

Atlantic Richfield Company

December 9, 2016

CERTIFIED – RETURN RECEIPT REQUESTED

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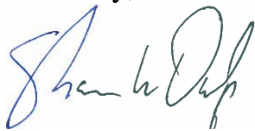
RE: Warm Springs Ponds Operable Units of the Silver Bow Creek Area NPL Site, Document No. CERCLA-VIII-91-25 – 2016 Five-Year Dam Safety Inspection Report

Dear Ms. Lemieux:

Pursuant to the above referenced order, enclosed you will find the *Draft Final Warm Springs Ponds (WSP) 2016 Five-Year Dam Safety Inspection Report*. The inspection was conducted according to methodology presented in the *WSP Operation and Maintenance (O&M) Manual* and is intended to fulfill the five-year dam safety periodic inspection as required by Montana Department of Natural Resources and Conservation (DNRC) regulation ARM36.14.601 (Periodic Owner Inspections). Pioneer Technical Services, Inc. conducted the periodic inspection.

If you have any questions or concerns regarding this submittal, please contact me at (406) 563-6645, or via email at shannon.dunlap@bp.com.

Sincerely,



Shannon Dunlap
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An affiliate of Atlantic Richfield Company

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**SILVER BOW CREEK/BUTTE AREA NPL SITE
WARM SPRINGS PONDS OPERABLE UNITS**

*Warm Springs Ponds
2016 5-Year Periodic Inspection Report*

Atlantic Richfield Company

December 8, 2016

**SILVER BOW CREEK/BUTTE AREA NPL SITE
WARM SPRINGS PONDS OPERABLE UNITS**

***Warm Springs Ponds
2016 5-Year Periodic Inspection Report***

Prepared for:

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December 8, 2016

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REVISION SUMMARY

Revision No.	Author	Version	Description	Date
Rev 0	Mike Browne	Draft	Issued for Atlantic Richfield Company Review	October 7, 2016
Rev 1	Mike Browne	Draft Final	Issued for Agencies Review	November 2, 2016
Rev 2	Mike Browne	Draft Final	Issued for Agencies Review, prioritized Appendix B punch list	November 7, 2016
Rev 3	Mike Browne	Draft Final	Issued for Agencies Review, updated text	December 8, 2016

1.0 INTRODUCTION

Pioneer Technical Services, Inc. (Pioneer) conducted the 5-year periodic dam safety inspection for the Warm Springs Ponds (WSP) facilities August 1 through 4 and August 10 and 11, 2016. A follow up inspection was performed October 12, 2016 with Pioneer and Arcadis personnel. Arcadis provided review comments to Pioneer on October 28, 2016. The WSP are owned by the Atlantic Richfield Company (Atlantic Richfield) and operated by Pioneer. This report presents the summary and conclusions of the 2016 WSP 5-year periodic dam and facilities inspection (2016 inspection) and includes field observations, photo documentation, a summary of the inspection results, and dam safety recommendations based on the inspection results. Figure 1 shows a general location map and Figure 2 shows a schematic of the WSP facilities system.

Purpose and Scope of Inspection. The purpose of the inspection was to assess the performance of the embankments and appurtenant structures as required under Section 8.9 of the *Warm Springs Ponds Operation and Maintenance (O&M) Manual* (WSP O&M Manual) (Atlantic Richfield Company, 2014). This inspection was conducted in general accordance with the methodology presented in the WSP O&M Manual, particularly Appendix C - Inspection and Maintenance Procedures (IMPs), and is intended to fulfill the 5-year dam safety inspection as required by Montana Department of Natural Resources and Conservation (DNRC) regulation ARM 36.14.601, Chapter 14 (Dam Safety Rules). The inspection is limited to dam safety concerns and did not include evaluation or observation of the WSP system's performance related to water quality and discharge standards. The inspection did not include Process (Treatment) Facilities, which are inspected as part of routine maintenance. The list below contains a brief summary of the IMPs addressed during this inspection.

- **IMP-1 Embankment Monitoring.** Monitoring, inspection, and maintenance procedures for all embankments except Dry Closure areas, which are covered under IMP-3. This IMP includes guidelines for dam safety inspections and also covers inspection procedures for emergency spillways and soil-cement toe drains as they pertain to dam safety.
- **IMP-2 Piezometer Monitoring.** Monitoring piezometers as they pertain to embankment stability and review of data. Detailed data relating to piezometers (including installation data, locations, monitoring frequency, and data recording procedures) are provided under a separate cover in the *Piezometer Manual, Revision 2* (Atlantic Richfield Company, 2012a).
- **IMP-3 Dry Closure Monitoring.** Monitoring, inspection, and maintenance procedures for all dry closure facilities. This IMP addresses performance of the dry closure covers and constituent performance issues.
- **IMP-4 Mill-Willow Bypass Monitoring.** Monitoring, inspection, and maintenance procedures for the Mill-Willow Bypass including restrictive vegetation growth management.
- **IMP-5 Monitoring Water Conveyance Channels.** Monitoring, inspection, and maintenance procedures for all earthen water conveyance channels except the Mill-Willow Bypass (covered under IMP-4). This includes vegetation growth management; erosion, trash, and debris removal; ice build-up checks; riprap performance checks; and other issues affecting the operation of the earthen channels.
- **IMP-6 Hydraulic Structures Monitoring.** Monitoring, inspection, and maintenance procedures for all hydraulic structures except Ponds 2 and 3 Emergency Spillways, which are

covered under IMP-1. This IMP covers various procedures to detect potential maintenance items on hydraulic structures and special procedures for cold weather operations.

- **IMP-7 Deformation Monitoring.** Monitoring and reporting procedures for embankment deformation survey monuments on the WSP dams. Review of deformation data.
- **IMP-8 Silver Bow Creek/Inlet Approach Channel Monitoring and Safety Awareness Plan.** Monitoring, inspection, and maintenance procedures for the Silver Bow Creek channel upgradient of Pond 3.
- **IMP-9 Pond 2 Dike Deformation Monitoring.** Monitoring stability procedures, visual and by survey, for the downstream slope of the Pond 2 embankment. Review of deformation data.
- **IMP-10 Noxious Weed Management.** Procedures for noxious weed monitoring and management.

Pioneer conducted the last independent party 5-year dam safety inspection in 2011 (Atlantic Richfield Company, 2012b). Pioneer also completed annual inspections in 2012, 2013, 2014, and 2015. The Montana Economic Revitalization and Development Institute (MERDI) conducted annual inspections prior to 2012.

Inspection Conditions. The inspection conditions (pond elevations, influent flow, effluent flow and daytime temperatures) are summarized in Table 1. Influent and effluent flows for the WSP system are measured in cubic feet per second (cfs). Pond elevations were measured (in feet) above mean sea level (amsl).

Table 1: Summary of Inspection Conditions

	8/4/2016
Pond 1 Elevation (ft)	4,817.15
Pond 2 Elevation (ft)	4,835.13
Pond 3 Elevation (ft)	4,868.82
Influent Flow (cfs)	17.4
Effluent Flow (cfs)	6.3
Approximate Daytime Air Temperature (°F)	60-70

cfs – cubic feet per second
ft – feet
°F – degrees Fahrenheit

Pond elevations were within normal operating range during the 2016 inspection. Subsequent to the 2016 inspection, Pond 3’s elevation was drawn down approximately 3 feet to facilitate construction of a boat ramp.

Horizontal survey coordinates referenced in this inspection report are based on Montana State Plane Coordinate System North American Datum (NAD) 83. Vertical survey points are based on WSP Local Plant Datum, which closely resembles National Geodetic Vertical Datum (NGVD) 29. Both coordinate systems are in international feet.

Numerous photos were taken to document the inspection conditions. These photos are referenced throughout the report and are included as a photograph log in Appendix A.1. Appendix A.2 includes reference photographs that compare photographs taken in 2016 to past photographs taken of the same locations.

Personnel. Mr. Bryn Vetter, Mr. Steve Lubick, Mr. Garrett Karnath, and Mr. Mike Browne, P.E., from Pioneer conducted the dam safety investigation. Each day, the inspection team conducted daily safety meetings at the control room. Independent of the dam safety inspection, Mr. Cole Dallaserra conducted the dry closure monitoring (IMP-3), Mr. John Mike Downey conducted the Mill-Willow Bypass monitoring (IMP-4), and Mr. Mark Stratton surveyed the deformation monitoring points (IMP-7 and IMP-9).

On October 12, 2016, Mr. Kevin Zitzow, P.E. from Arcadis performed a site visit with Mr. Browne to become familiar with the WSP and look at select items of concern. Mr. Zitzow reviewed the Draft Warm Springs Ponds 2016 5-Year Periodic Inspection Report and provided comments on October 28, 2016. Atlantic Richfield contracted Arcadis to provide an independent, third party review of the dam inspection and inspection report.

Inspection Recommendations. Recommendations are provided throughout this report for items of concern noted during the inspection. This report also includes items of concern from past inspections that are still outstanding. Inspection recommendations from the 2011, 2012, 2013, 2014, 2015, and 2016 inspections are denoted as **Item 11-XX, Item 12-XX, Item 13-XX, Item 14-XX, Item 15-XX, and Item 16-XX**, respectively. To aid in tracking progress, Appendix B summarizes the recommendations in an Action Item Punch List.

Inspection Summary. No critical conditions requiring immediate attention were observed during this inspection. Numerous observations of non-critical items of concern were observed and documented. Recommendations for these items have been provided throughout the report and are summarized in the Action Item Punch List provided in Appendix B.

2.0 IMP-1 EMBANKMENT MONITORING

To be consistent with the WSP O&M Manual (Atlantic Richfield Company, 2014), this document refers to embankment sections along the Mill-Willow Bypass as *dikes* and the sections separating the WSP as *dams*. The freeboard of the embankments at the time of the inspection appeared to be adequate. The sections below describe the embankments inspected and the observations noted during the inspection.

Woody vegetation (primarily willow trees and shrubs) are growing on several segments of the embankments, particularly along the downstream toe area and on some of the upstream slopes. Some negative impacts of woody vegetation on and near embankments include:

1. Facilitates water movement along root penetration which may lead to embankment piping.
2. Decaying roots lead to voids and threaten structural integrity.
3. Attractive habitat for burrowing animals.
4. Loosens soil matrix.
5. Obscures visual observation and limits effectiveness of inspections.

Several small animal burrows and ant hills were observed routinely throughout the WSP embankments. The rodent holes are typically small and generally protrude a limited amount into the embankments. The ant hills vary from small to large with the larger ant hills being several feet in diameter and up to two feet tall. Small animal burrows and ant hills are difficult to control but do pose an embankment risk due to the underground burrowing. The subsequent sections contain specific details and locations of the relevant animal burrows and ant hills.

Item 12-1: Remove woody vegetation growing on the embankment and near the embankment toe. In general, woody vegetation with roots greater than 1/2-inch diameter should not be allowed to grow on the embankment or within 25 feet of the downstream toe.

Item 13-1: Fill in small animal burrow as part of IMP-1. Small animal burrows are difficult to prevent because of the size of the animals. Fill in small burrows as they are observed and inspect the embankment for distress around the burrow. Document the location and frequency of burrow repairs. If problems continually occur in a particular area, consult the engineer to evaluate mitigating methods such as trapping, fumigants, or toxicants.

Item 13-2: Remove ant hills as part of IMP-1. Ant hills are also difficult to control. The *Technical Manual for Dam Owners – Impacts of Animals on Earthen Dams* (FEMA, 2005) recommends reducing the ant populations by physically destroying the visible ant mounds. This can be accomplished by using a shovel to remove the mound or pouring very hot water onto the mound. Document the location and frequency of the ant hills. If problems continually occur in a particular area, consult the engineer to evaluate mitigating methods such as fumigants or toxicants.

2.1 Pond 1

In general, the Pond 1 embankments were found to be in good condition and there were no major items of concern noted during the 2016 inspection. The subsections below contain embankment descriptions and items observed during the inspection.

2.1.1 Pond 1 Dam: North Embankment

The majority of Pond 1 embankment is generally characterized as being in good condition. The crest did not show any visible settlement, misalignments, cracking, or traffic damage. The upstream slope had adequate riprap and grass protection, and did not show any visible settlement, cracking, sloughing, depressions, slumps, or bulges. The downstream slope had a uniform grading, and did not show visible settlement, cracking, erosion, sloughing, slumps, depressions, bulges, boils, seepage, or animal traffic. The grass vegetation was dense on some areas of the western portion of the dam, which limited ground surface visibility during the inspection.

Picture # 1 through Picture # 6 display the Pond 1 Dam North Embankment (pictures are included in Appendix A.1). There were several small items of concern noted during the inspection:

- Some small, woody vegetation along the upstream slope and sporadically along the downstream toe as shown in Picture # 1.
- In 2011, a surface erosion repair project was performed on the downstream slope of the embankment near the South Wet Closure. Vegetation has been reestablished throughout a majority of the repaired area; however, some areas remain bare. The bare areas are still covered with biodegradable erosion control mat placed during the 2011 repairs. A typical bare area is shown in Picture # 5.
- Minor surface erosion was observed on the downstream side of the embankment.
- Moist area/seep was observed at the downstream slope close to the right abutment during the 2015 inspection. The moist area was observed below riprap near the interface of the intermediate rock berm and the downstream bench. The moist area was not located/observed during the 2016 inspection.
- A rodent burrow and soil spoils from the burrow were observed along the downstream toe, approximately 150 yards west of the left abutment. The area was soft and a metal inspection rod could be inserted 3 feet into the soft area. The area was marked with a pin flag to facilitate future monitoring. The area is shown in Picture # 5.
- A rodent hole was observed on the downstream slope approximately 30 yards west of the embankment bend near Piezometer AH-A5R. The rodent hole was on the steep face of an exposed road cut (see Picture # 6).

In 2013, a large rodent hole, located on the crest of the dam near the right abutment was observed by site operators during routine operation and maintenance. The rodent hole was excavated and replaced with compacted fill during the summer of 2014. This area of the embankment was found to be in good condition during the 2014, 2015, and 2016 inspections.

During the 2012 annual inspection, inspectors observed a polyvinyl chloride (PVC) pipe penetrating through the embankment's downstream slope approximately 10 vertical feet below the crest. At the location of the pipe, the embankment impounds the Pond 1 dry closure, there is no ponded water in the vicinity. The pipe was 6 inches in diameter and located just east of Piezometer AH-A4R. Remnants of this pipe were also observed at the surface of the Pond 1 dry closure approximately 50 yards south of the Pond 1 Dam. The pipe was broken at the Dry Closure location and appeared to have been driven over during past weed spraying operations. This pipe is currently non-functional and thought to be a remnant of a past research project. The coordinates of the pipe location are listed in Table 2.

Table 2: Pipeline Coordinates

	Northing	Easting	Elevation
North End of Pipeline	720,380.284	1,140,675.959	4,812.46
Break in Pipe (where it was driven over)	720,233.340	1,140,551.981	4,812.53
South End of Pipeline	718,353.019	1,139,373.156	4,815.00

Item 12-2: Pipes penetrating through an embankment expose the embankment to an elevated risk of internal embankment erosion (*piping*), should it be exposed to water, by creating a direct seepage path along the exterior of the pipe. Evaluate the function of the pipe and in-place engineering controls to minimize piping. Consider abandonment if the pipes are no longer needed.

Item 15-1: Reseed and apply organic material as needed on bare spots observed in the 2011 erosion repair area. Pioneer recommends performing this work in the near future in effort to reuse the existing erosion control mat. The erosion control mat is biodegradable and has a limited timeframe before it becomes unusable.

Item 15-2: Monitor moist area observed on downstream slope near right abutment. Pioneer recommends monitoring and documenting on a monthly basis in accordance with IMP-1. Note: the moist area was not observed during the 2016 inspection.

Item 16-1: Monitor animal burrow/soft spot observed on downstream toe approximately 150 yards southeast of left abutment. Pioneer recommends monitoring and documenting on a monthly basis in accordance with IMP-1. Fill in and repair the rodent hole during the next scheduled maintenance opportunity.

2.1.2 Lower Wet Closure Dam/Dike: North Embankment

A spongy area has existed between the lower wet closure and the groundwater interception trench for several years and receives regular monitoring. Seepage is occurring on the south bank of the groundwater interception trench, across from the Pond 1 Traveling Screen Building. Five distinct areas of moist soil and wet, spongy soil were observed just above the water surface of the groundwater interceptor trench. The groundwater interception trench was installed downgradient of the lower wet closure to establish groundwater flow paths towards the ditch where it is collected and pumped back to Pond 2, preventing offsite migration of groundwater. The seepage is away from and below the embankment toe and foundation. This seepage is not considered a

hazard to the stability of the lower wet closure embankment; the groundwater interception trench is functioning as intended. No action beyond regular embankment monitoring is recommended. Picture # 7 displays the lower wet closure dam/dike north embankment and Picture # 8 displays a typical seepage/spongy area.

A rodent hole was observed on the downstream slope of the north embankment approximately 200 yards west of the pump house. The rodent hole should be monitored and repaired per **Item 13-1**.

2.1.3 Pond 1 Flood Extension Dike and Soil-Cement Erosion Protection

There were no reportable items of concern noted during the time of the inspection. Thick grass vegetation was growing along the downstream toe and approximately on the bottom one-third of the downstream slope, which limited ground surface visibility during the inspection. Minor erosion was noted on the downstream slope approximately 50 feet north of the dual 66-inch outlets. The erosion is not a dam safety concern in its current state. Picture # 9 shows the flood extension dike.

2.1.4 Pond 1 Wet/Dry Closure Separator Dike

There were no reportable items of concern noted during the time of the inspection.

2.1.5 Wet Closure Dikes (North, Middle, and South) Below Pond 1

In general, the wet closure dikes were in good condition. The inspectors observed several ant hills, numerous locations with spotted knapweed and leafy spurge throughout the wet closure dikes, and occasional woody vegetation. The woody vegetation should be controlled or removed as part of routine maintenance as described in IMP-1 and Item 12-1. The dike separating the south and middle wet closures is shown in Picture # 10.

