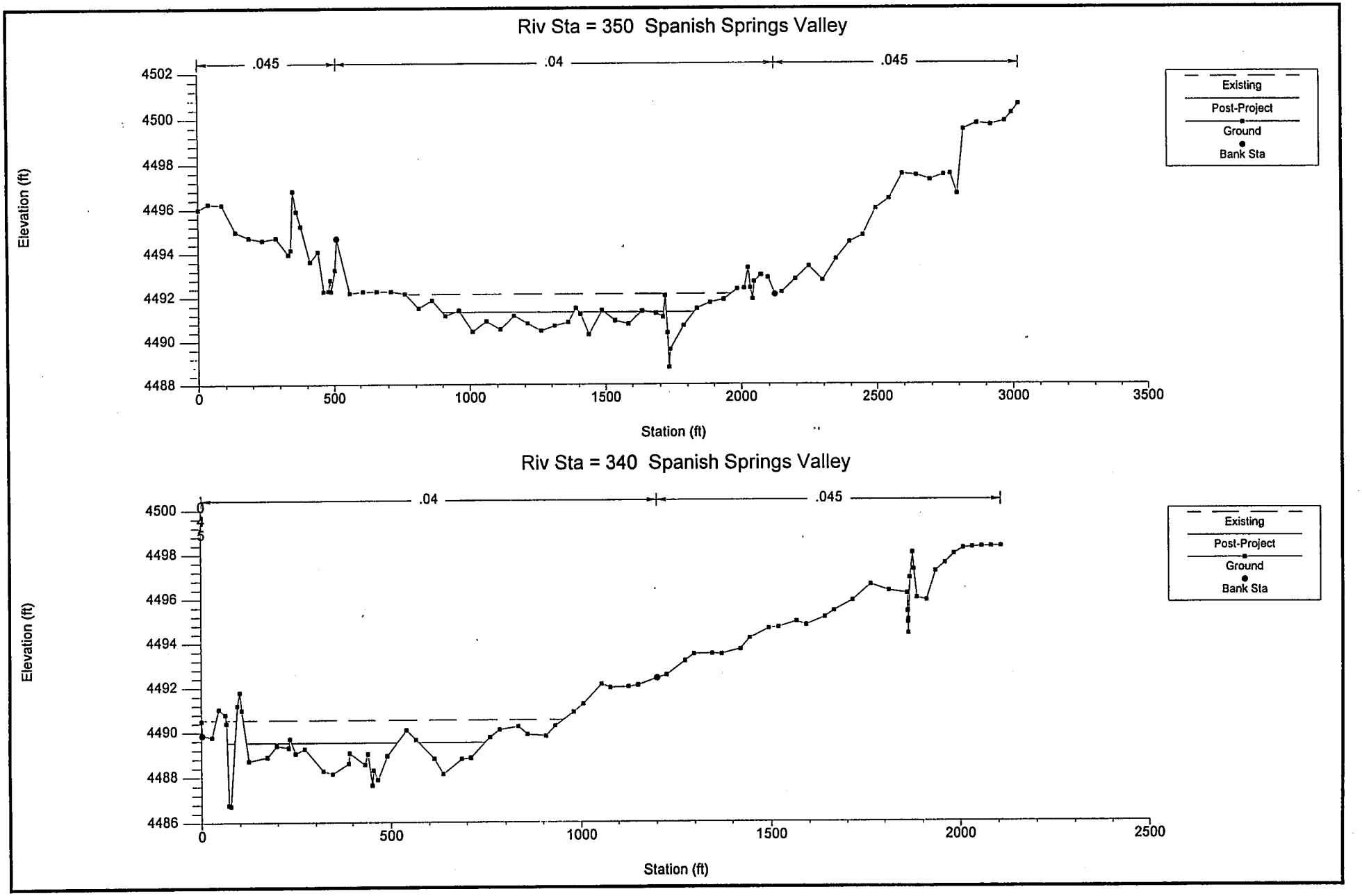

Riv Sta = 420 Spanish Springs Valley
.045
.04
.045
4514
4512
4510
4508
4506
4504
Elevation (ft)
0
500
1000
1500
2000
2500
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 410 Spanish Springs Valley
.045
.04
.045
4511
4510
4509
4508
4507
4506
4505
4504
4503
4502
Elevation (ft)
0
500
1000
1500
2000
2500
Station (ft)
Existing
Post-Project
Ground
Bank Sta

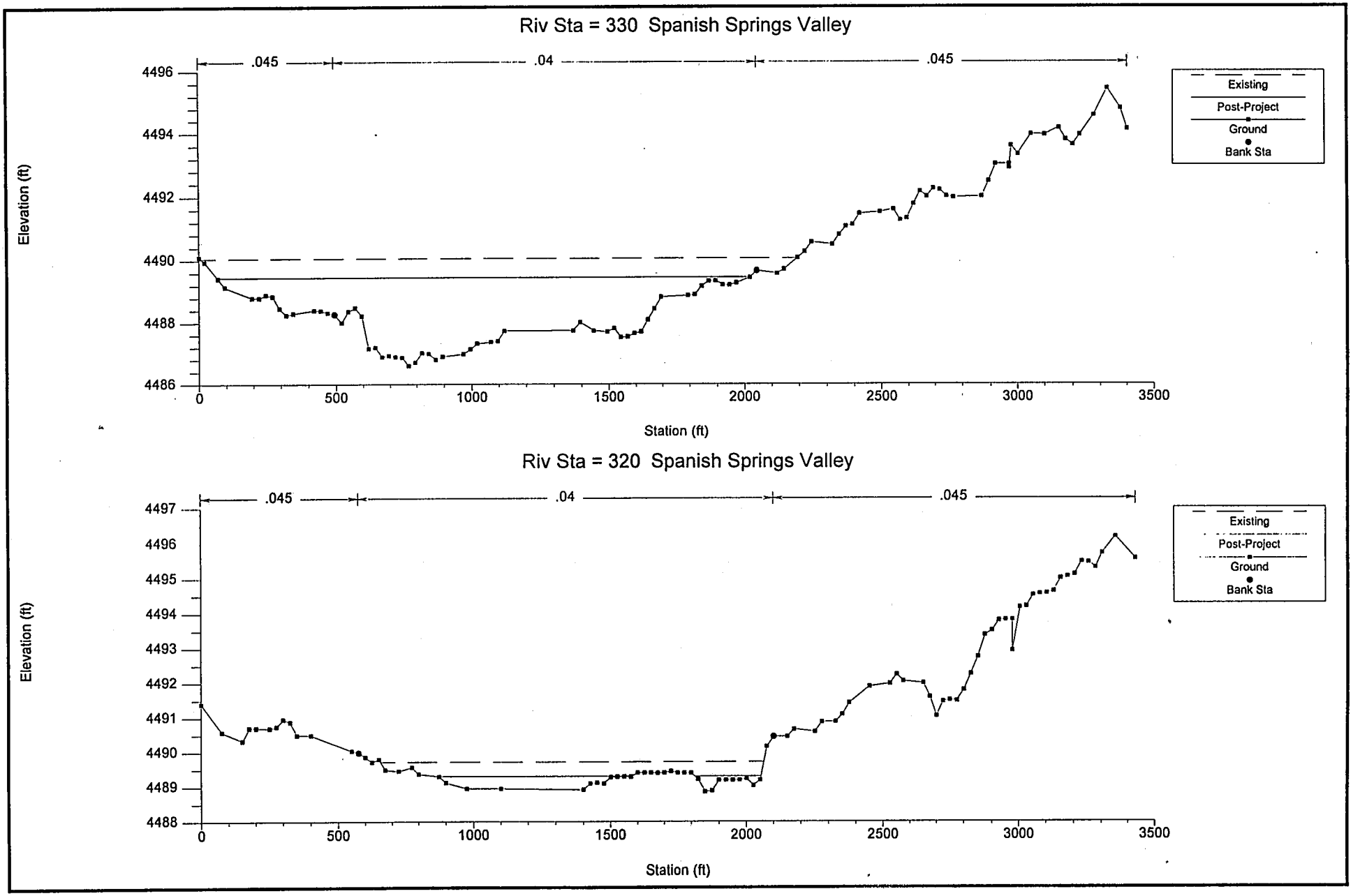

Riv Sta = 400 Spanish Springs Valley
.045
.04
.045
4510
4508
4506
4504
4502
4500
4498
Elevation (ft)
0
500
1000
1500
2000
2500
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 390 Spanish Springs Valley
.045
.04
.045
4504
4502
4500
4498
4496
Elevation (ft)
0
500
1000
1500
2000
2500
3000
3500
Station (ft)
Existing
Post-Project
Ground
Bank Sta