Minor erosion from wave run up has historically been documented along the perimeter of the middle wet closure. In 2015, Jordan Contracting Inc. (JCI) regraded the slope and placed riprap around the perimeter of the dike. The slope was in good condition with uniform grading during the 2016 inspection.

On the west dike of the south wet closure, a 6-inch diameter rodent hole was observed on the east side of the embankment, approximately 20 yards north of the abutment with Pond 1 dam (see Picture # 11). An abandoned piece of trash pump pipe was on the ground surface adjacent to the hole. The location was marked with a pink pin flag. The trash pump pipe was collected and disposed.

Item 16-2: A rodent hole was observed on the east dike of south wet closure (eastern side of dike, approximately 20 yards north of Pond 1 dam) and marked with pink pin flag. It is recommended that the rodent hole be monitored on a monthly basis. Fill in and repair the rodent hole during the next scheduled maintenance opportunity.

2.2 Pond 2

In general, the Pond 2 embankments were in good condition. There were no major items of concern observed during the inspection. The subsections below describe the embankments as well as items observed during the 2016 inspection.

2.2.1 Pond 2 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway

The embankments were generally characterized as being in good condition. The crest did not show any visible settlement, misalignments, cracking, or traffic damage.

The upstream slope is generally in good condition with no major immediate areas of concern, had adequate riprap and grass protection, and did not show any visible settlement, cracking, or sloughing. The upstream slope appeared dry and stable but had some irregularities in the slope. The slope irregularities were at or near the pond elevation and appeared to be caused by vegetation, wave action, and foot traffic. The majority of the slope was covered with riprap, which was often overlain with grasses, woody vegetation (brush and sage brush), and cattails. The entirety of the slope could not be observed at some locations due to the dense vegetation. The upstream slope is shown in Picture # 12 and Picture # 13.

In general, the downstream slope had a uniform grading, adequate grass cover, and did not show visible settlement, cracking, erosion, sloughing, slumps, depressions, bulges, boils, or animal traffic. It was noted that on some areas of the western portion of the dam, grass was thick on the downstream slope, which limited ground surface visibility during the inspection. The downstream slope is shown in Picture # 14. Inspectors noted the following observations during the inspection:

- Patchy areas of poor vegetation/exposed soil-cement on the downstream slope; however, there was no erosion at these locations and the conditions did not appear to be a dam safety concern at this time.
- Rodent holes:
 - Numerous small rodent holes (generally 3 inches or less in diameter), ant hills, and noxious weeds were observed on the downstream slope and toe area. A metal rod was used to prod the rodent holes which appeared to be confined to the surficial soils located on top of the soil-cement. The small rodent holes and ant hills do not appear to be a dam safety concern at this time; however, they should be filled and removed as they are observed.
 - A 6-inch diameter rodent hole was located about mid slope near Station 168+50. The rodent hole appeared to be abandoned and is shown in Picture # 15.
- Green grassy vegetation was observed on the downstream slope near the toe at Station 185+00. It was noted that the surrounding vegetation was dry and brown. The ground surface in the vicinity of the green vegetation was wet (see Picture # 16). No sand boils, bulges, or visible flow were observed in the area. Adjacent toe drains (184 through 186) are plumbed into the manifold system and it is unknown if the drains were actively discharging water.

The Pond 2 Emergency Spillway section was in good condition on both sides of the embankment with no critical or maintenance items to report.

Pond 2 toe drains are numbered 142 through 191. Drains 164 through 191 flow into the manifold system. Most of the drains were easy to locate and relatively free of dense vegetation and accumulated Mill-Willow Bypass sediment. Inspectors noted the following observations during the inspection:

- Toe drains 142 and 189 had contained minor amounts of sediment within the discharge pipe. No water was discharging from these toe drains at the time of the inspection.
 - Toe Drain 142 is shown in Picture # 17 and Picture # 18. The area around the toe drain was cleared of vegetation and graded to drain in 2015 by JCI using heavy equipment. Pioneer speculates the sediment may have inadvertently been placed within the pipe during the clearing and grading operations.
 - Toe Train 189 discharges into the manifold system. Any sediment that may have migrated through the embankment with seepage water should have been discharged into the manifold. Sediments within the overflow discharge pipe may have been inadvertently placed during clearing and grading operations.
- While compiling the 2015 inspection report, Pioneer noted As-built Drawings (Warm Springs Ponds Inactive Area, RA Construction – Phase I Toe Drain Manifold and Earthwork 1993, Sheet 11) indicated the last toe drain is 193.
 - Historical and current monitoring records list the last toe drain as 191. The difference between the As-Built Drawings and monitoring records was unclear.
 - During the 2016 inspection, Pioneer investigated the discrepancy. The last toe drain, with an exterior overflow device, plumbed into the manifold system, is toe drain 191. Pioneer speculates the following:
 - There is no ponded water upstream of toe drains 192 and 193 due to geometry of Pond 2 West Embankment abutting against Pond 2 North Dam; therefore, it is possible the toe drains were not constructed, or,
 - Toe drains 192 and 193 were plumbed directly into the manifold system without an exterior overflow device.

Items of note regarding the dam safety of Pond 2 dike include the following:

Item 16-3: A rodent hole was observed at the downstream toe near Station 168+50. It is recommended that the rodent hole be monitored on a monthly basis. Fill in and repair the rodent hole during the next scheduled maintenance opportunity.

Item 16-4: Monitor green vegetation and embankment soils at the downstream toe near Station 185. Inspect for changes in vegetation color, seepage, sloughing, and/or erosion. Pioneer recommends monitoring monthly through 2017.

Item 16-5: Remove sediment in toe drains 142 and 189 and inspect the drains quarterly through 2017. Document toe drains condition, flows, and additional soil accumulation (if any) within or around the toe drains. Consult with Atlantic Richfield's designated engineer if additional soil is observed within or around the toe drains. Additional exploration, such as video inspection of toe drains may be warranted.

Item 16-6: Remove Toe Drain 192 and 193 from As-Built drawing Warm Springs Ponds Inactive Area, RA Construction – Phase I Toe Drain Manifold and Earthwork 1993, Sheet 11.

2.2.2 Pond 2 Dam: North Dam Embankment

The crest did not show any visible settlement, misalignments, cracking, or traffic damage.

The upstream slope was generally in good condition with no items of immediate concern. It was covered with riprap and sporadic vegetation consisting of grasses, cattails, and small shrubs. The entirety of the slope could not be observed at some locations due to dense vegetation. The upstream slope did not show any visible settlement, cracking, sloughing, depressions, slumps, or bulges. Picture # 19 shows the crest and upstream slope of the dam.

The downstream slope was generally in good condition and had uniform grading, adequate grass cover, and did not show visible settlement, cracking, erosion, sloughing, slumps, depressions, bulges, boils, seepage, or animal traffic. Picture # 20 displays the downstream slope of the dam. The items of note below are followed by specific recommendations.

- A sinkhole depression has historically been observed in the rock toe berm on the east end of the embankment. The sinkhole was located near piezometers within the toe berm and is approximately 2 feet deep and 2 feet in diameter. Subsequent to the 2015 inspection, on October 29, JCI excavated a test pit at the sinkhole location as recommended in Item 11-05 to explore what underlying reasons were causing the sinkhole. The test pit was inconclusive and no underlying reasons for the sinkhole were determined. The test pit and sinkhole were backfilled with in-kind materials and leveled with adjacent ground. No evidence of the sinkhole was observed during the 2016 inspection.
- The eastern portion of the downstream slope (area of rock toe berm) is relatively steep and has some areas of non-uniform grading with surficial sloughing. The surficial soils were fine-grained granular soils. Pioneer understands the granular soils are likely remnants of past onsite screening operations to place riprap on the upstream slope. These soils were casually spread on the downstream slope.
- The rock toe berm visually appeared to be lower in elevation near the sinkhole. It is uncertain whether the toe berm was constructed lower here or the embankment had settled due to the weight of rock. This observation was initially observed during the 2011 five-year inspection.
- Soil piles were observed approximately every 50 yards about mid-slope on the western portion of the dam. The source of the soil piles is unknown. They do not appear to be a dam safety concern.
- Inspectors observed multiple ant hills and small animal burrows throughout the dam.

- Inspectors noted woody vegetation, primarily willows, at some locations along the downstream toe. In 2015, JCI removed woody vegetation that could be safely accessed and reached with an excavator brush cutter. Vegetation which could not be reached with the excavator remains in place.
- In 2015, a 10-inch diameter rodent hole was noted near the downstream toe area approximately 250 feet southeast of SS-5. The hole was repaired in July 2016. The repaired area is shown in Picture # 21.

2.2.3 Pond 2 East and West Wet Closures and Inlet Channel Dikes

The Pond 2 east and west wet closures and inlet channel dikes were generally in functional condition. The wet closures and inlet channel dikes are used to manage water within the WSP system. The dikes are hydraulically connected by decant structures within Pond 2. The water elevations in the east and west wet closures are typically about 3 feet higher than the elevation in Pond 2. Items of concern include the following:

- Numerous locations had minor embankment erosion/scarping and multiple small animal burrows and ant hills. A 10-inch diameter animal burrow was observed on the west wet closure channel, approximately at the midpoint. The rodent hole is shown in Picture # 22.
- Sloughing was frequently observed throughout the dikes.
- Excessive woody growth was observed within the dikes. This excessive vegetation hindered the visual embankment inspection.
- Knapweed was frequently observed on the dikes.

Item 16-7: Repair the rodent holes during the next scheduled maintenance opportunity.

2.2.4 Wildlife Pond Dikes

In general, the Wildlife Pond dikes that could be visually observed were in functional condition. The dikes are hydraulically connected between the Wildlife Ponds and Pond 2. The Wildlife Pond dikes are used to manage water within the WSP system. A portion of the Island Pond dike is shown in Picture # 23. Items of concern and recommendations include the following:

- Excessive woody growth was observed within the dikes. This excessive vegetation hindered the visual embankment inspection.
- Multiple small animal burrows and ant hills were noted throughout the Wildlife Pond dikes, particularly along the downstream and upstream slopes of the Pond 2/Hog Hole and Island Pond separator dike.
- Embankment undercutting was observed where the Hog Hole discharge culvert enters the Island Pond. The undercutting was not considered a dam safety concern but monitoring during future inspections is recommended according to IMP-1.

2.3 Pond 3

In general, the Pond 3 embankments were in good condition. The subsections below list descriptions of the embankments and items observed during the inspection.

2.3.1 Pond 3 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway

The crest of the embankment was generally in good condition and did not show any visible settlement, misalignments, cracking, or traffic damage. The Pond 3 emergency spillway section was in good condition on both sides of the embankment with no critical or maintenance items to report. The emergency spillway is shown in Picture # 24.

The upstream slope was generally in good condition and was covered with riprap and sporadic vegetation consisting of grasses, cattails, and small shrubs. The entirety of the slope could not be observed at some locations due to dense vegetation. The upstream slope did not show any visible settlement, cracking, sloughing, depressions, slumps, or bulges. Some irregularities in the slope were noticed between the emergency spillway and SS-3B. The irregularities are attributed to two types of riprap, rounded and angular. The angular riprap was placed at some point in the past to shore up areas of displaced rounded riprap. Picture # 25 shows the embankment upstream slope.

Historically, the upstream slope is not lined with riprap from approximately Station 77+50 to the south end of Pond 3; consequently, wave action and erosion has caused the embankment to be over-steepened in some locations. Maintenance work was performed in the fall of 2015 to regrade the over-steepened portions of the slope and place riprap on the regraded slope. Picture # 26 shows the regraded slope with riprap.

The downstream slope was generally in good condition and had uniform grading, adequate grass cover, and did not show visible settlement, cracking, erosion, sloughing, slumps, depressions, bulges, boils, or animal traffic. Picture # 27 and Picture # 28 displays the downstream slope of the dam. Items observed during the inspection include the following:

- Soil-cement was exposed at numerous locations along the toe. The exposed soil-cement is a result of erosion that occurred during past elevated flows in the Mill-Willow Bypass. In its current condition, the exposed soil-cement does not pose a dam safety concern. The exposed soil-cement has historically been observed. The exposed soil-cement is shown in Picture # 29.
- Geotextile was exposed near Stations 99+00, 115+00, and 123+50. The exposed geotextile has historically been observed and does not currently pose a dam safety concern.
- Numerous small animal burrows and ant hills were observed throughout the embankment. The majority of these burrows were located at the embankment toe. A metal rod was used to prod the rodent holes. The rodent holes appeared to be confined to the surficial soils located on top of the soil-cement. The small rodent holes and ant piles do not appear to be a dam safety concern at this time; however, they should be filled and removed as they are observed.
- Numerous ant hills were noted along the downstream toe. In general, the ant hills appeared to be fewer in number than past years. Many of the ant hills observed in the 2016 inspection were abandoned.

- No vegetation was growing along the downstream toe embankment west of the Pond 3 dry closure. The barren area is generally 4 feet wide and approximately 200 feet long.
- During the 2015 inspection, green vegetation (grasses) and damp soil were observed near the northern end of the dike at Station 135+00. This area of green vegetation was also observed during the 2016 inspection. The area was approximately 100 yards long and spanned from the downstream toe approximately two-thirds of the way up towards the crest. The damp soil was relatively soft and easily penetrated with a probe. Surrounding vegetation was dry and brown. No seepage or freestanding water was observed on the downstream slope or toe. A thorough visual inspection of the area was limited due to the dense vegetation. Picture # 30 through Picture # 33 show the location of the green vegetation.
- Green vegetation, cattails, and wet soil were observed on the downstream slope near the toe at Station 89+50. Visible water could be seen when the vegetation was pressed down. The location is shown in Picture # 34 through Picture # 36. The inspectors could not determine if the water was flowing. Sand boils, sloughing, bulges, and slope irregularities were not observed. Excavator tracks (from past years), oriented perpendicular to the dike, from the crest to the downstream toe had tracked down vegetation in the area. The visible water and green vegetation was predominantly located within the excavator track footprints at the downstream toe.
- Small soil mounds from mole burrows are located about midway on the downstream slope at Station 9+25. The burrows appeared to be limited to surficial soils. The mounds do not appear to be a dam safety concern at this time.

Pond 3 toe drains are numbered 3 through 138. Historically toe drain 1, 2, and 139 to 141 have not been located or monitored. Pond 3 toe drains were generally in good condition, free of vegetation, had positive drainage channels leading away from the drain outfalls, and could be readily located. Toe drain 30 is shown in Picture # 36. Inspectors noted the following observations during the inspection:

- Toe drain 113 had a rodent nest within the pipe. The drain was cleaned out and the nest was removed during the inspection.
- During the 2015 inspection, it was noted that toe drains 45, 47, and 58 were partially filled with soil. Subsequent to the 2015 inspection, JCI removed the soil from the drains (45, 47, and 58), repaired the pipes and rodent guards, and regraded the outfall areas to provide positive drainage. Sediment was not observed within these toe drains during the 2016 inspection. No water was discharging from these toe drains during the inspections performed in 2015 or 2016.
- Toe drains 11, 12, and 13 had missing and/or broken rodent guards (flappers).
- The rebar station marker located at toe drain 13 was knocked down.
- Toe drain 84 pipe is partially crushed where it exits the embankment. Picture # 37 shows the crushed pipe.
- Sediment was observed in toe drains 37, 39, 43, 72, and 79. Toe drain 43 is shown in Picture # 17 and Picture # 18. Water was not flowing out of any of these drains. It is unclear during the inspection how the soil entered the pipes. Some possible sources include deposition from

high stream flows in Mill-Willow Bypass, embankment piping, animals, or incidentally placed during past maintenance work.

Item 15-7: Monitor green vegetation and embankment soils on downstream slope at Station 135+00. Inspect for changes in vegetation color, seepage, sloughing, and/or erosion. Pioneer recommends monitoring monthly through 2017.

Item 16-8: Monitor green vegetation and wet embankment soils on downstream slope at Station 89+50. Inspect for changes in vegetation color, seepage, sloughing, and/or erosion. Pioneer recommends monitoring monthly through 2017.

Item 16-9: Remove sediment from toe drains 37, 39, 43, 72, and 79. Inspect quarterly through 2017. Document toe drains condition, flows, and soil accumulation (if any) within or around the toe drains. Consult with Atlantic Richfield's designated engineer if additional soil is observed within or around the toe drains. Additional exploration, such as video inspection of toe drains may be warranted.

2.3.2 Pond 3 Dam: North Embankment - Bypass Spillway to East Outlet Works

The crest of the embankment was in good condition with no critical items or maintenance items to report. The crest did not show any visible settlement, misalignments, cracking, or traffic damage. Picture # 37 and Picture # 38 show the upstream and downstream slopes, respectively.

The upstream slope was generally in good condition with no items of immediate concern and was covered with riprap and sporadic vegetation consisting of grasses and small shrubs. The upstream slope did not show any visible settlement, cracking, sloughing, slumps, or bulges. Four relatively small areas (approximately 10 feet in diameter) on the upstream slope between SS-3E and SS-3W had small depressions in the surface. The irregularities in the slope are likely attributed to two types of riprap, rounded and angular. The angular riprap was placed at some point in the past to shore up areas of displaced rounded riprap.

The downstream slope was generally in good condition, had adequate grass cover, and did not show visible settlement, cracking, erosion, sloughing, slumps, depressions, bulges, boils, or seepage. Animal traffic trails were occasionally observed on the downstream slope. The downstream slope included a rock-filled berm that served as an intermediate bench. The embankment slope upstream of the bench was uniform in grade and generally well vegetated with grasses. The embankment slope downstream of the bench contained some areas of thick woody vegetation and non-uniform/steep localized slopes. The list below shows the items of concern and recommendations:

- Vegetation at the downstream toe of the dam was thick and consisted of grasses, cattails, shrubs, and willows. A detailed inspection of the toe could not be conducted at all locations due to the thick vegetation.
- Exposed geotextile with underlying rock at Station 115+00 was observed on the downstream slope. Geotextile appears to have been used as a separator between rockfill and surficial soils. Currently, the geotextile does not appear to be a dam safety concern.

- Several small animal burrows and ant hills were observed on the downstream slope and toe.
- Past inspections noted an embankment slough adjacent to the eastern-most siphon leading to the Hog Hole. This sloughing was initially noted in 2011. The embankment slough was repaired in summer 2016. The repaired area is shown in Picture # 40 and Picture # 41.

Item 11-12: Woody vegetation, willows and shrubs, are located along the downstream toe on the western half of the dam. The vegetation is dense between the Hog Hole and Pond 3 dam and is sporadic between the east Wildlife Pond and Pond 3 dam. Pioneer recommends removing the woody vegetation within the embankment and embankment toe. Areas where there is thick vegetation growth should be controlled to allow a more thorough observation of the embankment during future inspections.

2.3.3 Pond 3 Dam: North Dam Embankment - East Outlet Works to East End of Pond 3

The upstream slope, crest, and downstream slope from the Pond 3 dam north embankment from east outlet works to the east end of Pond 3 were generally in good condition. The upstream and downstream slopes of the embankment are shown in Picture # 42 and Picture # 43, respectively.

The crest of the embankment was in good condition and did not show any visible signs of settlement, misalignments, cracking, or traffic damage.

The upstream slope is covered with riprap and was generally in good condition. The upstream slope did not show any visible settlement, cracking, sloughing, depressions, slumps, or bulges.

The downstream slope was generally in good condition and had uniform grading, adequate grass cover, and did not show visible settlement, cracking, erosion, sloughing, slumps, depressions, bulges, boils, seepage, or animal traffic. Inspectors noted the following observations during the inspection:

- Green vegetation, cattails, and wet soil were observed during the 2016 inspection on the downstream slope near the toe approximately 150 yards west of the right (east) abutment. The 2016 inspection is the first year Pioneer had observed the green vegetation, cattails, and wet soil. The wet area was approximately 100 feet long and vertically located about 2 feet above the downstream toe. Mossy vegetation is located on ground surface underlain by gravel soils and was sporadically observed at higher locations on the embankment as well. The location is shown in Picture # 44 and Picture # 45. The inspectors could not determine if the water was flowing. Sand boils, sloughing, bulges, and slope irregularities were not observed. The location was marked with a pin flag to aid in future monitoring.
The area was re-inspected on September 26, 2016. Pond 3's pool level was drawn down approximately 3 feet due to the boat ramp construction activities. The soil beneath the vegetation was noted as being moist; however, there was no visible free water. Soils underlying the vegetation were gravelly. The eastern and western extents of the green vegetation was staked to aid in future monitoring.

- In 2015 and 2016, a soft area was observed about mid slope approximately 100 feet from the right abutment. A metal probe could be inserted into the soft area with relative ease to a depth of 18 inches. The soil was visually classified as silty sand. The soils moisture content was considered damp and appeared to be similar to other surficial soils outside the soft area. No seepage or embankment distress was noted in the area. The soft area is shown in Picture # 46.
- On the downstream slope, the inspectors noted wood debris (old power poles), concrete rubble, and willows along the toe.

Item 15-9: Monitor the soft area for seepage and embankment distress quarterly through 2017.

Item 16-10: Monitor green vegetation and embankment soils on the downstream slope approximately 150 yards west of the right (east) abutment. Inspect for changes in vegetation color, seepage, sloughing, and/or erosion. Pioneer recommends monitoring monthly through 2017.

3.0 IMP-2 PIEZOMETER MONITORING

The two primary functions of piezometer monitoring are to assess the performance and stability of the embankments. Piezometers with an “AH” designation assess the performance and stability of the embankment and piezometers with a “P” designation assess the performance of the groundwater interception trench. Select Relief Well “RW” piezometers are also monitored in conjunction with the AH piezometers. Site operators perform piezometer monitoring as recommended in the *Piezometer Manual, Revision 2* (Atlantic Richfield Company, 2012a). Pioneer routinely reviews the piezometer data collected by the site operators. Part of this 2016 inspection included a comprehensive review of “AH” piezometer data. Appendix C contains graphical representations of the piezometer data.

The phreatic surface measured in the piezometers is compared to unique flag levels established for each piezometer in the *Technical Memorandum for Warm Springs Ponds Operations Support* developed by Short Elliott Hendrickson, Inc. (SEH, 2007) and listed in the *Piezometer Manual, Revision 2* (Atlantic Richfield Company, 2012a). The flag levels generally correspond to phreatic levels assumed in the stability analysis. There are three flag levels; Red Level (highest, most urgent), Yellow Level (intermediate level), and Green Level (normal level).

A review of the piezometer levels indicated that some of the piezometers (RW-A7, AH-A13, AH-B19, AH-B13, and AH-B15) routinely exceed the yellow flag warning, which is anticipated based on past experience and information in the *Technical Memorandum for Warm Springs Ponds Operations Support* (SEH, 2007). These piezometers are monitored weekly and/or monthly to keep track of the phreatic surface within the embankments.

Item 11-28: Perform maintenance on plugged piezometers per the *Piezometer Manual, Revision 2* (Atlantic Richfield Company, 2012a).

4.0 IMP-3 DRY CLOSURE MONITORING

The dry closure monitoring areas inspected are shown on Figure 3 and include the following:

1. Pond 1 dry closure.
2. Pond 2 east dry closure.
3. Pond 2 east wildlife dry closure.
4. Pond 3 inlet area dry closure.
5. Pond 3 main dry closure.

The dry closures were generally in good condition with no immediate items of concern. Sporadic noxious weeds were observed in varying amounts throughout the enclosures and will require routine spraying. Dry closure monitoring forms, inspection summaries, and a photo log are included in Appendix D. The monitoring forms document the vegetation and erosion, and provide recommendations if applicable.

5.0 IMP-4 MILL-WILLOW BYPASS

The Mill-Willow Bypass is a constructed channel that routes the flows of Mill and Willow Creeks around the WSP system. The Mill-Willow Bypass was generally in good condition and had no immediate items of concern. A Mill-Willow Bypass inspection form and photo log is included in Appendix E. There were no reportable items of concern noted during the 2016 inspection.

6.0 IMP-5 WATER CONVEYANCE CHANNEL

The water conveyance channels inspected included the following:

1. Pond 3 approach channel.
2. Pond 3 inlet channel.
3. Bypass spillway channels (inlet and outlet).
4. Inlet approaches for the Pond 3 outlet works.
5. Pond 2 inlet channel.
6. Pond 2 wet closure inlet channels.
7. Main Pond 2 inlet channel.
8. Pond 2 outlet channel and riprap stilling basin.
9. Pond 2 toe trench.
10. Groundwater interception trench.
11. Pond 1 toe trench and connecting ditches leading to the wet closure.
12. Pumpback pipeline discharge channel.

6.1 Pond 3

6.1.1 Pond 3 Approach Channel Dike, Overflow Spillway, and Fuse Plug

In general, the Pond 3 approach channel dike was in good condition with no critical maintenance items to report. The dike was generally well vegetated with grasses. The Pond 3 approach channel overflow spillway and fuse plug were in good condition with no critical or maintenance items to report. The approach channel is shown in Picture # 47.

6.1.2 Pond 3 Inlet Channel

There were no reportable items of concern noted during the inspection of the Pond 3 inlet channel. The inlet channel is shown in Picture # 48.

6.1.3 Pond 3 Bypass Spillway Channels (Inlet and Outlet)

The Pond 3 bypass spillway channels were in good condition with no critical maintenance items to report. The inlet channel is shown in Picture # 49.

6.1.4 Inlet Approaches for Pond 3 Outlet Works

During the inspection, there were no reportable items of concern noted for the inlet approaches for Pond 3 outlet works.

6.2 Pond 2

6.2.1 Pond 2 Inlet Channel and Main Inlet Channel

There were no reportable items of concern noted during the inspection for the Pond 2 inlet or main inlet channel.

6.2.2 Pond 2 Outlet Channel and Riprap Stilling Basin

There were no reportable items of concern noted during the inspection.

6.2.3 Pond 2 Wet Closure Inlet Channels

For the Pond 2 wet closure inlet channels, there were no reportable items of concern noted during the inspection. There was no visible sloughing or bank erosion noted along the banks of the channels, water was flowing freely.

6.2.4 Pond 2 Toe Trench

The Pond 2 toe trench had minor sloughing along the trench banks. The sloughing was limited to the trench banks and did not approach Pond 2 north dam. In its current state, the sloughing is not considered a safety concern. Small animal burrows were observed on the north side of the toe trench. The rodent holes should be addressed per **Item 13-1**.

During the 2015 inspection, a 10-inch diameter rodent hole was noted near the downstream toe area approximately 250 feet southeast of SS-5. The rodent hole was repaired by JCI subsequent to the 2015 Inspection.

6.3 Pond 1

6.3.1 Pond 1 Toe Trench and Connecting Ditches Leading to Lower Wet Closures

There were no reportable items of concern noted during the inspection.

6.4 Groundwater Interception Trench

Picture # 7 shows the groundwater interception trench with dense willow trees near the east end of the trench.

On the north side of the interception trench, approximately 200 yards west of the pump house, the trench toe has sloughed in, adjoining soils are relatively soft, and there appears to be an animal path in the vegetation within the water. Pioneer suspects a muskrat may be living in the embankment at this location.

Item 16-11: Monitor the groundwater interception trench muskrat hole (north side of trench, approximately 200 yards west of pump house) location on a monthly basis. Repair the trench, if warranted based on monthly monitoring.

6.5 Pumpback Pipeline Discharge Channel

There were no reportable items of concern noted during the 2016 inspection.

7.0 IMP-6 HYDRAULIC STRUCTURE FACILITIES

The hydraulic structure facilities inspected included the following:

1. Pond 3 inlet structure.
2. Pond 3 bypass spillway.
3. Pond 3 west outlet works.
4. Pond 3 east outlet works.
5. Siphons and outlet structures for Wildlife Ponds.
6. Pond 2 flow measurement weir.
7. Pond 2 wet closure outlet structures (five total).
8. Pond 2 inlet channel box culvert.
9. Pond 2 service spillway.
10. Pond 2 outlet box culvert/drop structure.
11. Upper inverted siphon (Mill-Willow Bypass).
12. I-90, Railroad, and Frontage Road bridges for Silver Bow Creek upstream of the Pond 3 inlet structure (three total).
13. Pond 1 inlet structure.
14. Pond 1 outlet structure.
15. Pond 1 northwest corner 12-inch diameter outlet pipe.
16. Pond 1 northwest corner dual 66-inch diameter outlet pipes (emergency spillway).
17. Lower wet closure outlet structures (three total).
18. Pond 2 toe trench outlet structure.
19. Groundwater interception trench trash rack.

7.1 Pond 1

7.1.1 Pond 1 Inlet Structure

There were no reportable items of concern noted during the 2016 inspection.

7.1.2 Pond 1 Outlet Structure

Pond 1 Outlet Structure is shown in Picture # 50. There were no reportable items of concern noted during the 2016 inspection.

7.1.3 Pond 1 Northwest Corner Dual 66-Inch Outlet Pipes (Emergency Spillway)

The dual 66-inch corrugated metal culverts generally appear to be in good condition. The culverts appear free of corrosion and distortion. In 2015, it was noted that the northern culvert may possibly have some separation at a segment joint near the middle portion of the culvert; however, the culverts were not entered for a detailed inspection due to confined space requirements. Overall, the culverts were free of obstructions and appeared to be in working order. The culverts are shown in Picture # 51 and Picture # 52.

7.1.4 Pond 1 Northwest Corner 12-Inch Outlet Pipe

The Pond 1 northwest corner outlet pipe was open on both ends and free of obstructions. There were no reportable items of concern noted. The outlet pipe is shown in Picture # 53.

7.2 Pond 2

7.2.1 Pond 2 Flow Measurement Weir (SS-4)

The Pond 2 Flow Measurement Weir is a sharp-crested trapezoidal weir and was in good condition at the time of the inspection. The weir is shown in Picture # 54.

7.2.2 Pond 2 Wet Closure Outlets

The exterior portions of the five Pond 2 wet closure outlets were inspected. The inspection found that woody vegetation was encroaching on the catwalks, the visible portions of the outlet pipes appeared to be in good condition, and all the concrete, steel appurtenances, and embankments adjacent to the outlets were in good condition. The east wet closure is shown in Picture # 55.

The access ramp to the eastern most outlet in the West Wet Closure was tilted and a portion of it had pulled away a couple inches from its concrete abutment. The outlet has been in this condition for several years and does not appear to be further deteriorating since the 2015 Inspection. This outlet is shown in Picture # 56.

Item 14-3: The access ramp is tilting and separating from the concrete support abutment. Repair or further support the access ramp.

7.2.3 Pond 2 Inlet Channel Box Culvert

The Pond 2 inlet channel box was in good condition at the time of the inspection.

7.2.4 Pond 2 Service Spillway (SS-5)

Picture # 57 and Picture # 58 display the downstream and upstream side of Pond 2's service spillway, respectively. During past inspections it was noted that multiple, bolted connections were missing or bent. These connections secure the steel channel stop log guides to the concrete columns that were repaired in 2010. These bolts have been in this condition for several years. The *Rehabilitation of Pond No. 2. Spillway Post Construction Report* (Muth, 2010) did not address these missing and bent bolts.

Site operators reported that the stop logs and support structure and bolts were in good condition. The foundation, floor, and walls of the spillway, catwalk structure, and the cutoff walls on the downstream side of the spillway all appeared to be in good condition. There was a vertical crack in the corner of the north concrete wing wall.

In 2012, deformation monuments were installed on top of the service spillway wing walls to monitor for rotational movement or settlement. These deformation monuments (DEF 13 through DEF 16) were surveyed in August 2016. The survey data does not show trends indicating rotational movement or settlement. The deformation survey data are included in Appendix F.

During the 2013 inspection, the inspectors noted the right upstream wing wall had some exposed rebar on the top portion of the wall. This wall is typically submerged; therefore, inspection observations were limited. A backhoe is routinely used to clean aquatic weeds from this area of the structure. Pioneer speculates that at some point in the past, the backhoe may have scraped against the wall exposing the rebar. The exposed rebar appears to be limited to the top portion of the wall. A steel sheet pile wall is located behind the wall and helps support the embankment adjacent to the wall. The exposed rebar was observed again during the 2016 inspection and currently does not appear to be a dam safety concern.

Item 11-38: Evaluate the need for cathodic protection to inhibit corrosion within the spillway structure per *Rehabilitation of Pond No. 2. Spillway Post Construction Report* (Muth, 2010).

7.2.5 Pond 2 Outlet Box Culvert/Drop Structure

Picture # 59 through Picture # 61 display the box culvert. Historically, water leaks between the two box culverts and can be seen exiting under the box culverts on the downstream side. The leak was reportedly repaired sometime prior to 2009. With exception of the leak between the culverts, the remainder of the structure appeared to be in good condition.

The water leak between the culverts appears to be directly related to the SS-5 effluent flow; the greater the flow, the greater the size of the leak. The actual flow rate of the leak could not be measured due to access limitations. Picture # 61 shows a visual comparison of the leak from June 2014 to August 2016. During the 2014 inspection, the inspectors noted that the joints between box culvert segments did not appear to be parallel. Joints were closely spaced near the top and widely spaced at the bottom of the box culvert. These joints may be a potential source of the water leaking through the culverts. An interior inspection of the culverts would be required to provide additional detail.

Item 11-40: Continue to monitor the leakage and identify if there is any movement of the culverts associated with potential hydrostatic uplift or piping of subgrade soils.

Item 14-4: Evaluate alternatives to stop the leak between the box culverts. Design and construct a preferred alternative to stop the leak between box culverts.

7.2.6 Pond 2 Toe Trench Outlet Structure

There were no reportable items of concern noted during the time of the inspection.

7.2.7 Groundwater Interception Trench Trash Rack

There were no reportable items of concern noted during the time of the inspection.

7.3 Pond 3

7.3.1 Pond 3 Inlet Structure

The Pond 3 inlet structure, including the concrete abutments, walls, wing walls, columns, trash rack, embankments, fences, and all appurtenances, appeared to be in good condition. Trash racks were clear and water was flowing freely. The upstream and downstream sides of the structure are shown in Picture # 63 and Picture # 64, respectively. There is a crack in the cast-in-place concrete gate structure on the south side of the inlet channel. The cracks are not an item of immediate concern other than to continue to monitor them. During the 2013 annual inspection, paint marks were placed along the crack and the width of the crack at each location was recorded. Measurements have been taken yearly during the annual inspections. There is no indication that crack width is increasing with time. Picture # 65 shows the crack-monitoring locations. Recorded measurements are listed in Table 3.

Table 3: Pond 3 Inlet Structure Crack Monitoring

Location	Crack Width (inches)			
	October 2013	June 2014	September 2015	August 2016
1	3/16	3/16	1/8	1/8
2	1/8	3/16	1/8	3/32
3	1/16	1/16	1/16	1/16
4	3/16	3/16	3/16	3/16
5	1/16	1/16	<1/16	1/32
6	1/16	1/16	<1/16	1/32

7.3.2 Pond 3 Bypass Spillway

Picture # 66 and Picture # 67 show the Pond 3 bypass spillway inlet structure and outlet structure, respectively. The mechanism to raise and lower the gates appeared to be in good condition. There were no reportable items of concern noted during the inspection. The Pond 3 bypass spillway is designed to pass elevated flows during runoff events and is not used during normal operations. The Pond 3 bypass spillway was not used during 2016.

7.3.3 Pond 3 East Outlet Works (SS-3E)

The Pond 3 east outlet works was in good condition and there were no reportable items of concern noted during the inspection. Picture # 68 and Picture # 69 show the inlet and outlet structures, respectively.

7.3.4 Pond 3 West Outlet Works (SS-3W)

The Pond 3 west outlet works was in good condition. Picture # 70 and Picture # 71 show the inlet and outlet structures, respectively. The outlet structure has a chain-link safety fence to prevent falls into the structure. One of the fence posts has been displaced resulting in a segment of the fence leaning over.