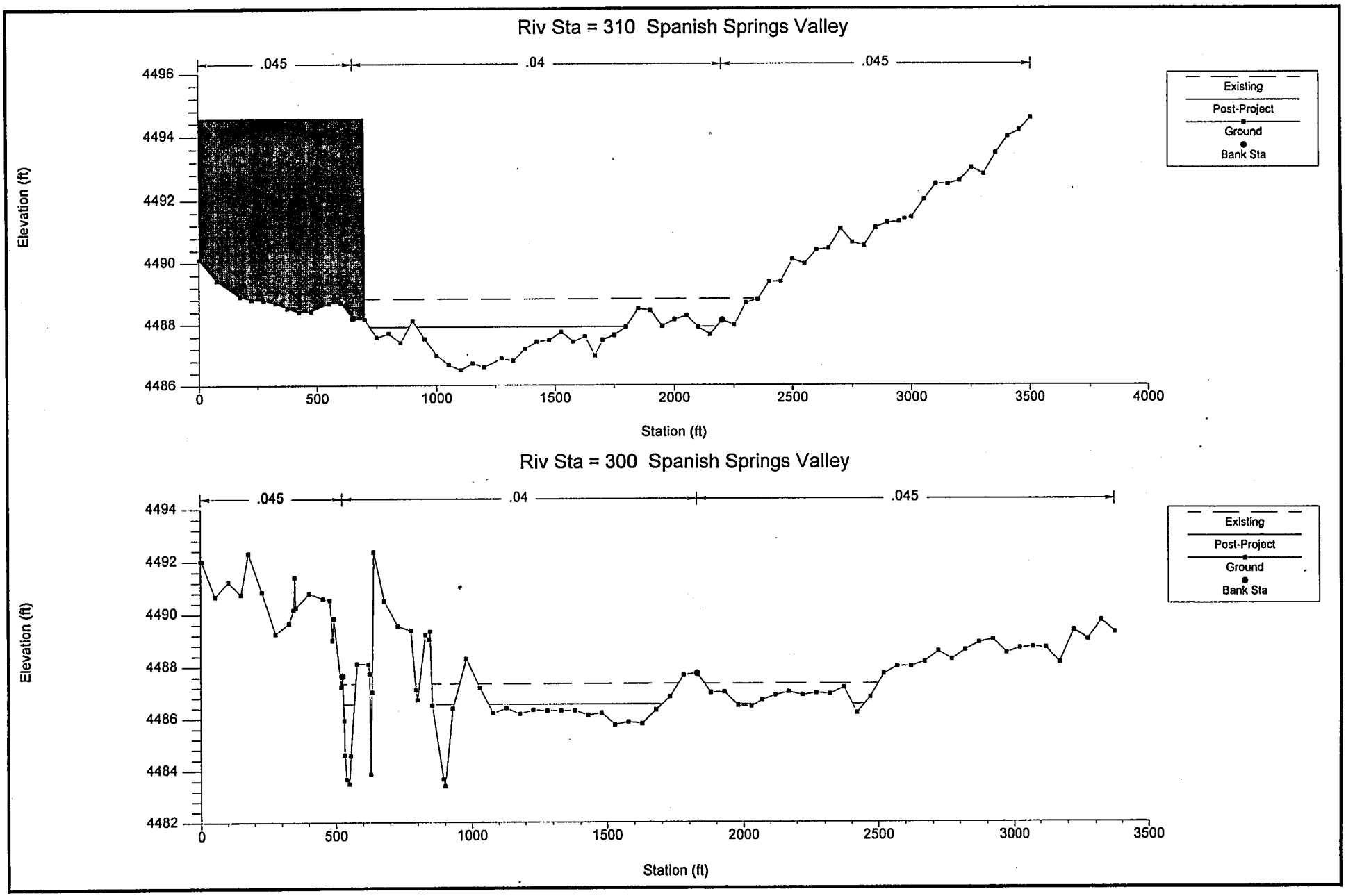

Riv Sta = 380 Spanish Springs Valley
.045
.04
.045
4502
4501
4500
4499
4498
4497
4496
4495
Elevation (ft)
0
500
1000
1500
2000
2500
3000
3500
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 371 Spanish Springs Valley
.045
.04
.045
4500
4499
4498
4497
4496
4495
Elevation (ft)
0
500
1000
1500
2000
2500
3000
Station (ft)
Existing
Post-Project
Ground
Bank Sta