Item 16-12: Repair the displaced end post of chain-link safety fence around perimeter of SS-3W outlet structure.

7.3.5 Siphons and Outlet Structures for the Wildlife Ponds

Two siphons were functioning at the time of the inspection. There was no embankment erosion noted around the active siphons.

Past inspections have observed erosion in the vicinity of the siphons. The siphons were rebuilt in early summer 2016. The discharge ends of the rebuilt siphons extend farther into the Wildlife Ponds to minimize future embankment erosion near the discharge.

7.3.6 Upper Inverted Siphon (Mill-Willow Bypass)

For the upper inverted siphon, there were no reportable items of concern noted during the inspection.

7.3.7 I-90, Railroad, and Frontage Road Bridges

Pioneer performed a limited visual inspection of the flow conditions under the bridges and did not inspect or access the I-90 and railroad bridge decks. There was no debris limiting Silver Bow Creek flow under either of the structures.

7.4 Three Lower Wet Closure Outlet Structures

The three outlet structures appeared to be in good condition. There were no reportable items of concern noted during the time of the inspection. Picture # 72 shows the middle lower wet closure structure.

8.0 IMP-7 DAM DEFORMATION SURVEY

As a supplement to the inspections required under Montana's Dam Safety Act (ARM 36.14.601), dam deformation surveys have been conducted to detect movement in the dam structures. The base survey was conducted in 1993 and 1995. Figure 4 (created in 2009) shows the approximate location of the deformation points. Pioneer completed the most recent deformation survey in August 2016.

Appendix F contains a graphic comparison of deformation data acquired to date. Global Positioning System-Real Time Kinetic (GPS-RTK) methods were used for the survey, with a rigorous routine based on original control points located on the ground away from the embankments established during the base survey. Reviews of the deformation data and discussions with Pioneer surveyors indicate that differences in alignment values are primarily attributable to expected error or bias in the method. No alarming measurements or trends in the data were noted during review of the 2016 deformation data.

Item 11-6: The 2011 5-year inspection report recommended additional dam deformation points to be installed along the downstream rock toe berm of the Pond 2 north dam. The rock toe berm was visually observed to be lower in elevation near the sinkhole. Installation of deformation points in this area are intended to monitor for settlement. Pioneer recommends installing and surveying dam deformation points, similar to those installed in 2008, and monitoring the location per IMP-9 to determine if the toe berm is settling.

9.0 IMP-8 SILVER BOW CREEK/INLET APPROACH CHANNEL MONITORING AND SAFETY AWARENESS PLAN

The inspectors reviewed the procedures for monitoring, inspecting, and maintaining the Silver Bow Creek channel upgradient of Pond 3. The inlet channel is typically inspected during runoff events for debris accumulation. There was no debris accumulation noted during the 2016 annual inspection.

10.0 IMP-9 POND 2 DIKE DEFORMATION MONITORING

Procedures to monitor the stability of the downstream face of the Pond 2 embankment are completed visually and by survey. Pioneer completed the most recent deformation survey in August 2016.

Appendix F contains a comparison by graphs of the 2016 deformation data compared to past deformation data. The GPS-RTK methods were used for the survey, with a rigorous routine based on original control points located on the ground away from the embankments established during the base survey. Figure 4 shows the approximate location of the deformation points.

Reviews of the deformation data and discussions with Pioneer surveyors indicate that differences in alignment values are primarily attributable to expected error and bias in the method. The data review did not indicate any movement or settlement that could be interpreted as critical to dam safety. The 2016 data are generally within the historical range of data.

The deformation points were constructed in line with each other to allow site personnel to visually look down the line of the deformation points and determine if any of the points have moved or shifted horizontally. The visual inspection of the deformation points during the 2016 inspection revealed the points were all in line with each other.

11.0 IMP-10 NOXIOUS WEED MANAGEMENT

Weed spraying was conducted on 475 acres of WSP in 2016. Weeds that were sprayed included leafy spurge, spotted knapweed, mullen, thistle, and toadflax. Figure 5 shows the locations sprayed.

12.0 RECOMMENDATIONS

The previous sections contain the recommendations for each specific item noted based on the findings of this 2016 inspection report along with outstanding items from past inspections. The key recommendations below are repeated along with the sections in which they were discussed:

- Monitor the leak between the two Pond 2 outlet box culverts. Develop an engineered repair to stop or control the leak (discussed in Section 7.2.5).
- Monitor the Pond 3 dike near Station 135+00 for seepage, sloughing, erosion, and boils on a monthly basis (discussed in Section 2.3.1). Green vegetation was observed in this area where surrounding vegetation was brown and appeared dormant.
- Monitor the Pond 3 dike near Station 89+50 for seepage, sloughing, erosion, and boils on a monthly basis (discussed in Section 2.3.1). Green vegetation and a wet area was observed at the toe where an excavator had tracked across in recent years. Pioneer recommends monitoring monthly through 2017.
- Gravel soils and/or sediment was observed in toe drains 37, 39, 43, 72, 79, 142, and 189 (discussed in Sections 2.2.1 and 2.3.1). Remove the soil and monitor these toe drains on a monthly basis for accumulation of additional soils/sediment.

12.1 Future Inspections

Water conveyance channel inspections should be conducted after the spring precipitation events or when the channel bottoms are visible and easily accessible. The embankment inspections should be scheduled in two phases: once during high pool levels when seepage conditions would be most evident, and again at low pool levels to observe possible upstream erosion.

The next 5-year dam safety inspection as required by DNRC Dam Safety Rules should be scheduled for 2021. The next annual inspection should be performed during the spring/early summer of 2017. The 2017 inspection is intended to inspect the WSP system during high water conditions.

Site personnel should consider closer, detailed inspections of the outlet structures and conduits (pipes, spillways, etc.). To Pioneer's knowledge, physical and/or video inspections of the conduits have never been performed. Pioneer recommends inspecting the conduits prior to the next 5-year inspection.

13.0 REFERENCES

Atlantic Richfield Company, 2014. Silver Bow Creek/Butte Area NPL Site, Final Operations and Maintenance (O&M) Manual for Warm Springs Ponds Operable Unit, Warm Springs Ponds Operable Unit, February 2014.

Atlantic Richfield Company, 2012a. Piezometer Manual Reversion 2, Silver Bow Creek/Butte Area NPL Site Warm Springs Ponds Operable Unit. June 2012.

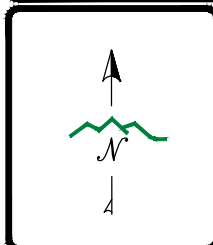
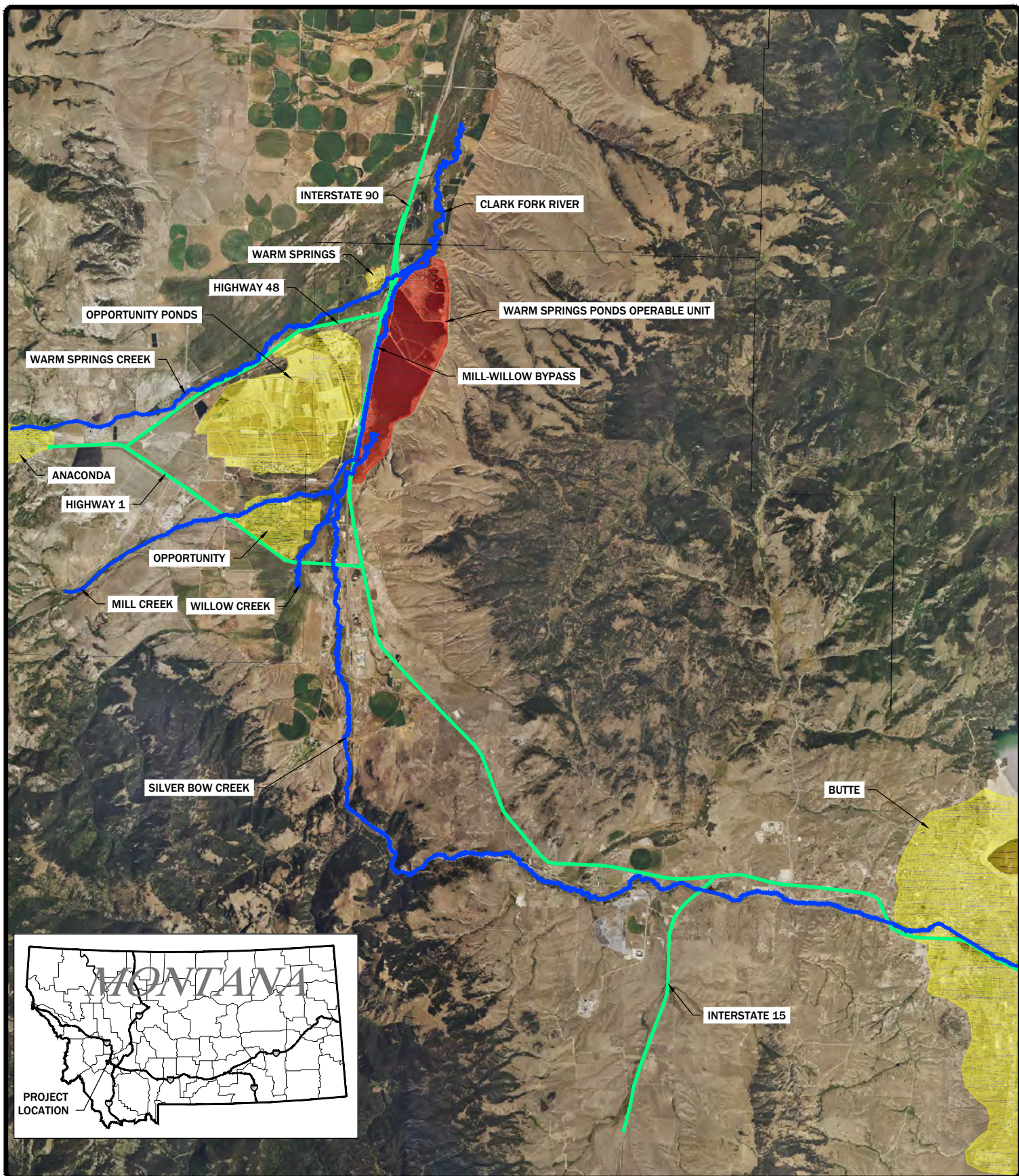
Atlantic Richfield Company, 2012b. 2011 Five-Year Independent Site Inspection Report, Silver Bow Creek/Butte Area NPL Site Warm Springs Ponds Operable Unit. April 3, 2012.

FEMA, 2005. Technical Manual for Dam Owners, Impacts of Animals on Earthen Dams, FEMA 473. September 2005.

Muth, 2010. Rehabilitation of Pond No. 2. Spillway Post Construction Report.

SEH, 2007. Technical Memorandum for Warm Springs Ponds Operations Support, Short Elliott Hendrickson, Inc. July 2007.

FIGURES



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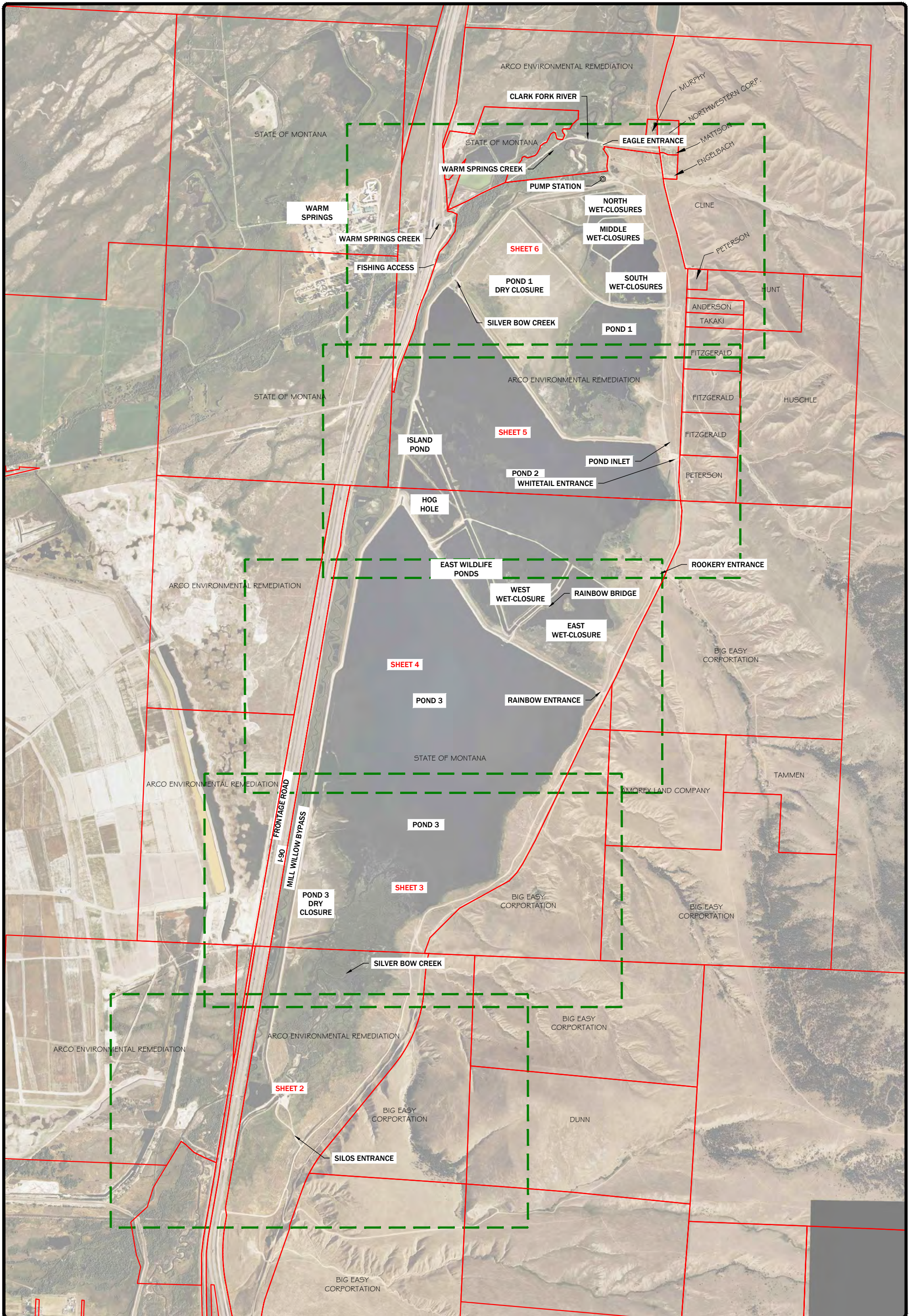
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FIGURE 1

PIONEER
TECHNICAL SERVICES, INC.
63-1/2 WEST BROADWAY
BUTTE, MONTANA 59701
(406)-782-5177

WARM SPRINGS
POND OPERABLE
UNIT
LOCATION
MAP

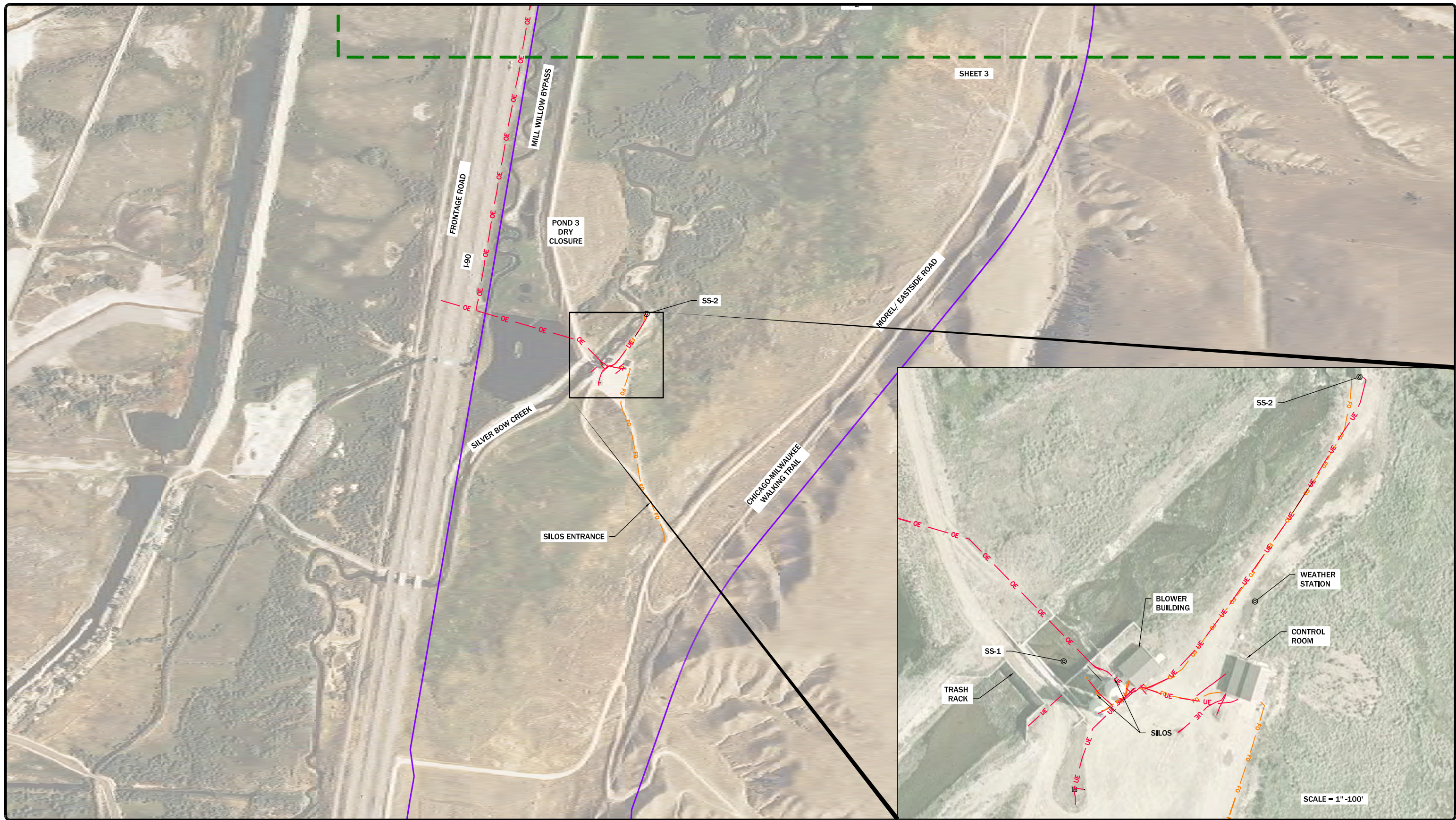
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FIGURE 2-1 SHEET 1 WARM SPRINGS PONDS SITE PLOT PLAN
PIONEER
 TECHNICAL SERVICES, INC.
 63-1/2 WEST BROADWAY
 BUTTE, MONTANA 59701
 (406) 782-5177

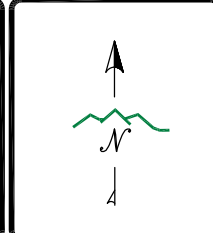
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LEGEND

	OVERHEAD ELECTRICAL LINE
	UNDERGROUND ELECTRICAL LINE
	FIBER OPTIC LINE
	GAS LINE
	ATLANTIC RICHFIELD APPROXIMATE PROPERTY BOUNDARY
	SHEET LAYOUT
	PIEZOMETER LOCATION

	DAM DEFORMATION LOCATIONS
	AS-23 149 SAMPLE LOCATIONS



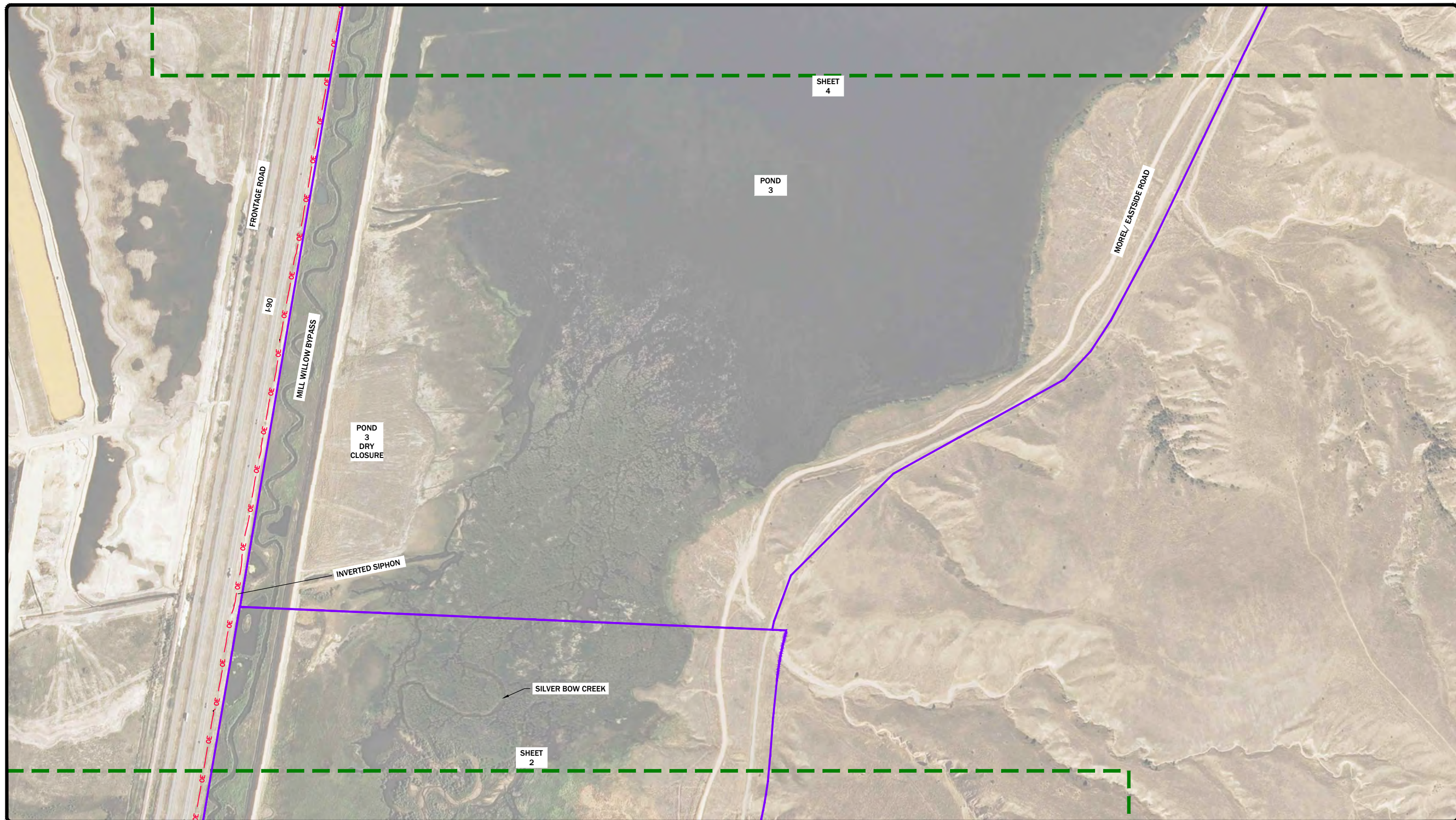
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FIGURE 2-1 SHEET 2 WSP SITE PLOT PLANS LIME SILOS AND CONTROL BUILDING

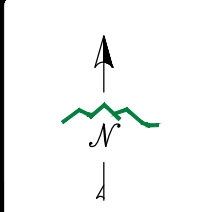
63-1/2 WEST BROADWAY
BUTTE, MONTANA 59701
(406) 782-5177

DATE: 12/9/11



- LEGEND**
- UE — OVERHEAD ELECTRICAL LINE
 - UNDERGROUND ELECTRICAL LINE
 - FO --- FIBER OPTIC LINE
 - GAS LINE
 - ATLANTIC RICHFIELD APPROXIMATE PROPERTY BOUNDARY
 - SHEET LAYOUT
 - MW-P-10 PIEZOMETER LOCATION

- ▲ DAM DEFORMATION LOCATIONS
- AS-23 149 SAMPLE LOCATIONS



DISPLAYED AS: _____
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SCALE IN FEET

0 300 600

FIGURE 2-1 SHEET 3 WSP SITE PLOT PLANS POND 3 SOUTH

PIONEER
 TECHNICAL SERVICES, INC.
 63-1/2 WEST BROADWAY
 BUTTE, MONTANA 59701
 (406) 782-5177

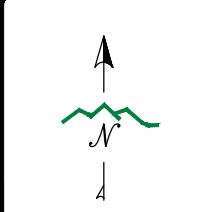
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LEGEND

- OE — OVERHEAD ELECTRICAL LINE
- UE — UNDERGROUND ELECTRICAL LINE
- FO — FIBER OPTIC LINE
- GAS — GAS LINE
- ATLANTIC RICHFIELD APPROXIMATE PROPERTY BOUNDARY
- SHEET LAYOUT
- MW-P-10 PIEZOMETER LOCATION

- ▲ DAM DEFORMATION LOCATIONS
- AS-8 52 SAMPLE LOCATIONS



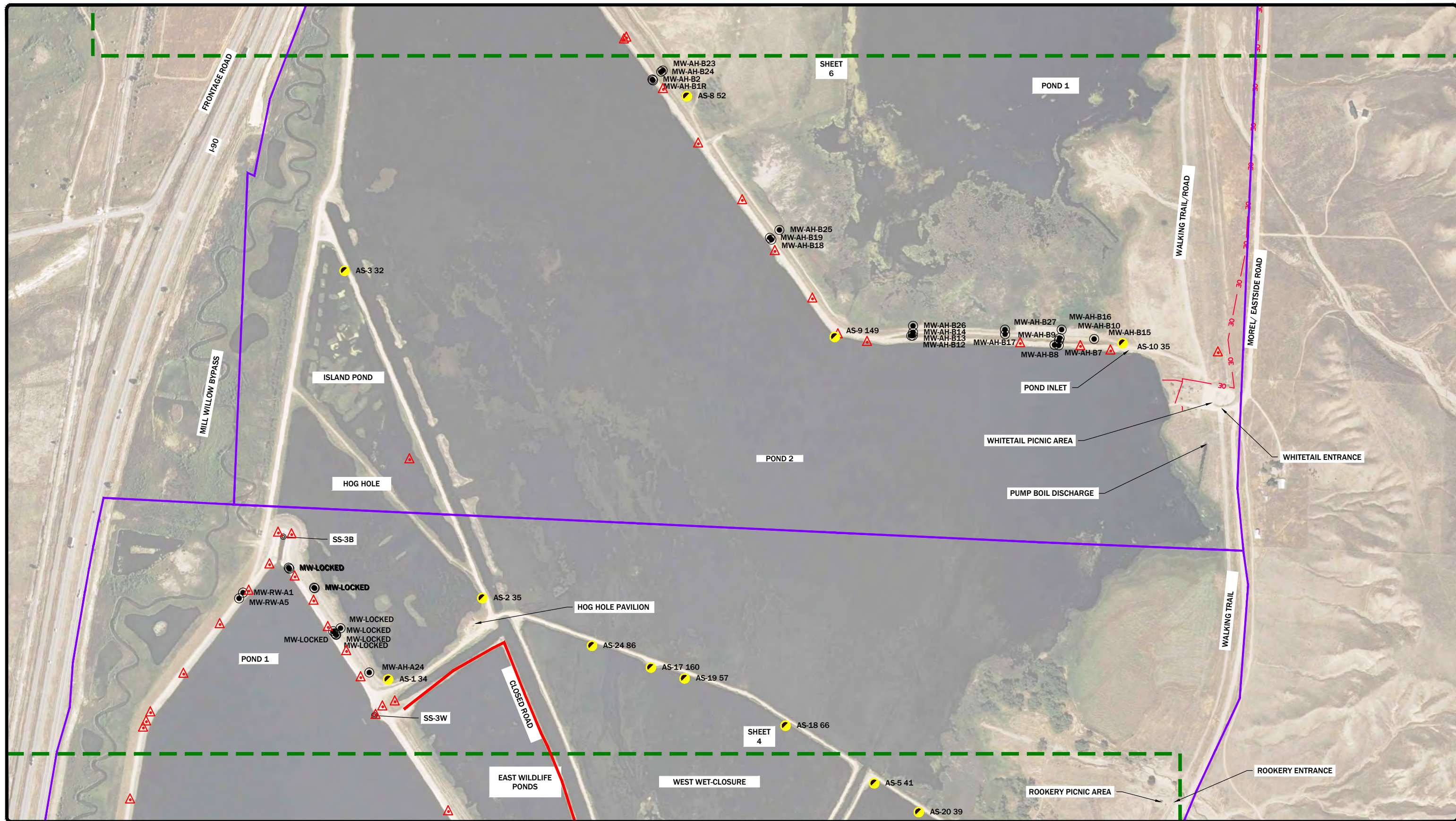
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SCALE IN FEET
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FIGURE 2-1 SHEET 4 WSP SITE PLOT PLANS POND 3 NORTH

PIONEER
 TECHNICAL SERVICES, INC.
 63-1/2 WEST BROADWAY
 BUTTE, MONTANA 59701
 (406) 782-5177

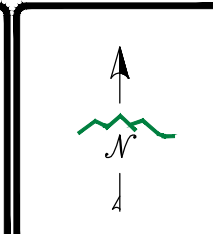
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LEGEND

	OE OVERHEAD ELECTRICAL LINE
	UE UNDERGROUND ELECTRICAL LINE
	FO FIBER OPTIC LINE
	GAS GAS LINE
	ATLANTIC RICHFIELD APPROXIMATE PROPERTY BOUNDARY
	SHEET LAYOUT
	MW-P-10 PIEZOMETER LOCATION

	DAM DEFORMATION LOCATIONS
	AS-23 149 SAMPLE LOCATIONS



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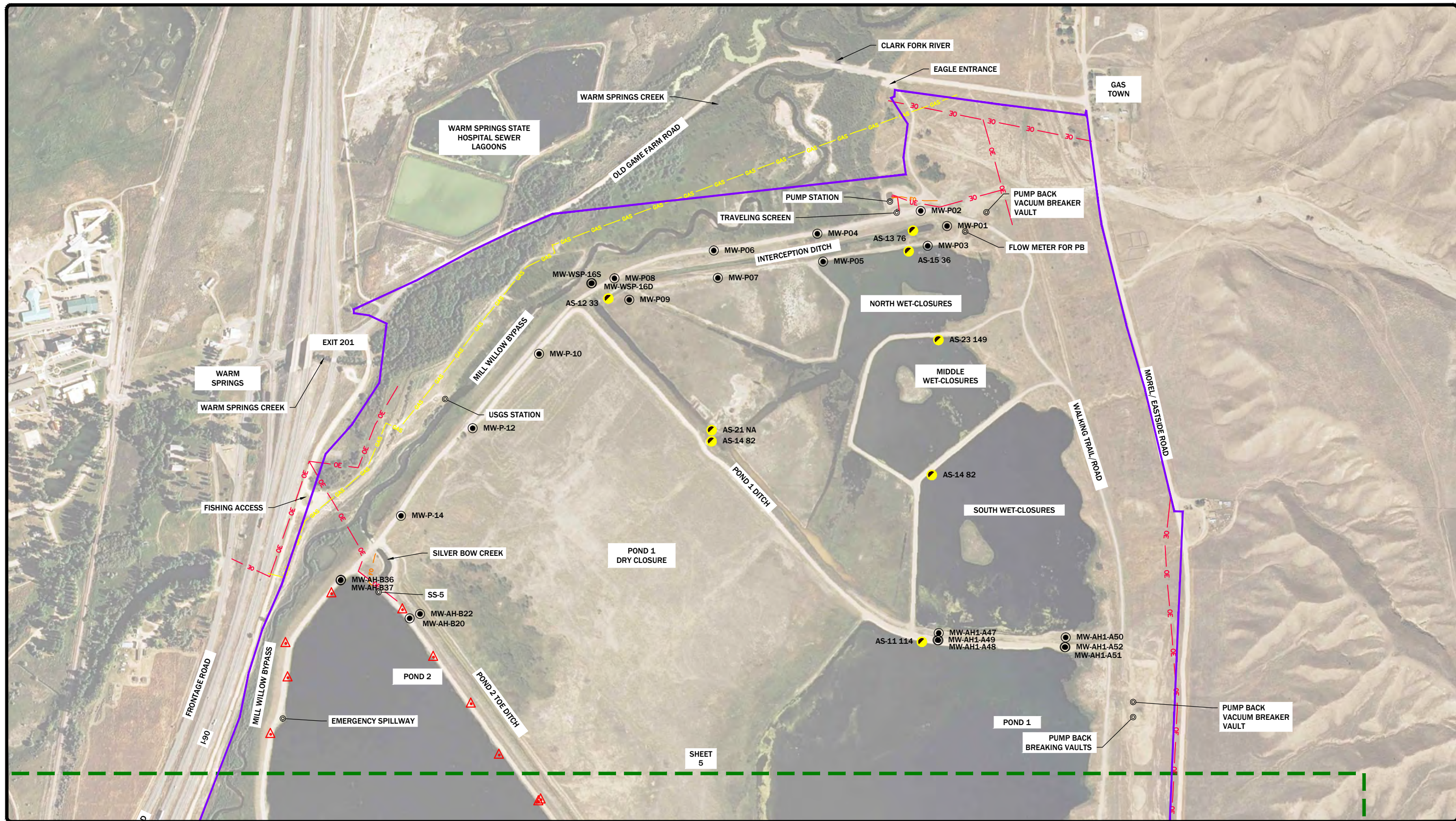
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FIGURE 2-1 SHEET 5 WSP SITE PLOT PLANS POND 2

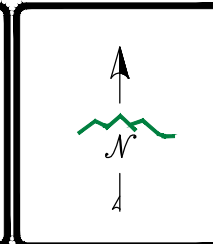
PIONEER
TECHNICAL SERVICES, INC.
63-1/2 WEST BROADWAY
BUTTE, MONTANA 59701
(406) 782-5177

DATE: 12/9/11



- LEGEND**
- UE — OVERHEAD ELECTRICAL LINE
 - UL — UNDERGROUND ELECTRICAL LINE
 - FO — FIBER OPTIC LINE
 - GAS — GAS LINE
 - ATLANTIC RICHFIELD APPROXIMATE PROPERTY BOUNDARY
 - SHEET LAYOUT
 - MW-P-10 ● PIEZOMETER LOCATION