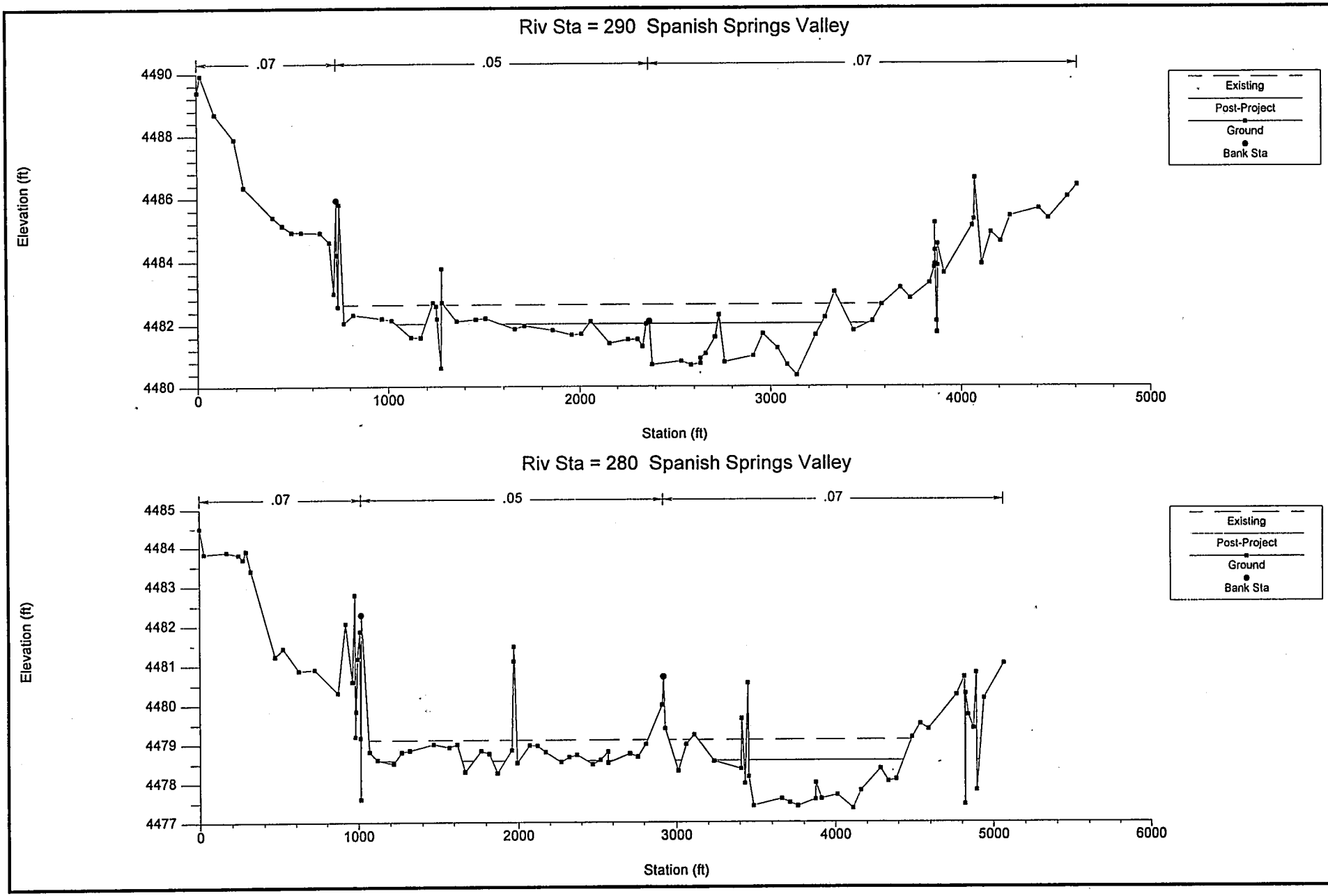

Riv Sta = 370 Spanish Springs Valley
.045
.04
.045
4504
4502
4500
4498
4496
4494
4492
0
1000
2000
3000
4000
Elevation (ft)
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 360 Spanish Springs Valley
.045
.04
.045
4502
4500
4498
4496
4494
4492
4490
0
1000
2000
3000
4000
Elevation (ft)
Station (ft)
Existing
Post-Project
Ground
Bank Sta

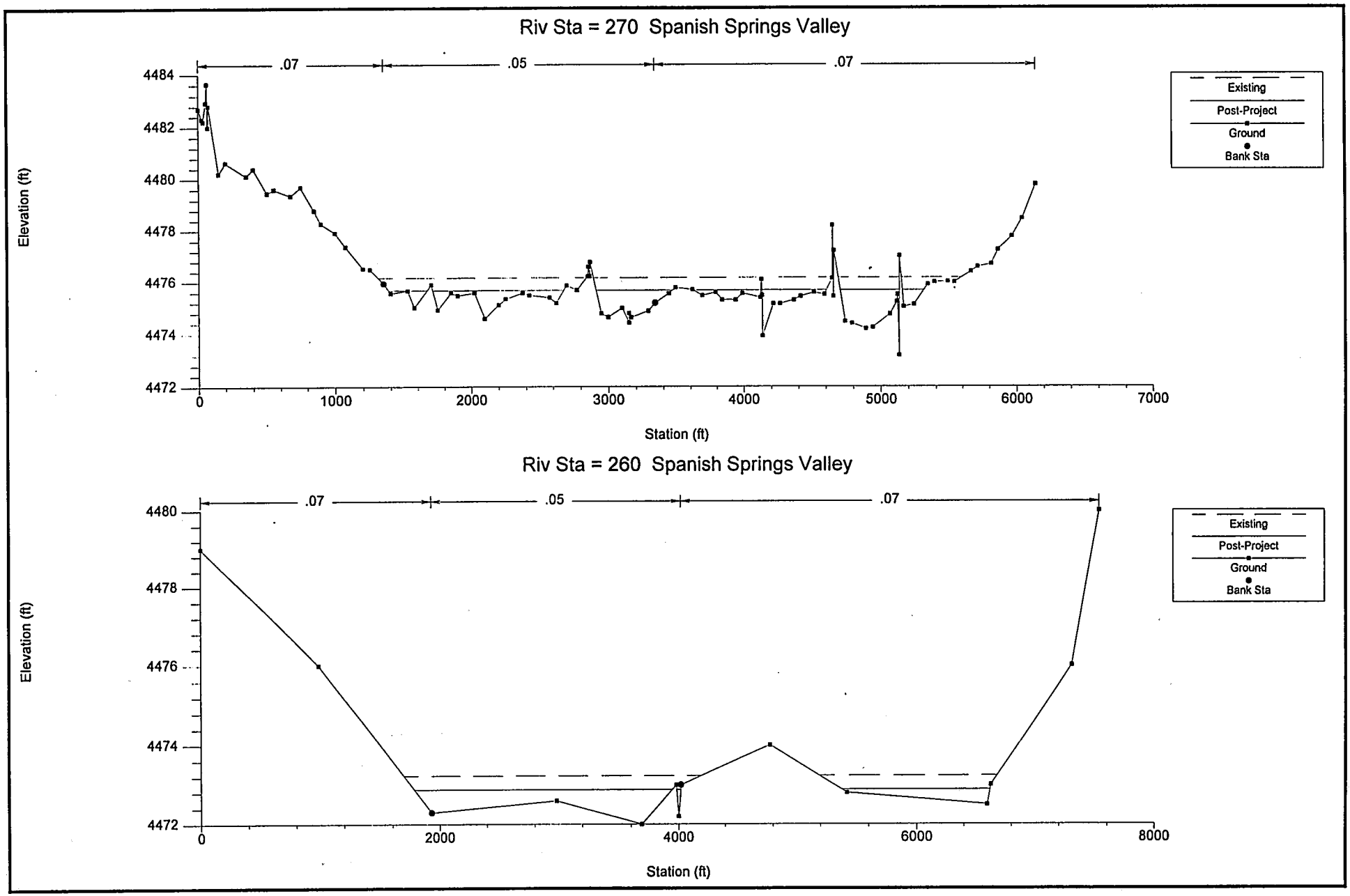

Spanish Springs Valley
Elevation (ft)
4540
4520
4500
4480
4460
4440
4420
0
5000
10000
15000
20000
25000
30000
35000
40000
140
160
180
200
220
230
240
260
270
280
290
300
340
360
371
390
410
430
450
470
Existing
Post-Project
Invert
Main Channel Distance (ft)


Riv Sta = 350 Spanish Springs Valley
.045
.04
.045
4502
4500
4498
4496
4494
4492
4490
4488
Elevation (ft)
0
500
1000
1500
2000
2500
3000
3500
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 340 Spanish Springs Valley
.04
.045
4500
4498
4496
4494
4492
4490
4488
4486
Elevation (ft)
0
500
1000
1500
2000
2500
Station (ft)
Existing
Post-Project
Ground
Bank Sta