- ▲ DAM DEFORMATION LOCATIONS
- AS-23 149 SAMPLE LOCATIONS



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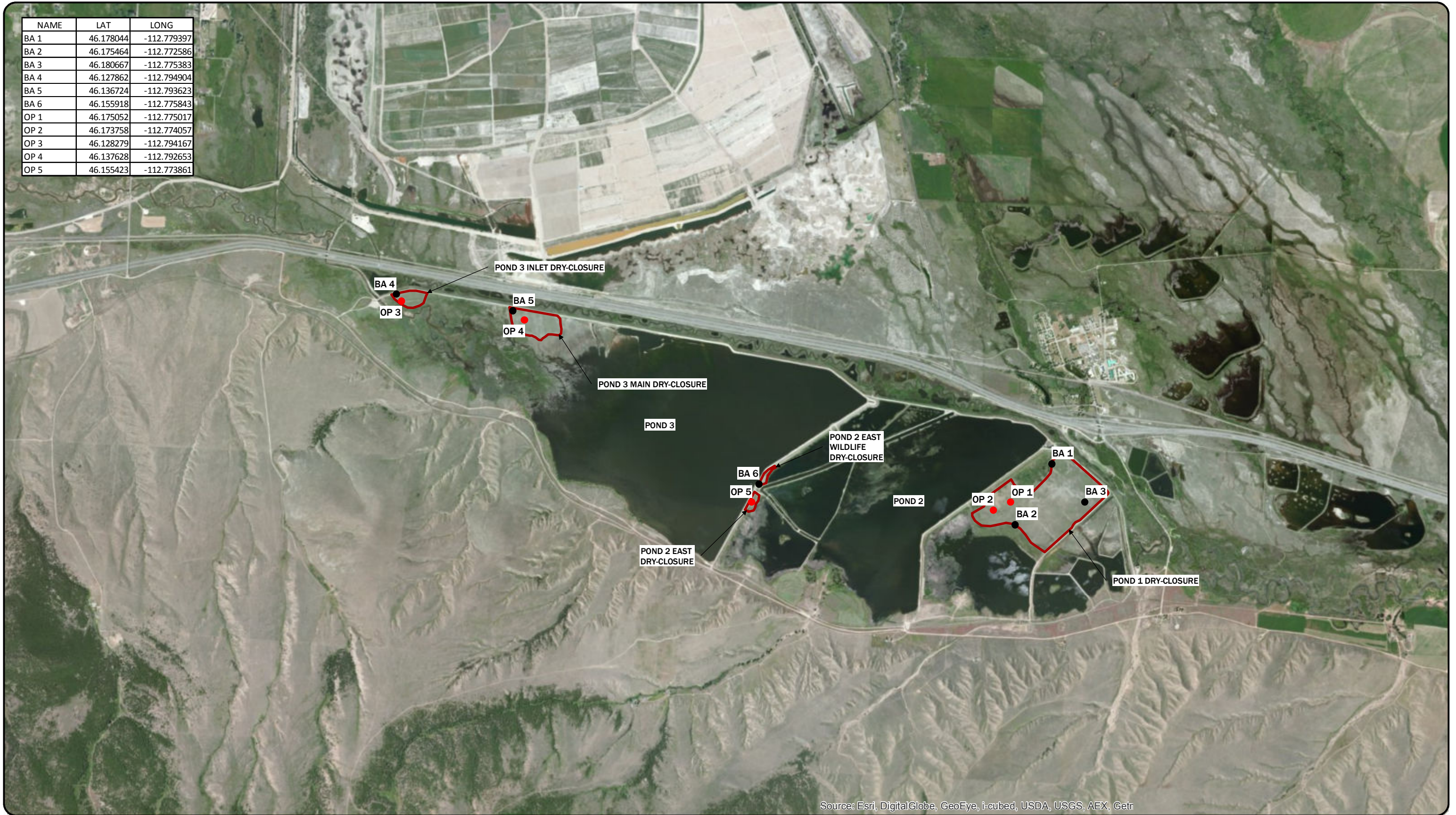
SCALE IN FEET
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FIGURE 2-1 SHEET 6 WSP SITE PLOT PLANS POND 1

PIONEER
 TECHNICAL SERVICES, INC.
 63-1/2 WEST BROADWAY
 BUTTE, MONTANA 59701
 (406) 782-5177

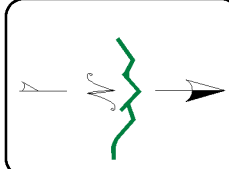
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BA 2	46.175464	-112.772586
BA 3	46.180667	-112.775383
BA 4	46.127862	-112.794904
BA 5	46.136724	-112.793623
BA 6	46.155918	-112.775843
OP 1	46.175052	-112.775017
OP 2	46.173758	-112.774057
OP 3	46.128279	-112.794167
OP 4	46.137628	-112.792653
OP 5	46.155423	-112.773861



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getr

- LEGEND**
- BARE AREA (BA)
 - OBSERVATION POINTS (OP)
 - DRY-CLOSURE BOUNDARY

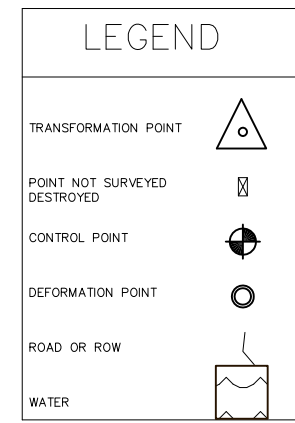
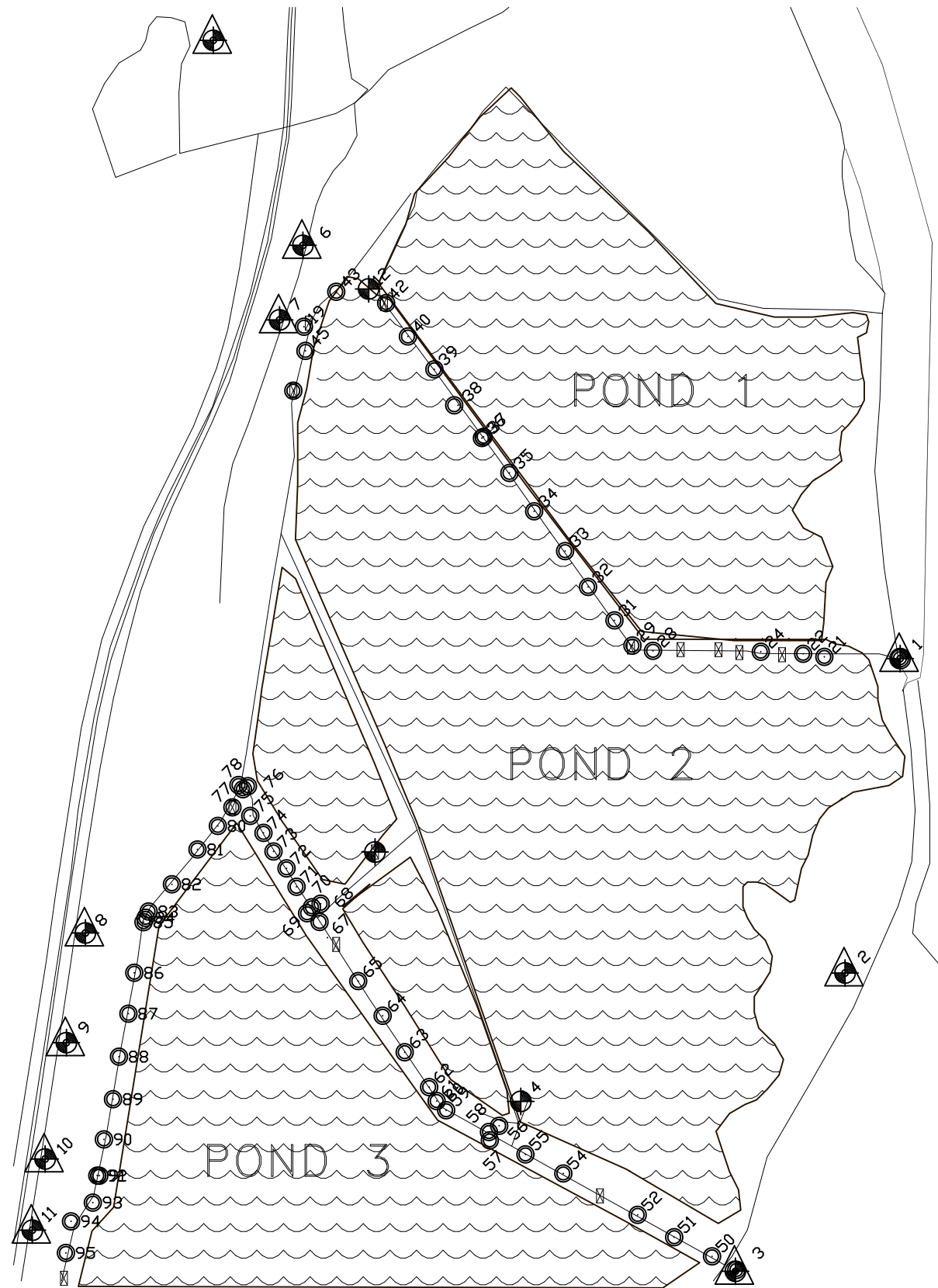


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FIGURE 3

WSP DRY-CLOSURE INSPECTION

DATE: 9/30/2014



DESC.	D.J.&A 1993 SURVEY			PIONEER 2009 SURVEY			
	NORTHING	EASTING	ELEV.	NORTHING	EASTING	ELEV.	
GPS-1	717113.719	1143695.042	4861.79	717113.706	1143695.1	4861.801	GPS-1
GPS-2	714179.279	1143177.501	4867.83	714179.247	1143177.5	4867.839	AL-CAP
GPS-3	711376.254	1142146.942	4891.98	711376.245	1142146.9	4891.96	AL-CAP
GPS-4	712972.975	1140130.373	4848.08	712972.97	1140130.4	4848.14	AL-CAP
GPS-5	715315.845	1138759.768	4849.44				AL-CAP
GPS-6	721017.115	1138082.552	4824.56	721017.138	1138082.5	4824.551	AL-CAP
GPS-7	720316.526	1137863.388	4825.43	720316.554	1137863.4	4825.43	AL-CAP
GPS-8	714555.24	1136038.76	4858.71	714555.234	1136038.8	4858.682	AL-CAP
GPS-9	713524.204	1135859.593	4861.09	713524.178	1135859.6	4861.116	AL-CAP
GPA-10	712431.547	1135660.006	4865.9	712431.574	1135660	4865.941	AL-CAP
GPS-11	711762.469	1135539.768	4870.92	711762.505	1135539.8	4870.89	AL-CAP
GPS-12	720607.125	1138700.31	4843.06	720607.145	1138700.3	4843.031	AL-CAP
WBASE	723198.446	1137227.04	4817.18				
DEF-20	717134.833	1143694.58	4862.39	DESTROYED			
DEF-21	717149.705	1142982.711	4843.82	717149.655	1142982.7	4843.752	SHOT-21
DEF-22	717178.74	1142783.388	4843.12	717178.916	1142783.4	4842.973	SHOT-22
DEF-23	717169.63	1142585.79	4843.46	DESTROYED			
DEF-24	717198.037	1142385.429	4843.94	717198.179	1142385.2	4843.734	SHOT-24
DEF-25	717190.057	1142184.349	4843.77	DESTROYED			
DEF-26	717216.997	1141988.246	4843.94	DESTROYED			
DEF-27	717218.021	1141632.02	4844.25	DESTROYED			
DEF-28	717206.45	1141372.512	4842.38	717206.329	1141372.5	4842.29	SHOT-28
DEF-29	717256.039	1141179.476	4842.27	717256.058	1141179.5	4842.214	SHOT-29
DEF-30	717241.543	1141165.342	4842.25	DESTROYED			
DEF-31	717493.018	1141010.585	4842.94	717492.989	1141010.5	4842.805	SHOT-31
DEF-32	717806.943	1140762.456	4842.58	717806.964	1140762.5	4842.403	SHOT-32
DEF-33	718143.713	1140546.554	4843.37	718143.723	1140546.6	4843.403	SHOT-33
DEF-34	718517.867	1140255.442	4843.17	718517.858	1140255.4	4843.174	SHOT-34
DEF-35	718877.993	1140022.947	4843.1	718878.022	1140022.9	4843.066	SHOT-35
DEF-36	719205.974	1139764.896	4842.95	719205.913	1139764.9	4842.94	SHOT-36
DEF-37	719217.819	1139780.498	4843.43	719217.87	1139780.4	4843.362	SHOT-37
DEF-38	719513.804	1139540.466	4842.8	719513.755	1139540.4	4842.709	SHOT-38
DEF-39	719852.326	1139318.148	4842.37	719852.321	1139318.1	4842.277	SHOT-39
DEF-40	720160.547	1139069.464	4841.86	720160.535	1139069.5	4841.834	SHOT-40
DEF-41	720474.384	1138864.738	4842.37	DESTROYED			
DEF-42	720469.142	1138844.63	4842.98	720469.173	1138844.6	4842.932	SHOT-42
DEF-43	720580.617	1138395.701	4842.84	720580.625	1138395.7	4842.675	SHOT-43
DEF-44	720286.392	1138137.336	4843.27	DESTROYED			
DEF-45	720025.197	1138106.16	4840.48	720025.226	1138106.2	4840.526	SHOT-45
DEF-46	719650.968	1137992.507	4842.22	DESTROYED			
DEF-49	711389.161	1142155.955	4892.16	DESTROYED			
DEF-50	711516.663	1141927.522	4884.72	711516.677	1141927.7	4884.62	SHOT-50
DEF-51	711696.586	1141571.664	4883.77	711696.495	1141571.8	4883.648	SHOT-51
DEF-52	711906.131	1141228.651	4883.35	711906.482	1141228.6	4883.231	SHOT-52
DEF-53	712084.832	1140873.993	4883.43	DESTROYED			
DEF-54	712295.314	1140529.682	4884.09	712295.299	1140529.7	4884.107	SHOT-54
DEF-55	712474.585	1140173.716	4882.95	712474.502	1140173.7	4882.97	SHOT-55
DEF-56	712743.315	1139926.856	4849.01	712743.369	1139926.8	4849.125	SHOT-56
DEF-57	712606.865	1139838.909	4881.03	712606.885	1139839	4881.062	SHOT-57
DEF-58	712685.159	1139830.739	4883.44	712685.198	1139830.8	4883.355	SHOT-58
DEF-59	712889.483	1139428.45	4882.99	712889.326	1139428.2	4882.907	SHOT-59
DEF-60	712936.1744	1139380.191	4883.42	712936.178	1139380.2	4883.391	SHOT-60
DEF-61	712975.9399	1139338.823	4883.47	712975.96	1139338.8	4883.361	SHOT-61
DEF-62	713106.946	1139268.865	4883.66	713106.941	1139268.9	4883.618	SHOT-62
DEF-63	713434.578	1139039.006	4883.73	713434.579	1139039	4883.404	SHOT-63
DEF-64	713777.438	1138831.859	4883.72	713777.457	1138831.8	4883.599	SHOT-64
DEF-65	714103.208	1138602.273	4883.02	714102.991	1138602.4	4882.954	SHOT-65
DEF-66	714447.517	1138395.409	4883.79	DESTROYED			
DEF-67	714659.174	1138238.724	4883.27	714659.353	1138238.3	4883.06	SHOT-67
DEF-68	714829.787	1138249.14	4845.01	714829.803	1138249.1	4844.953	SHOT-68
DEF-69	714740.754	1138121.688	4881	714740.771	1138121.7	4880.981	SHOT-69
DEF-70	714796.943	1138167.311	4883.82	714796.928	1138167.3	4883.764	SHOT-70
DEF-71	714989.47	1138022.637	4883.36	714989.502	1138022.3	4883.319	SHOT-71
DEF-72	715162.514	1137928.317	4883.38	715162.519	1137928.3	4883.342	SHOT-72
DEF-73	715321.201	1137806.082	4883.45	715321.002	1137805.9	4883.413	SHOT-73
DEF-74	715495.918	1137711.882	4884.05	715495.909	1137711.9	4883.944	SHOT-74
DEF-75	715655.544	1137587.561	4883.3	715655.47	1137587.4	4883.218	SHOT-75
DEF-76	715934.753	1137565.742	4883.1	715934.8	1137565.7	4883.019	SHOT-76
DEF-77	715905.944	1137518.693	4881.86	715906.044	1137518.6	4881.836	SHOT-77
DEF-78	715945.304	1137477.077	4883.4	715945.321	1137477	4883.291	SHOT-78
DEF-79	715736.039	1137420.134	4883.76	DESTROYED			
DEF-80	715561.407	1137282.807	4884.06	715561.505	1137282.8	4883.973	SHOT-80
DEF-81	715340.229	1137091.443	4883.48	715340.244	1137091.3	4883.409	SHOT-81
DEF-82	715012.842	1136851.463	4884.56	715012.763	1136851.4	4884.474	SHOT-82
DEF-83	714757.193	1136632.126	4884.38	714757.226	1136632.1	4884.275	SHOT-83
DEF-84	714697.868	1136604.102	4884.87	714697.896	1136604.1	4884.79	SHOT-84
DEF-85	714656.882	1136584.668	4884.72	714656.862	1136584.7	4884.661	SHOT-85
DEF-86	714181.278	1136497.707	4883.91	714181.296	1136497.7	4883.87	SHOT-86
DEF-87	713796.836	1136442.581	4883.67	713796.84	1136442.5	4883.638	SHOT-87
DEF-88	713393.062	1136354.023	4883.75	713393.06	1136354	4883.75	SHOT-88
DEF-89	712993.142	1136297.959	4882.69	712993.132	1136297.9	4882.696	SHOT-89
DEF-90	712615.648	1136212.414	4883.66	712615.639	1136212.4	4883.593	SHOT-90
DEF-91	712274.444	1136169.175	4883.61	712274.468	1136169.2	4883.639	SHOT-91
DEF-92	712275.61	1136150.063	4883.92	712275.611	1136150.1	4883.916	SHOT-92
DEF-93	712021.387	1136107.944	4880.42	712021.398	1136107.9	4880.386	SHOT-93
DEF-94	711845.265	1135903.345	4880.4	711845.281	1135903.3	4880.428	SHOT-94
DEF-95	711548.717	1135855.192	4884.02	711548.714	1135855.2	4884.07	SHOT-95
DEF-96	711310.133	1135836.594	4884.36	DESTROYED			
DEF-19	720252.119	1138092.325	4832.972	720252.035	1138092.3	4832.814	TOE-DRAI

DISPLAYED AS:

COORD SYS/ZONE: MSP

DATUM: NAD83

UNITS: FEET

SOURCE: PIONEER

SCALE IN FEET

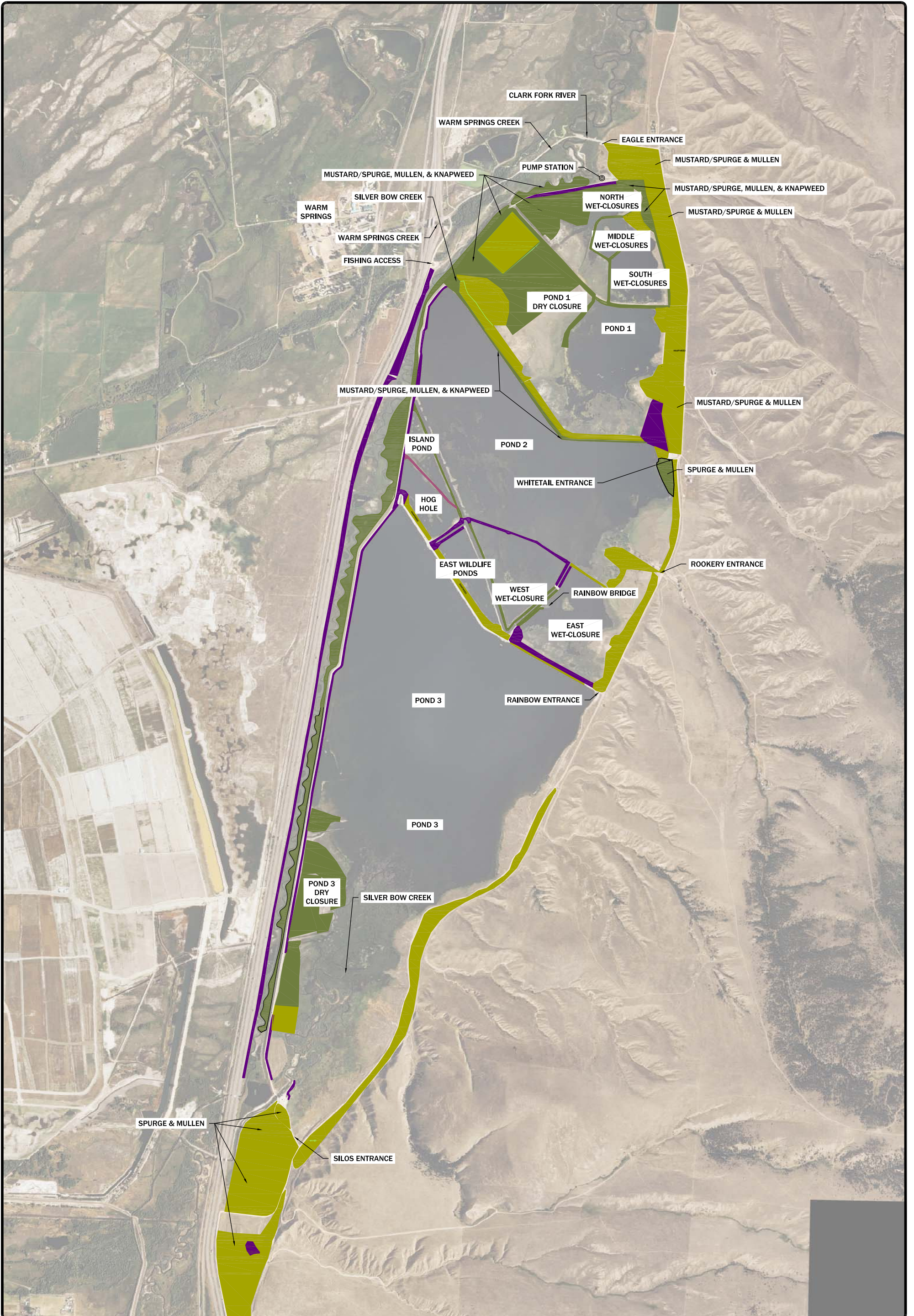
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FIGURE 4

WARM SPRINGS DAM-DEFORMATION SURVEY OCTOBER-2009

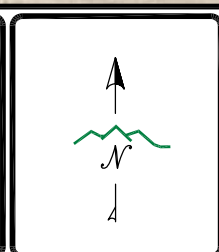
63-1/2 WEST BROADWAY
BUTTE, MONTANA 59701
(406) 782-5177

DATE: 1/26/10



	MULLEN
	LEAFY SPURGE
	SPOTTED KNAPWEED
	THISTLE

2016 TOTAL ACRES SPRAYED - 475 ACRES
 ADDITIONAL SPOT SPRAYING WAS PERFORMED ALONG THE WEST SIDE DIKE ROAD FROM SILO TO SS-5 DISCHARGE.



DISPLAYED AS:
 COORD SYS/ZONE: MSP
 DATUM: NAD83
 UNITS: FEET
 SOURCE: PIONEER/NAIP 2011

SCALE IN FEET
 0 1000 2000

FIGURE 5
WARM SPRINGS PONDS WEED SPRAYING LOCATIONS

PIONEER
 TECHNICAL SERVICES, INC.
 63-1/2 WEST BROADWAY
 BUTTE, MONTANA 59701
 (406) 782-5177

DATE: 9/30/2016

APPENDIX A

PHOTO LOG AND PHOTO REFERENCE LOG

Appendix A.1 Photo Log
Appendix A.2 Photo Reference Log

Appendix A.1

Photo Log



Picture # 1

Description: Pond 1 Dam North Embankment, looking east at downstream from near Piezometer AH-A5R.



Picture # 2

Description: Pond 1 Dam North Embankment, looking west at upstream slope from near right abutment. Note woody shrubs on upstream slope.



Picture # 3

Description: Pond 1 Dam North Embankment, looking southeast at downstream slope and crest from near from near left abutment.



Picture # 4

Description: Burrow mounds/soft spot located along downstream toe approximately 200 yards west of east abutment.



Picture # 5

Description: Pond 1 Dam North Embankment, looking south at downstream slope. Due to erosion, slope was regraded in recent years. Arrow denotes area void of vegetation regrowth in coconut erosion control mat.



Picture # 6

Description: Pond 1 Dam North Embankment. Rodent hole on downstream slope near bend in embankment.



Picture # 7

Description: Lower Wet Closure North Embankment downstream slope, looking east along Groundwater Interception Trench.



Picture # 8

Description: Spongy area observed at Lower Wet Closure Dam/Dike: North Embankment – near Groundwater Interception Trench.



Picture # 9

Description: Pond 1 Flood Extension Dike and Soil-Cement Erosion Protection, look south. Arrow denotes location of dual 66-inch outlet pipes.



Picture # 10

Description: Lower Wet-Closure. Looking southwest at dike separating South and Middle Wet-Closure.



Picture # 11

Description: South Wet-Closure, west dike. On eastern side of dike approximately 20 yards north of Pond 1 Dam. Arrow denotes location of hole.



Picture # 12

Description: Pond 2 West Embankment upstream slope and crest. Looking south. Circled area is emergency spillway.



Picture # 13

Description: Pond 2 West Embankment upstream slope.
Looking north from near Island Pond dike.



Picture # 14

Description: Pond 2 West Embankment downstream slope.
Looking south.



Picture # 15

Description: Pond 2 West Embankment. Rodent hole on downstream slope (approximately in middle of slope) near Station 168+50.



Picture # 16

Description: Pond 2 West Embankment. Note green vegetation on bottom portion of downstream slope near Station 185+00. Looking south.



Picture # 17

Description: Pond 3 Toe Drain 43. Note sediment/gravels within drain.



Picture # 18

Description: Pond 3 Toe Drain 43. Note sediment/gravels within drain.



Picture # 19

Description: Description: Pond 2 Dam North Embankment. Upstream slope and crest. Looking southeast from near SS-5.



Picture # 20

Description: Pond 2 Dam North Embankment. Downstream slope looking northwest from near piezometer AH-B2.



Picture # 21

Description: Pond 2 Dam North Embankment, downstream toe area approximately 250 feet southeast of SS-5. A 10-inch diameter rodent hole observed at this location during 2015 inspection. Rodent hole was repaired in July 2016.



Picture # 22

Description: Rodent hole observed on the west wet closure channel.



Picture # 23

Description: Island Pond Dike, looking southeast



Picture # 24

Description: Pond 3 Dike West Embankment looking south emergency spillway.



Picture # 25

Description: Pond 3 Dike West Embankment, looking north at upstream slope and crest.



Picture # 26

Description: Pond 3 Dike West Embankment, looking southeast at upstream slope near Station 77. Slope was regraded and lined with riprap in 2015.



Picture # 27

Description: Pond 3 Dike West Embankment looking south downstream slope and emergency spillway.



Picture # 28

Description: Pond 3 Dike West Embankment looking south at downstream slope.



Picture # 29

Description: Pond 3 Dike West Embankment. Note exposed soil cement frequently observed along downstream toe.



Picture # 30

Description: Pond 3 Dike West Embankment downstream slope. Looking south at southern extents of area of green vegetation near Station 135+00.



Picture # 31

Description: Pond 3 Dike West Embankment downstream slope. Looking southeast at northern extents of area of green vegetation near Station 136+00.



Picture # 32

Description: Pond 3 Dike West Embankment downstream slope. Typical ground/soil conditions at location of green vegetation near Station 135+00.



Picture # 33

Description: Pond 3 Dike West Embankment. Downstream slope near toe at Station 89+50. Note green vegetation and cattails.



Picture # 34

Description: Pond 3 Dike West Embankment. Looking south near Station 89+50. Note green vegetation and cattails next to inspector.



Picture # 35

Description: Pond 3 Dike West Embankment. Downstream slope near toe at Station 89+50. Ground conditions within green vegetation and cattails. Note free standing water on ground surface.



Picture # 36

Description: Pond 3 Dike West Embankment Toe Drain 30.



Picture # 37

Description: Pond 3 Dike West Embankment Toe Drain 84. Arrow is pointing to crushed location of pipe.



Picture # 38

Description: Pond 3 North Embankment. Looking northwest from near Piezometer AH-A6.



Picture # 39

Description: Pond 3 North Embankment. Looking southeast from near SS-3W.



Picture # 40

Description: Pond 3 Dam North Embankment. Arrow shows location of embankment repair in southern corner of hog hole.



Picture # 41

Description: Pond 3 Dam North Embankment. Looking north at location of embankment repair in southern corner of hog hole.



Picture # 42

Description: Pond 3 North Dam Embankment. Looking northwest at upstream slope and crest from near right abutment. Note piezometer AH-A28 in photo.



Picture # 43

Description: Pond 3 North Dam Embankment. Looking northwest at upstream slope and crest from near right abutment. Note piezometer AH-A28 on left side of photo.



Picture # 44

Description: Pond 3 North Dam Embankment. Wet area at downstream toe.



Picture # 45

Description: Pond 3 North Dam Embankment. Wet area at downstream toe.



Picture # 46

Description: Pond 3 Dam North Embankment downstream slope. Arrow is pointing to a soft embankment soil location near the right abutment noted in 2015 and 2016.



Picture # 47

Description: Pond 3 Approach Channel, looking southwest (upstream) towards Interstate 15.



Picture # 48

Description: Pond 3 Inlet Channel, looking southwest (upstream) towards Pond 3 Inlet Channel.



Picture # 49

Description: Pond 3 Bypass Spillway Channel, looking north.



Picture # 50

Description: Pond 1 Outlet Structure.



Picture # 51

Description: Dual 66-inch Pond 1 Emergency Spillway Culverts, looking southeast at downstream end of culvert.



Picture # 52

Description: Northern 66-inch Pond 1 Emergency Spillway Culvert. Arrow denotes location of possible joint separation.



Picture # 53

Description: Pond 1 northwest corner 12-inch outlet pipe.



Picture # 54

Description: SS-4, Pond 2 flow measurement weir. Looking northeast at upstream side of weir.



Picture # 55

Description: Pond 2 East Wet Closure outlet, looking southeast.



Picture # 56

Description: Pond 2 West Wet Closure walkway. Circle denotes separation and tilting from concrete abutment.



Picture # 57

Description: Pond 2 Service Spillway, looking southwest at downstream side of spillway.



Picture # 58

Description: Pond 2 Service Spillway, looking southeast at upstream side of spillway.



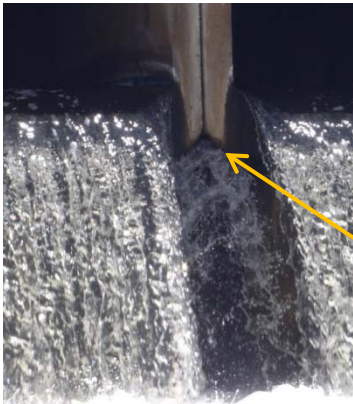
Picture # 59

Description: Pond Outlet Box Culvert Box Structure. Looking northwest and upstream side of structure.

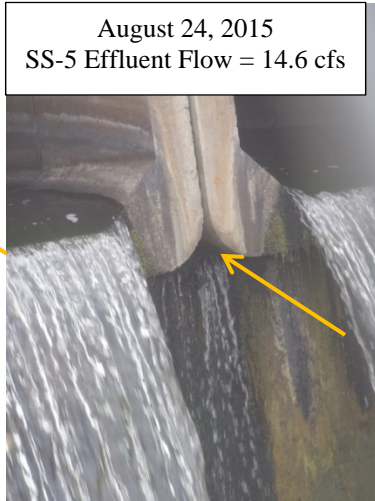


Picture # 60

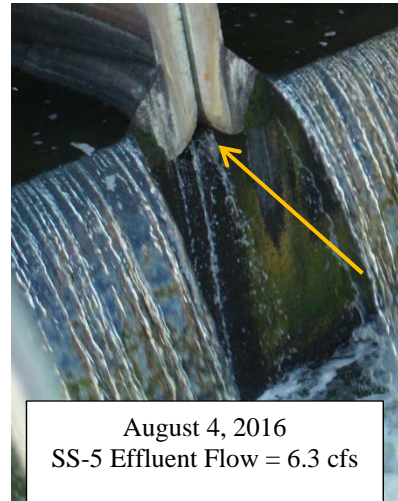
Description: Pond Outlet Box Culvert Box Structure, looking southeast at downstream portion of structure. Circled area denotes water leaking between the two box culverts.



June 23, 2014
SS-5 Effluent Flow = 43 cfs



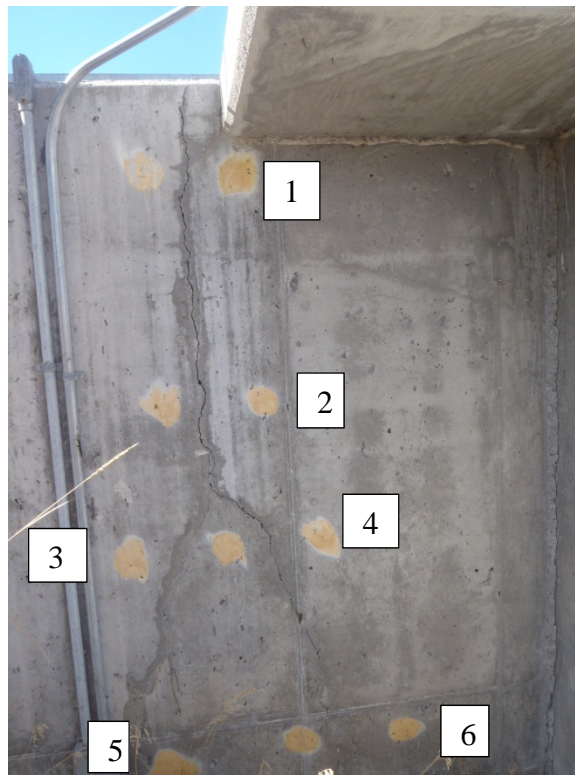
August 24, 2015
SS-5 Effluent Flow = 14.6 cfs



August 4, 2016
SS-5 Effluent Flow = 6.3 cfs

Picture # 61

Description: Pond Outlet Box Culvert Box Structure. Comparison of water leaking between box culverts from 2014 to 2016.



Picture # 62

Description: Pond 3 Inlet Structure crack monitoring. Numbers denote crack monitoring locations.



Picture # 63

Description: Pond 3 Inlet Structure, looking north at upstream side.



Picture # 64

Description: Pond 3 Inlet Structure, looking southwest at downstream side.



Picture # 65

Description: Pond 3 Inlet Structure crack monitoring locations.
Note: crack monitoring locations 5 and 6 are not shown in picture.



Picture # 66

Description: Pond 3 Bypass Spillway, looking southeast.



Picture # 67

Description: Pond 3 Bypass Spillway Outlet Structure, looking southeast.



Picture # 68

Description: SS-3E Inlet Structure, looking southwest.



Picture # 69

Description: SS-3E Outlet Structure, looking west.



Picture # 70

Description: SS-3W Inlet Structure, looking south.



Picture # 71

Description: SS-3W Outlet Structure, looking southwest.
Arrow denotes displaced fence post.



Picture # 72

Description: Middle Wet Closure Outlet, looking south.

Appendix A.2
Photo Reference Log



Picture #: 1

10/3/2016

Description: Looking Northwest from Southeast Edge of Pond 3, Taken from Eastside Road

Project: Warm Springs Ponds

Project Task: Annual Photo Reference Stations



Picture #: 2

Date: 9/28/2016

Description: Looking Upstream (Southwest) standing on Lime Plant Inlet Bridge above Trashrack.

Project: Warm Springs Ponds

Project Task: Annual Photo Reference Stations



Picture #: 3
Date: 9/28/2016
Description: Looking Northeast from Pond 3 Bypass Spillway Outlet over Hog Hole and Wildlife Pond.
Project: Warm Springs Ponds
Project Task: Annual Photo Reference Stations



Picture #: 4
Date: 9/28/2016
Description: Looking West Across Wildlife Ponds; Standing on Pond 3 Embankment near SS-3E
Project: Warm Springs Ponds
Project Task: Annual Photo Reference Stations



Picture #: 5

Date: 9/28/2016

Description: Looking NorthWest Across East Wildlife and West Wet Closure; Standing on Pond 3 Embankment near SS-3E.

Project: Warm Springs Ponds

Project Task: Annual Photo Reference Stations



Picture #: 6

10/3/2016

Description: Looking North Across West Wet Closure and East Wildlife Ponds; Standing on Pond 3 Embankment near SS-3E.