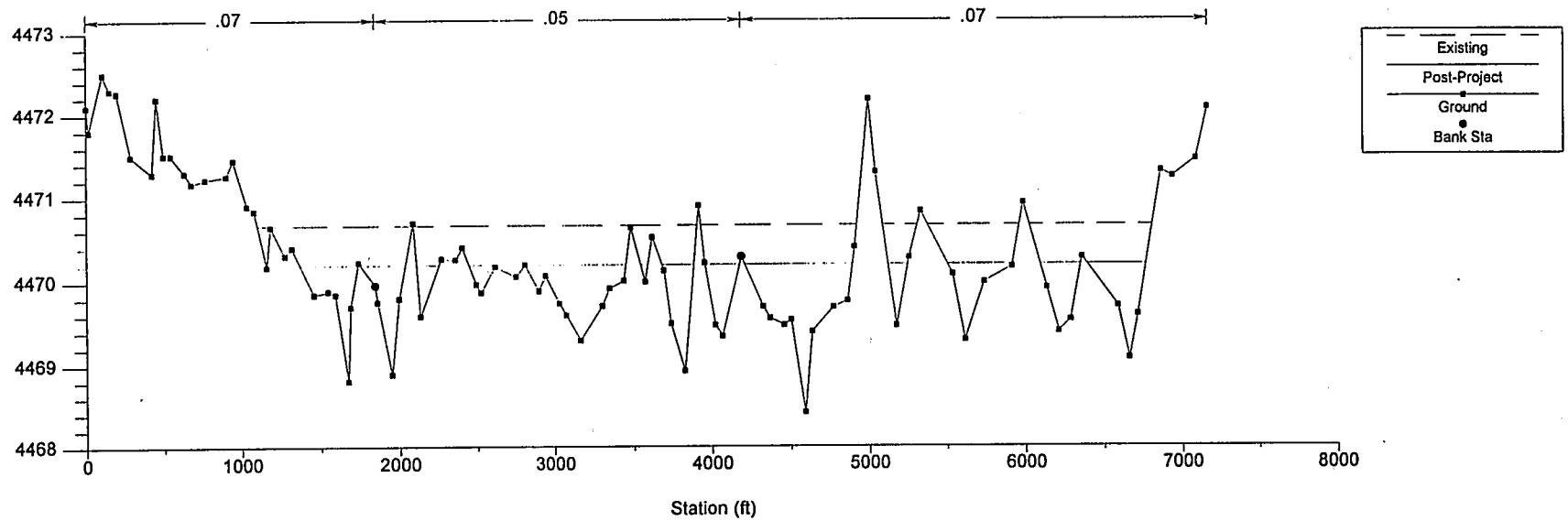

Riv Sta = 330 Spanish Springs Valley
.045
.04
.045
4496
4494
4492
4490
4488
4486
Elevation (ft)
0
500
1000
1500
2000
2500
3000
3500
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 320 Spanish Springs Valley
.045
.04
.045
4497
4496
4495
4494
4493
4492
4491
4490
4489
4488
Elevation (ft)
0
500
1000
1500
2000
2500
3000
3500
Station (ft)
Existing
Post-Project
Ground
Bank Sta


Riv Sta = 310 Spanish Springs Valley
.045
.04
.045
4496
4494
4492
4490
4488
4486
Elevation (ft)
0
500
1000
1500
2000
2500
3000
3500
4000
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 300 Spanish Springs Valley
.045
.04
.045
4494
4492
4490
4488
4486
4484
4482
Elevation (ft)
0
500
1000
1500
2000
2500
3000
3500
Station (ft)
Existing
Post-Project
Ground
Bank Sta


Riv Sta = 290 Spanish Springs Valley
.07
.05
.07
4490
4488
4486
4484
4482
4480
0
1000
2000
3000
4000
5000
Elevation (ft)
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 280 Spanish Springs Valley
.07
.05
.07
4485
4484
4483
4482
4481
4480
4479
4478
4477
0
1000
2000
3000
4000
5000
6000
Elevation (ft)
Station (ft)
Existing
Post-Project
Ground
Bank Sta


Riv Sta = 270 Spanish Springs Valley
.07
.05
.07
4484
4482
4480
4478
4476
4474
4472
Elevation (ft)
0
1000
2000
3000
4000
5000
6000
7000
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 260 Spanish Springs Valley
.07
.05
.07
4480
4478
4476
4474
4472
Elevation (ft)
0
2000
4000
6000
8000
Station (ft)
Existing
Post-Project
Ground
Bank Sta

Riv Sta = 250 Spanish Springs Valley



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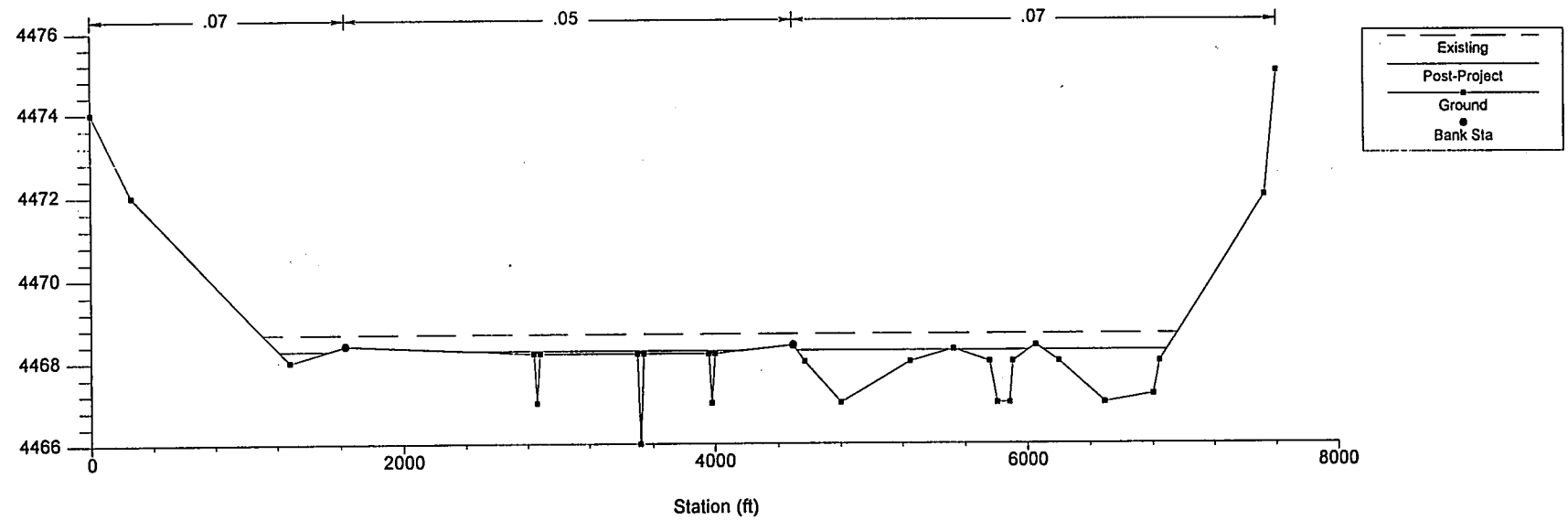
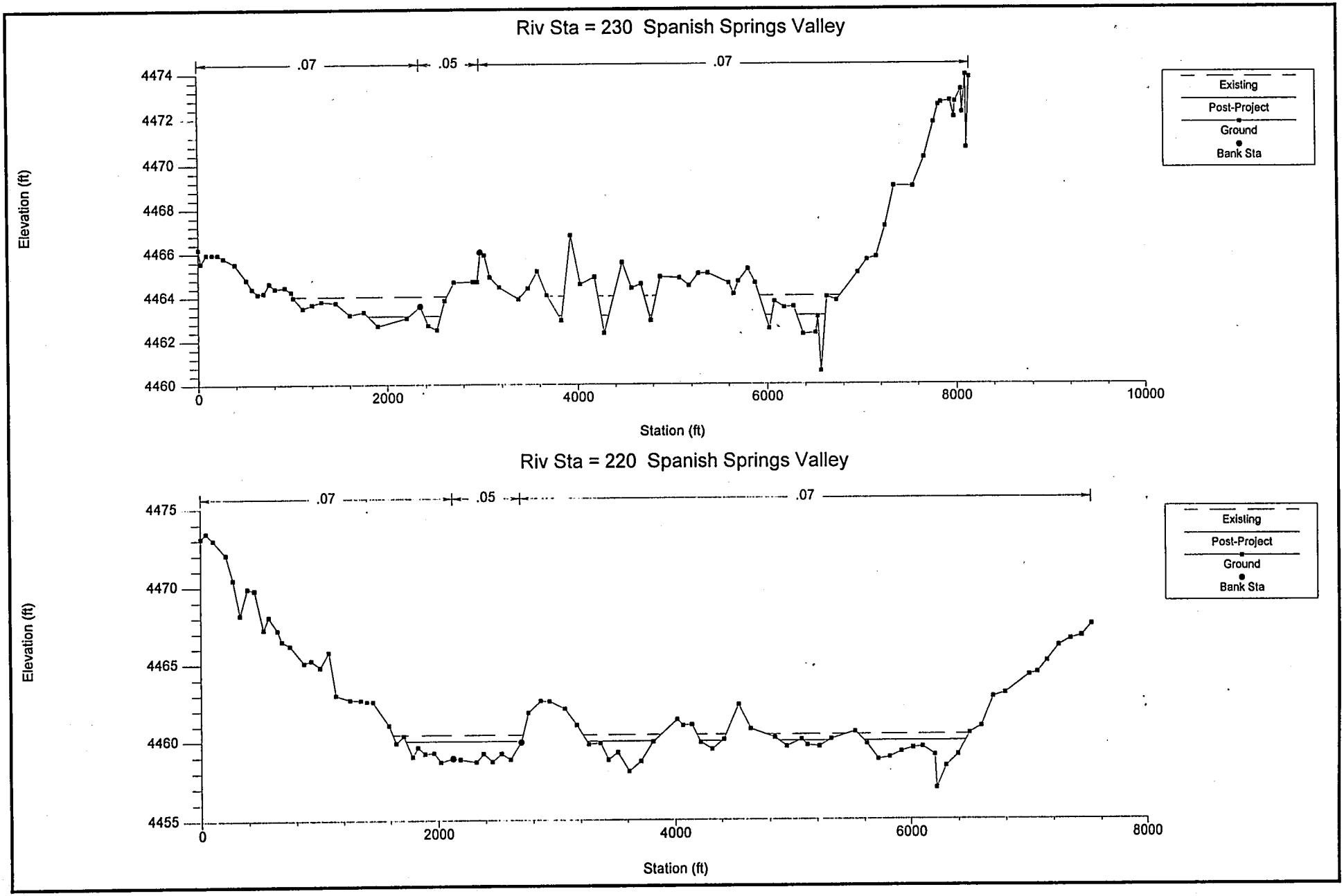
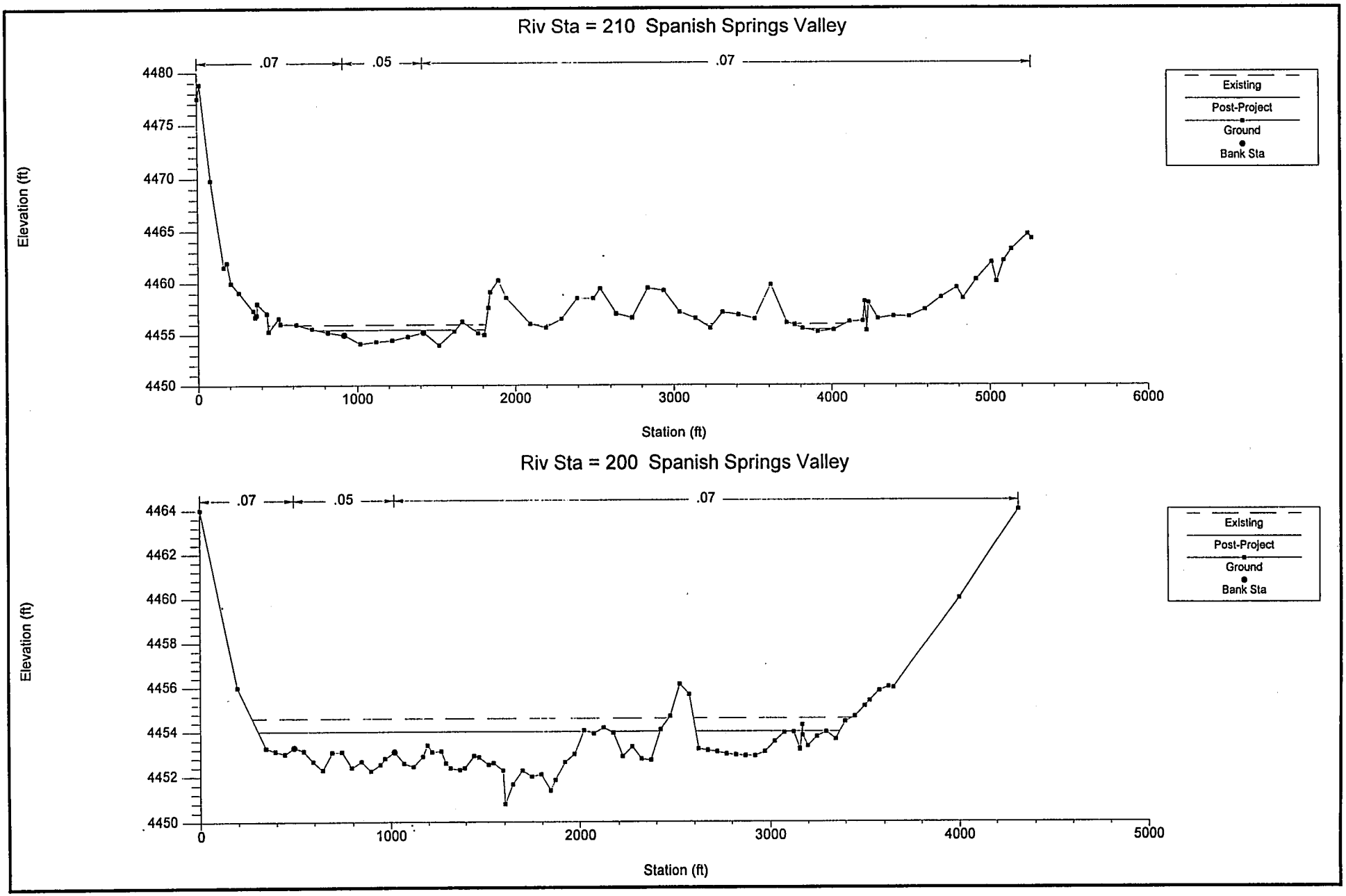
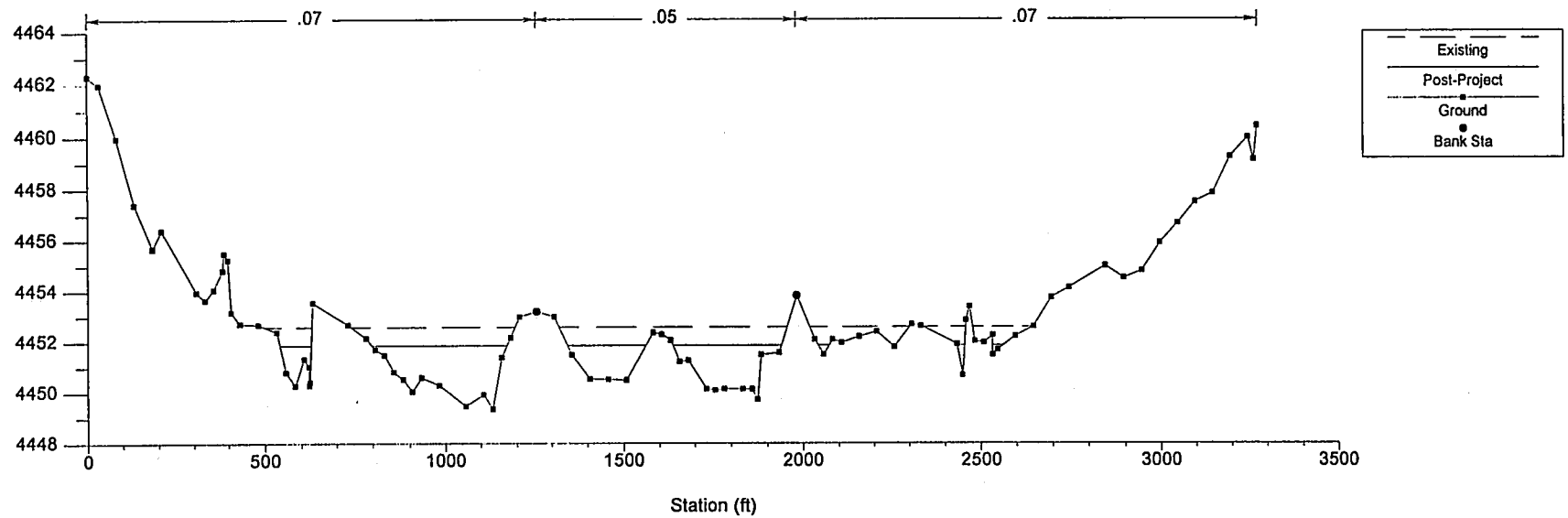



Riv Sta = 230 Spanish Springs Valley
.07
.05
.07
4474
4472
4470
4468
4466
4464
4462
4460
Elevation (ft)
0
2000
4000
6000
8000
10000
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 220 Spanish Springs Valley
.07
.05
.07
4475
4470
4465
4460
4455
Elevation (ft)
0
2000
4000
6000
8000
Station (ft)
Existing
Post-Project
Ground
Bank Sta


Riv Sta = 210 Spanish Springs Valley
.07
.05
.07
4480
4475
4470
4465
4460
4455
4450
0
1000
2000
3000
4000
5000
6000
Elevation (ft)
Station (ft)
Existing
Post-Project
Ground
Bank Sta
Riv Sta = 200 Spanish Springs Valley
.07
.05
.07
4464
4462
4460
4458
4456
4454
4452
4450
0
1000
2000
3000
4000
5000
Elevation (ft)
Station (ft)
Existing
Post-Project
Ground
Bank Sta

Riv Sta = 190 Spanish Springs Valley



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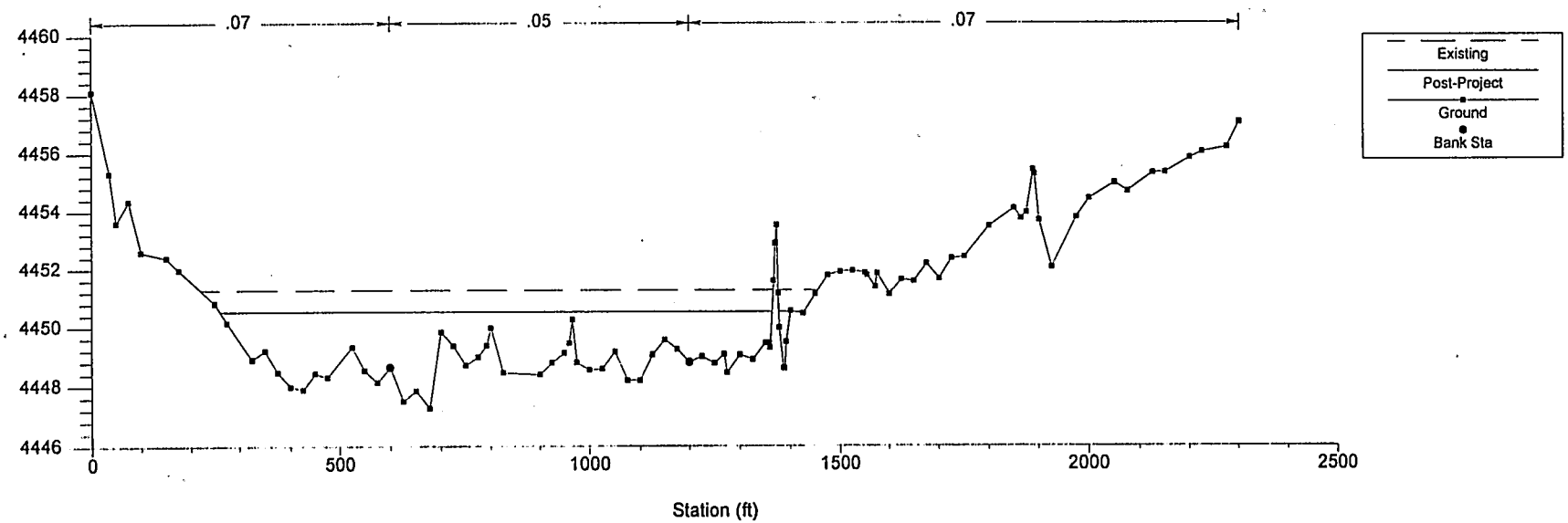

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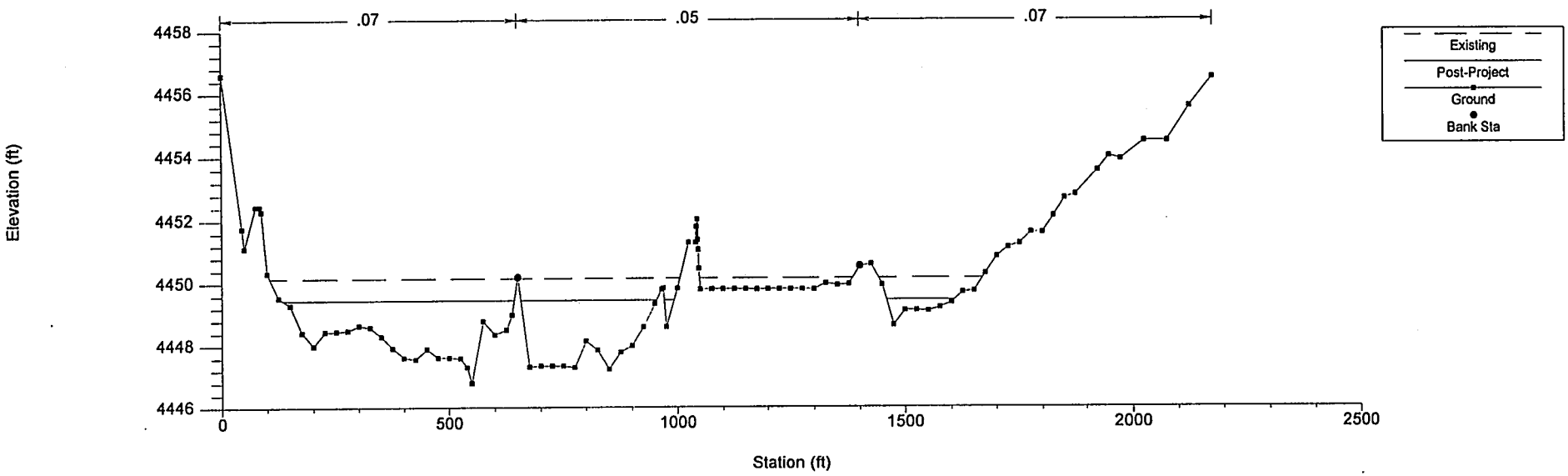

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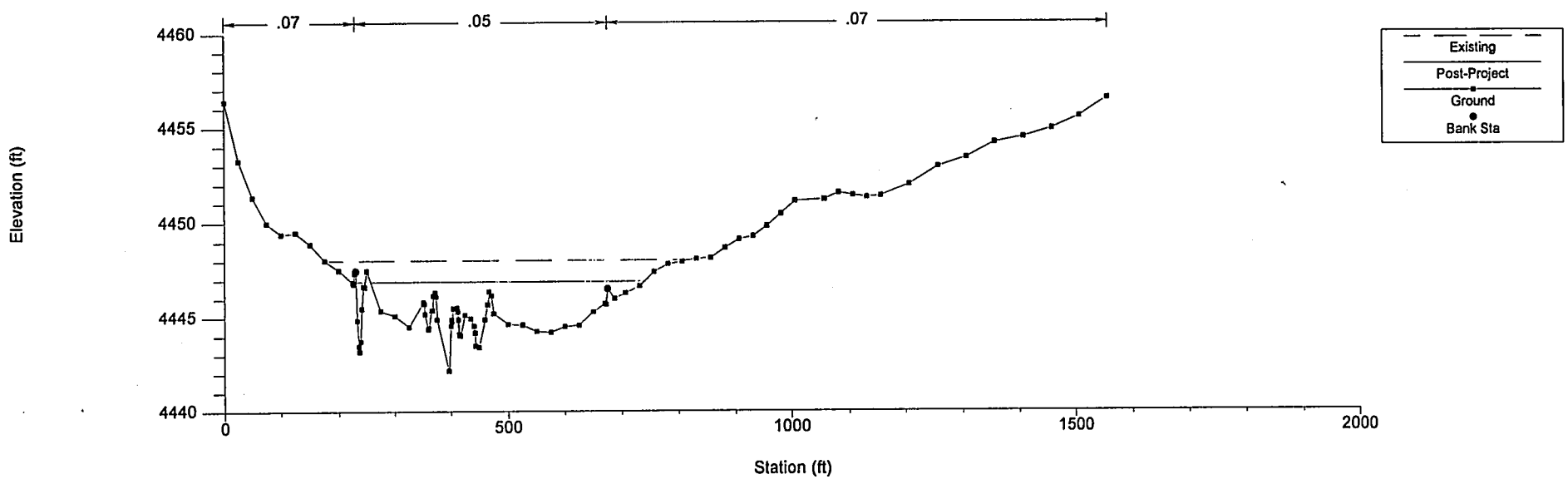
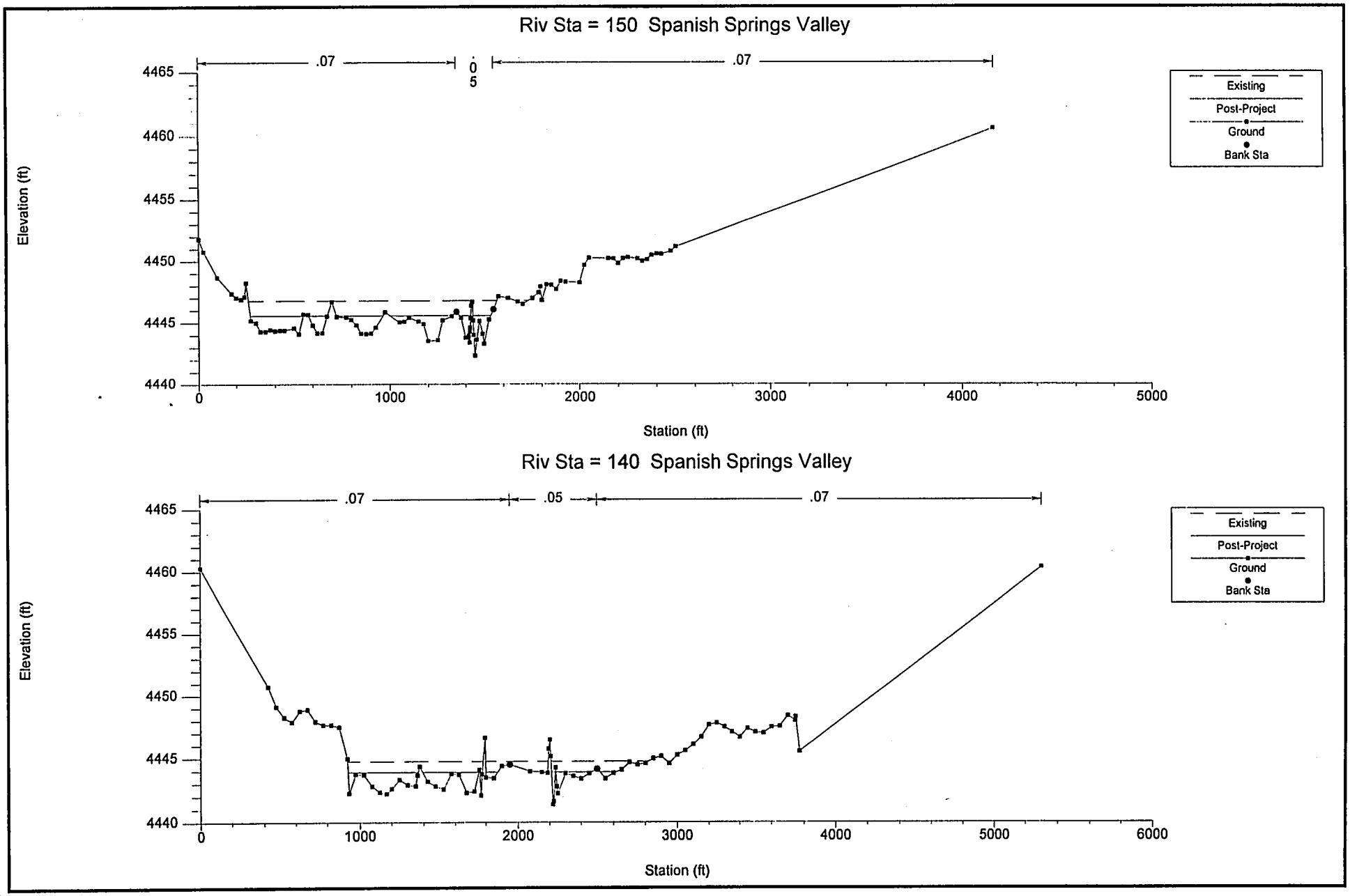
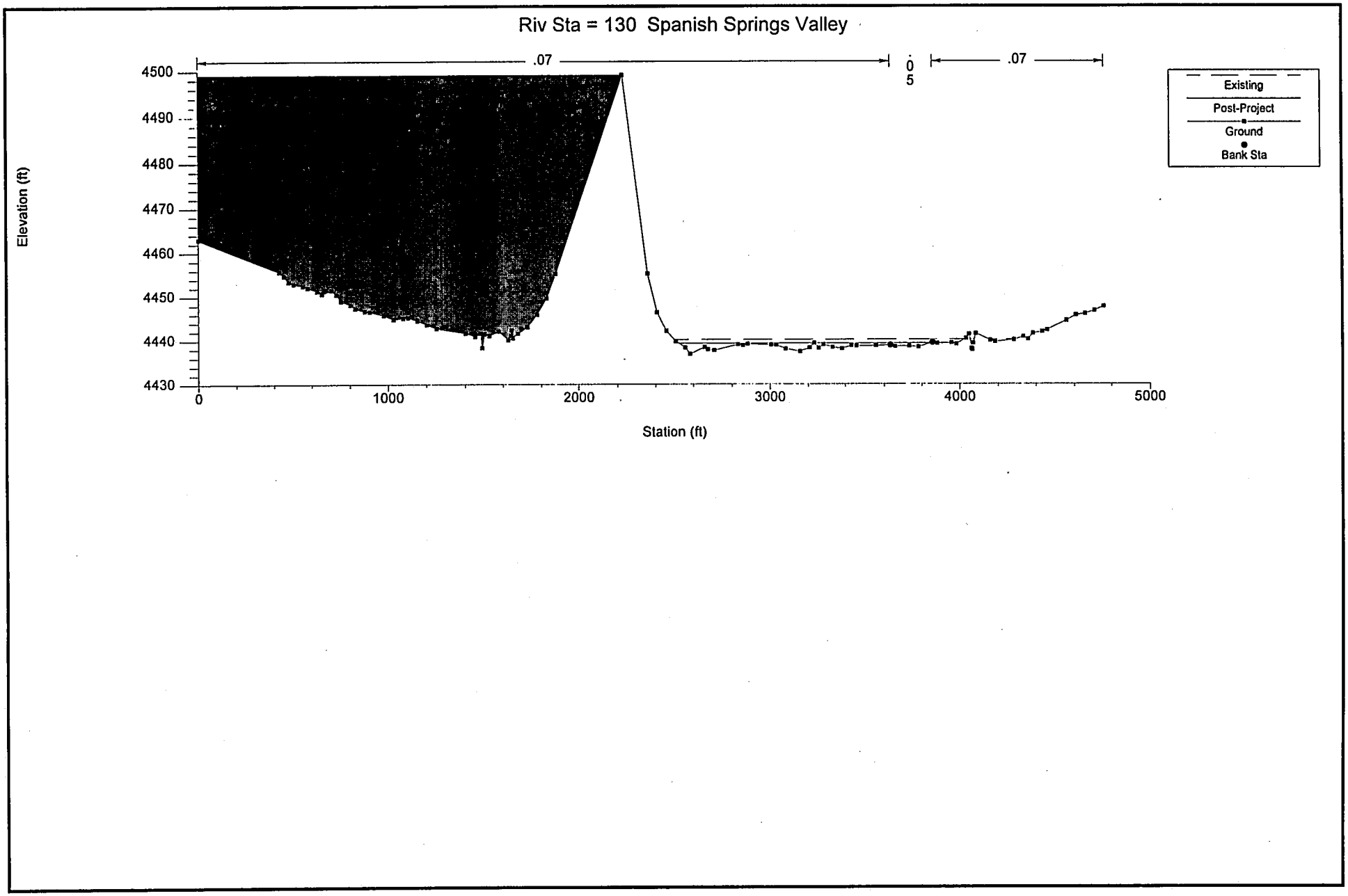



Riv Sta = 150 Spanish Springs Valley
.07
.05
.07
Existing
Post-Project
Ground
Bank Sta
Elevation (ft)
4465
4460
4455
4450
4445
4440
0
1000
2000
3000
4000
5000
Station (ft)
Riv Sta = 140 Spanish Springs Valley
.07
.05
.07
Existing
Post-Project
Ground
Bank Sta
Elevation (ft)
4465
4460
4455
4450
4445
4440
0
1000
2000
3000
4000
5000
6000
Station (ft)


Riv Sta = 130 Spanish Springs Valley
.07
.05
.07
Existing
Post-Project
Ground
Bank Sta
Elevation (ft)
4500
4490
4480
4470
4460
4450
4440
4430
0
1000
2000
3000
4000
5000
Station (ft)

Boneyard Flat Diversion
Public Workshop 12/20/95 7PM-9PM

NAME	ADDRESS
Bob & Linda Shane	Lackey Ledge.
Joel Dosgues	260 Agua Fria Dr.
Fred & Nonda Hamilton	515 Calle De La Plata
Jean Monahan.	399 Calle Limpio.
Clark Monson	520 Calle de la Plata SSCHA
MARK HUNTER	550 Valle Verde
JOE A. GANDOLFO	550 VALLE VERDE
Scott Downum	RTD Co
Ed Weeks	535 CALLE BONITO
Will Brown	2129 Cielo Vista Dr.
Roger Canary	561 Calle De Plata
Norma Canary	561 Calle De La Plata
Donna Davis	510 Calle De La Plata
Leon Smith	2525 Rio Seco Ln.
* Jerry CASPER	2327 Cielo Vista
Carol Green	560 Valle Verde
FRANK CSIGA	NDOT ~ 1263 S. STEWART ST C.
Bob MANSFIELD	650 VALLE VERDE.
JEANNE DEMBOSKI	11375 Campo Rico Ln
David K Lane	2440 La Solana Ln
Ray Barbato	755 FRIEDMAN CIRCLE SPARKS 89436
Gwen Rentner	300 Cabrillo Ln. Reno 895 SPANISH SPRINGS.
BUD LEHMKUHL	397 CALLE LIMPIO SPARKS 8943.
Cynthia Albright	WCDCP

Boneyard Flat Diversion
Public Workshop

Wednesday, December 20, 1995

Public Comments:

WILL SEDIMENT DETENTION STRUCTURES CAUSE SEDIMENT LOADS TO PHOKE CHANNELS?

DON'T FORGET ABOUT CHANNEL MAINENANCE AS DEBRIS, SEDIMENT ETC CAN DEGRADE CHANNEL CAP.

GARY BARBATO

Boneyard Flat Diversion
Public Workshop

Wednesday, December 20, 1995

Public Comments:

You have the Southern most Route going through my N. Prop Line and on top of my Power & Well FRESH WATER MY FRONT DOOR IS APPX 100' FROM MY N. PROP LINE — I DO NOT WANT A DITCH IN MY FRONT YARD — FURTHER I HAVE NO DESIRE TO HAVE A HOLDING POND ON MY WEST P.L. — NO I DONT WANT A BALL PARK OR ANY TYPE OF PUBLIC NOISE MAKING EVENT NO MATTER HOW NOBLE YOUR CAUSE MAY BE.

THANK YOU. O.L. BUD CEHAKUHE
397 CALLE LIMPIO
SPARKS, NV 89436

P.S. I Couldn't Sell my place this past year due to Flood plain and Dusty Roads WHY WOULD I WANT A DITCH and Pond —

Boneyard Flat Diversion
Public Workshop

Wednesday, December 20, 1995

Public Comments:

On what was heard at Public Meeting on 12-20-95, I believe nothing but good could Result from this Ditch being constructed

Carol Beeson

Boneyard Flat Diversion
Public Workshop

Wednesday, December 20, 1995

Public Comments:

On the plan presented on 12/20 you show the drainage channel on my N property line and going across Campo Rico Lane To Pyramid Hwy. Also a potential Catch Basin is located on my EAST property line. With 2 young Children who play in this AREA I have great concern with these locations which show NO safety fencing and would be a REAL danger to my children.

Jeanne Dembeck
11375 Campo Rico Ln
Sparks NV 89436
425-1623

Mr. Leonard Crowe
Washoe County Comprehensive Planning
Flood Control Officer
1001 E. 9th St.
Reno, NV 89512

Dec.22,1995

Mr. Crowe

On December 20 a meeting was held to discuss a flood control plan and drainage channel to route the water from Griffin Canyon to Boneyard Flats. I was unable to attend this meeting because of illness however my wife did attend. I was astounded and deeply upset when she informed me that the proposed routes (all that were discussed) would place the channel at my back property line and then up the side. Please reference enclosed land map #52. The route is highlighted.

This proposed route is extremely unfair to property owners with houses on them already, which are outside the flood plain. In 1993 I moved here with my family to live a better lifestyle and provide a safe and secure future for my two young boys' ages 7 and 8. Before purchasing my lot I went to county planning to check for hazards such as floods and they showed me a map and informed me that my lot was outside the flood plain. Now I find that this flood control plan has been discussed for several years prior to my purchasing my property, why wasn't this information provided at the time of my inquiry? Now it is to late for me to have purchased a different piece of property or to alter anything on my property, my house is built with a garage etc. tucked into a quadrant closest to your propose channel. I can not just pick up my house and move to the other side of the lot. Our biggest concern is the safety of our children and my wife was informed the channel could be fenced. I do not see how to secure the drainage pipe under Campo Rico Ln. It seems as if this is a disaster waiting to happen. With all these vacant lots, I find it incredible that your proposal has to infringe on the existing houses on Campo Rico Ln. The undeveloped land would at least still have the option of locating their structure relative to the drainage channel and at least they would be aware a channel exists before purchasing and building. I realize something has to be done to help the individuals in the flood zone (although they should have realized the risk when purchasing property in a flood zone) but make it equitable and do not place an unfair burden on those outside the flood zone. I like to compliment the county for trying to utilize our precious resource of water.

Mr. Crowe, I met you at the November meeting of the Spanish Springs Citizens Advisory Board at Alice Taylor School. In discussing the channel route at that time with Mr. Donovan and me you informed me the channel route would follow Calle De La Plata and cross Pyramid Highway there then over to Boneyard Flat. Why was this route changed? Another possible route to consider would be to follow the Gas Pipe Line since nothing can be built over that and it appears to be the most direct route and possibly the least costly. I tried to call you on Dec. 21 and left a message on your voice mail.

Since our property will be greatly affected by this plan, as presented on Dec. 20, we would like the opportunity of discussing this with you as soon as possible.

Sincerely,

Eugene Dembenski

Eugene Dembenski
11375 Campo Rico Ln
Sparks, NV 89436
702-425-1623