Project: Warm Springs Ponds

Project Task: Annual Photo Reference Stations



Picture #: 7
9/28/2016
Description: Looking North from the Top of Berm at Pond 3 East Outlet Works to Pond 2
Project: Warm Springs Ponds
Project Task: Annual Photo Reference Stations



Picture #: 8
9/28/2016
Description: Looking Northeast from Top of Berm at Pond 3 East Outlet Works to Pond 2, showing the East Wet Closure.
Project: Warm Springs Ponds
Project Task: Annual Photo Reference Stations



Picture #: 9

9/28/2016

Description: Looking Upstream (South) from Middle of Mill-Willow Bypass

Project: Warm Springs Ponds

Project Task: Annual Photo Reference Stations



Picture #: 10

9/28/2016

Description: Looking Downstream (North) from the South End of the Mill-Willow Bypass

Project: Warm Springs Ponds

Project Task: Annual Photo Reference Stations



Picture #: 10A

10/3/2016

Description: Looking Downstream (North) from the Middle of the Mill-Willow Bypass.

Project: Warm Springs Ponds

Project Task: Annual Photo Reference Stations

APPENDIX B
ACTION ITEM PUNCH LIST

Appendix B: Dam Inspection Action Item Punch List

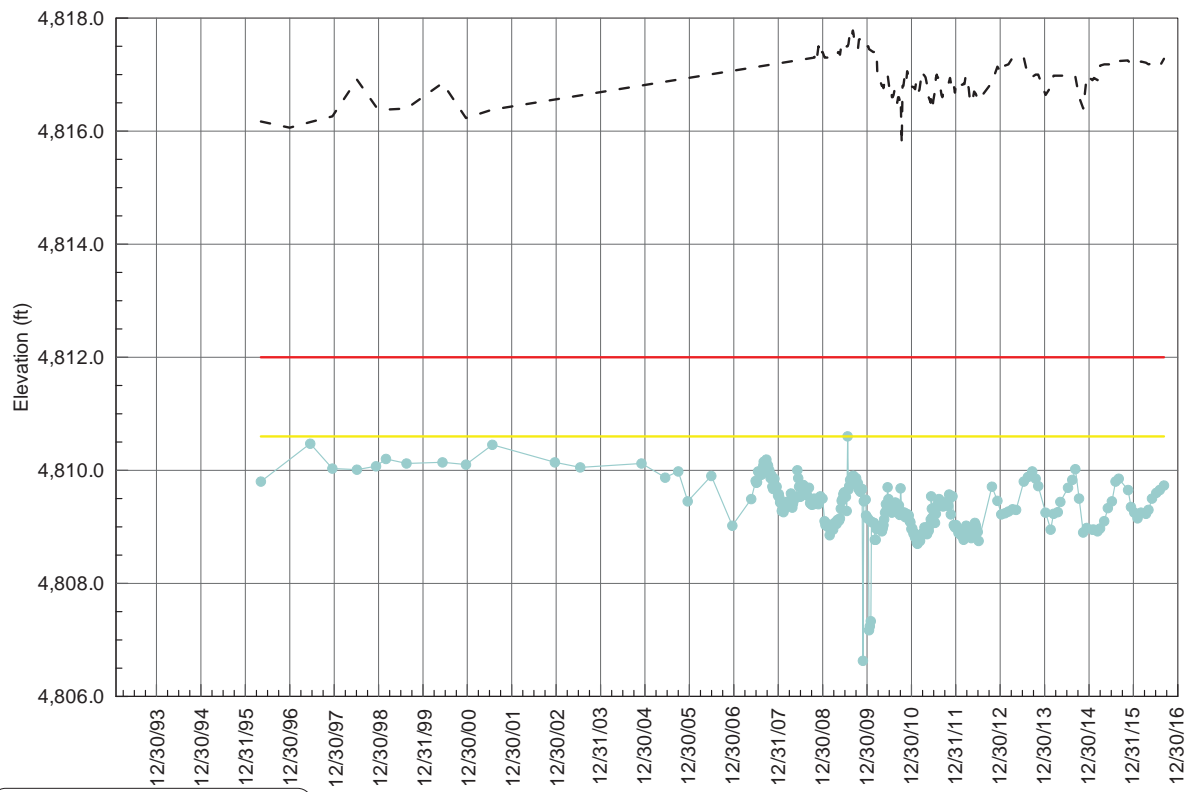
Item No.	Report Section Item Located	Recommended Task	Priority Level (1=High, 5=Low)	Cost (1=High, 5=Low)	Task Leader	Task & Date Completed
Item 11-6	8.0 IMP-7 Dam Deformation Survey	The 2011 five-year inspection report recommended additional dam deformation points to be installed along the downstream rock toe berm of Pond 2 North Dam. The rock toe berm was visually observed to be lower in elevation near the sinkhole, the deformation points are intended to monitor for settlement. Pioneer recommends installing surveying dam deformation points, similar to those installed in 2008, and monitoring the location per IMP-9 to determine if the toe berm is settling.	1	4		
Item 11-12	2.3.2 Pond 3 Dam: North Embankment - Bypass Spillway to East Outlet Works	Woody vegetation (willows, shrubs) was observed along the downstream toe on the western half of the dam. The vegetation is dense between the Hog Hole and Pond 3 Dam and sporadic between East Wildlife Pond and Pond 3 Dam. Pioneer recommends removing woody vegetation within the embankment and embankment toe. Areas where there is thick vegetation growth should be controlled to allow a more thorough observation of the embankment during inspections.	1	4 (Vegetation removal) 2 (Embankment repair, if warranted)		
Item 11-28	3.0 IMP-2 Piezometer Monitoring	Perform maintenance on plugged piezometers per the <i>Piezometer Manual, Revision 2</i> (Atlantic Richfield Company, 2012a).	1	3		
Item 11-38	7.2.4 Pond 2 Service Spillway (SS-5)	Evaluate need for cathodic protection to inhibit corrosion within the spillway structure.	3	5 (evaluation only)		
Item 11-40	7.2.5 Pond 2 Outlet Box Culvert/Drop Structure	Continue to monitor the leakage between the two box culverts to identify if there is any movement of the culverts or piping of subgrade soils.	4	4		
Item 12-1	2.0 IMP-1 Embankment Monitoring	Remove woody vegetation growing on the embankments or near the embankment toes. <u>Ongoing task.</u>				
Item 12-2	2.1.1 Pond 1 Dam: North Embankment	Evaluate the function of broken PVC pipe extruding through the embankment. Consider abandoning pipe if no longer needed. Pipes extruding through embankment dams are a dam safety concern.	1	5		
Item 13-1	2.0 IMP-1 Embankment Monitoring	Fill in small animal burrows as part of IMP-1. <u>Ongoing task.</u>				
Item 13-2	2.0 IMP-1 Embankment Monitoring	Routinely inspect embankments for animal burrows per IMP-1. Document burrow locations and repair at next scheduled maintenance opportunity. <u>Ongoing task.</u>				
Item 13-2	2.0 IMP-1: Embankment Monitoring	Remove ant hills as part of IMP-1. <u>Ongoing task.</u>				
Item 14-3	7.2.2 Pond 2 Wet Closure Outlets	Access ramp to West Wet Closure is tilting and separating from concrete abutment. Repair or further support access ramp.	3	5		
Item 14-4	7.2.5 Pond 2 Outlet Box Culvert/Drop Structure	Evaluate alternatives to stop leak between the box culverts. Design and construct preferred alternative to stop the leak.	4	4		
Item 15-1	2.1.1 Pond 1 Dam: North Embankment	Reseed and apply organic material as needed on bare spots observed in the 2011 erosion repair area. Pioneer recommends performing this work in 2016 in effort to reuse the existing erosion control mat. The erosion control mat is biodegradable and has a limited timeframe before it becomes unusable.	1	4		
Item 15-2	2.1.1 Pond 1 Dam: North Embankment	Monitor moist area observed on downstream slope near right abutment. Pioneer recommends monitoring and documenting on a monthly basis in accordance to IMP-1.	2	4		
Item 15-7	2.3.1 Pond 3 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway	Monitor green vegetation and embankment soils on downstream slope at Station 135. Inspect for changes in vegetation color, seepage, sloughing, and/or erosion. Pioneer recommends monitoring monthly through 2017.	3	5		
Item 15-9	2.3.3 Pond 3 Dam: North Dam Embankment - East Outlet Works to East End of Pond 3	Monitor the soft area for seepage and embankment distress quarterly through 2017.	3	5		
Item 16-1	2.1.1 Pond 1 Dam: North Embankment	Monitor animal borrow/soft spot observed on downstream toe approximately 150 yards southeast of left abutment. Pioneer recommends monitoring and documenting on a monthly basis in accordance to IMP-1. Fill in and repair the rodent hole during the next scheduled maintenance opportunity.	4	5		

Appendix B: Dam Inspection Action Item Punch List

Item No.	Report Section Item Located	Recommended Task	Priority Level (1=High, 5=Low)	Cost (1=High, 5=Low)	Task Leader	Task & Date Completed
Item 16-2	2.1.5 Wet-Closure Dikes (North, Middle, and South) Below Pond 1	Rodent hole marked with pink pin flag on East Dike of South Wet-Closure (eastern side of dike, approximately 20 yards north of Pond 1 Dam). Monitor rodent hole on monthly basis. Fill in and repair the rodent hole during the next scheduled maintenance opportunity.	4	5		
Item 16-3	2.2.1 Pond 2 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway.	Rodent hole observed at downstream toe near Station 168+50. Monitor rodent hole on monthly basis. Fill in and repair the rodent hole during the next scheduled maintenance opportunity.	4	5		
Item 16-4	2.2.1 Pond 2 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway.	Monitor green vegetation and embankment soils at downstream toe near Station 185. Inspect for changes in vegetation color, seepage, sloughing, and/or erosion. Pioneer recommends monitoring monthly through 2016.	4	5		
Item 16-5	2.2.1 Pond 2 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway.	Remove sediment in toe drains 142 and 189. Inspect drains quarterly through 2017. Document toe drain condition, flow, and additional soil accumulation (if any) within or around the toe drain. Consult with Atlantic Richfield's designated engineer if additional soil is observed within or around the toe drains. Additional exploration, such as video inspection of toe drains may be warranted.	2	4		
Item 16-6	2.2.1 Pond 2 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway.	Remove Toe Drain 192 and 193 from as-built drawing Warm Springs Ponds Inactive Area, RA Construction – Phase I Toe Drain Manifold and Earthwork 1993, Sheet 11.	4	5		
Item 16-7	2.2.3 Pond 2 East and West Wet – Closures and Inlet Channel Dikes	Repair rodent holes during the next scheduled maintenance opportunity.	4	5		
Item 16-8	2.3.1 Pond 3 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway	Monitor green vegetation and wet embankment soils on downstream slope at Station 89+50. Inspect for changes in vegetation color, seepage, sloughing, and/or erosion. Pioneer recommends monitoring monthly through 2017.	4	5		
Item 16-9	2.3.1 Pond 3 Dike: West Embankment, Soil-Cement Protection, and Emergency Spillway	Remove sediment from toe drains 37, 39, 43, 72, and 79. Inspect quarterly through 2017. Document toe drain condition, flow, and soil accumulation (if any) within or around the toe drain. Consult with Atlantic Richfield's designated engineer if additional soil is observed within or around the toe drains. Additional exploration, such as video inspection of toe drains may be warranted.	2	4		
Item 16-10	2.3.3 Pond 3 Dam: North Dam Embankment – East Outlet Works to East End of Pond 3	Monitor green vegetation and embankment soils on downstream slope approximately 150 yards west of the right (east) abutment. Inspect for changes in vegetation color, seepage, sloughing, and/or erosion. Pioneer recommends monitoring monthly through 2017.	4	5		
Item 16-11	6.4 Groundwater Interception Trench	Groundwater Interception Trench muskrat hole (north side of trench, approximately 200 yards west of pump house). Monitor location on monthly basis. Repair trench, if warranted based on monthly monitoring.	5	5		
Item 16-12	7.3.4 Pond 3 West Outlet Works (SS-3W)	Repair displaced end post of chain link safety fence around perimeter of SS-3W outlet structure.	3	5		

APPENDIX C
PIEZOMETER GRAPHS

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



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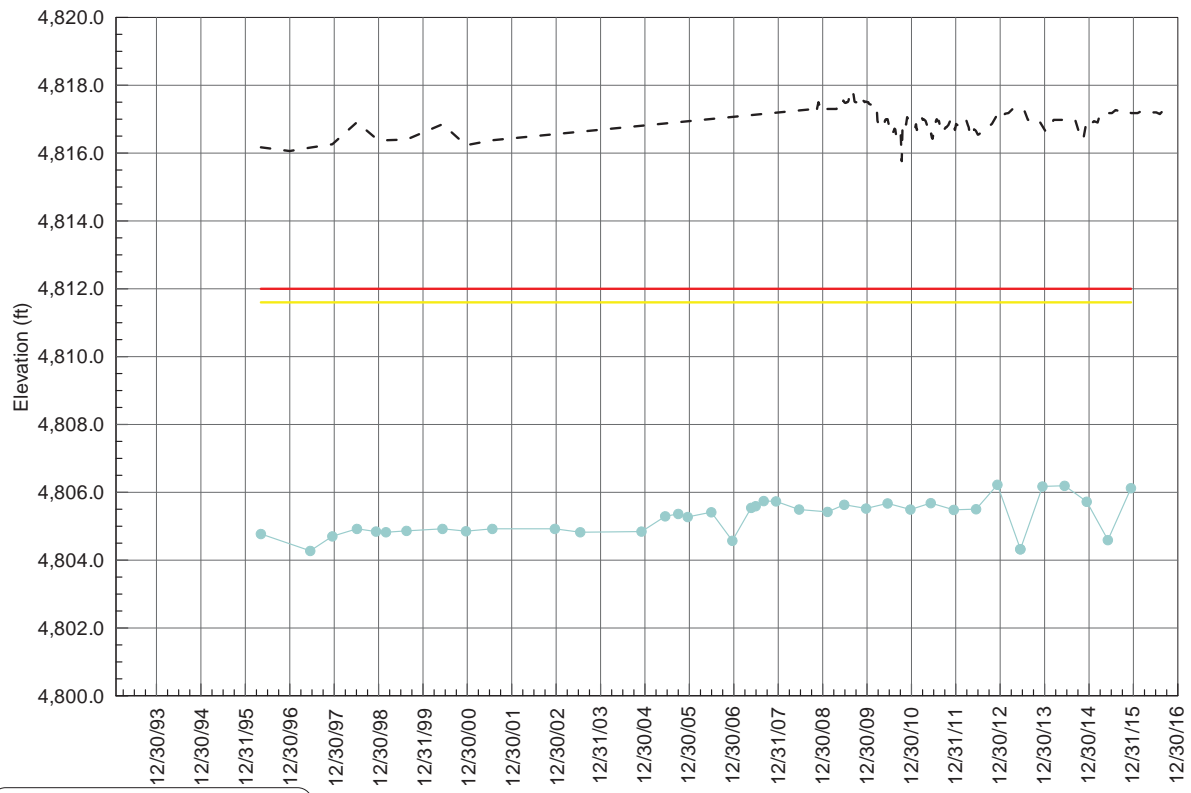
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- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Date

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH1-A48
POND 1**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



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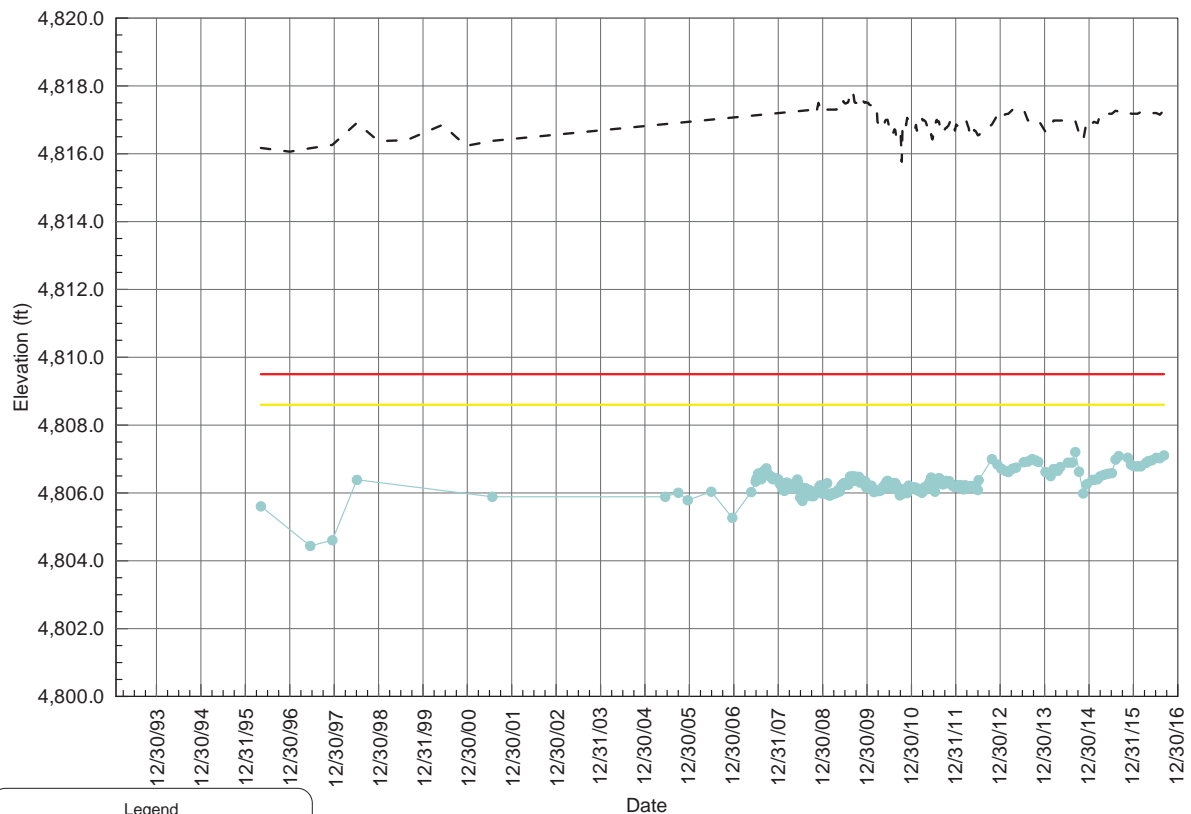
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- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Date

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH1-A49
POND 1**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



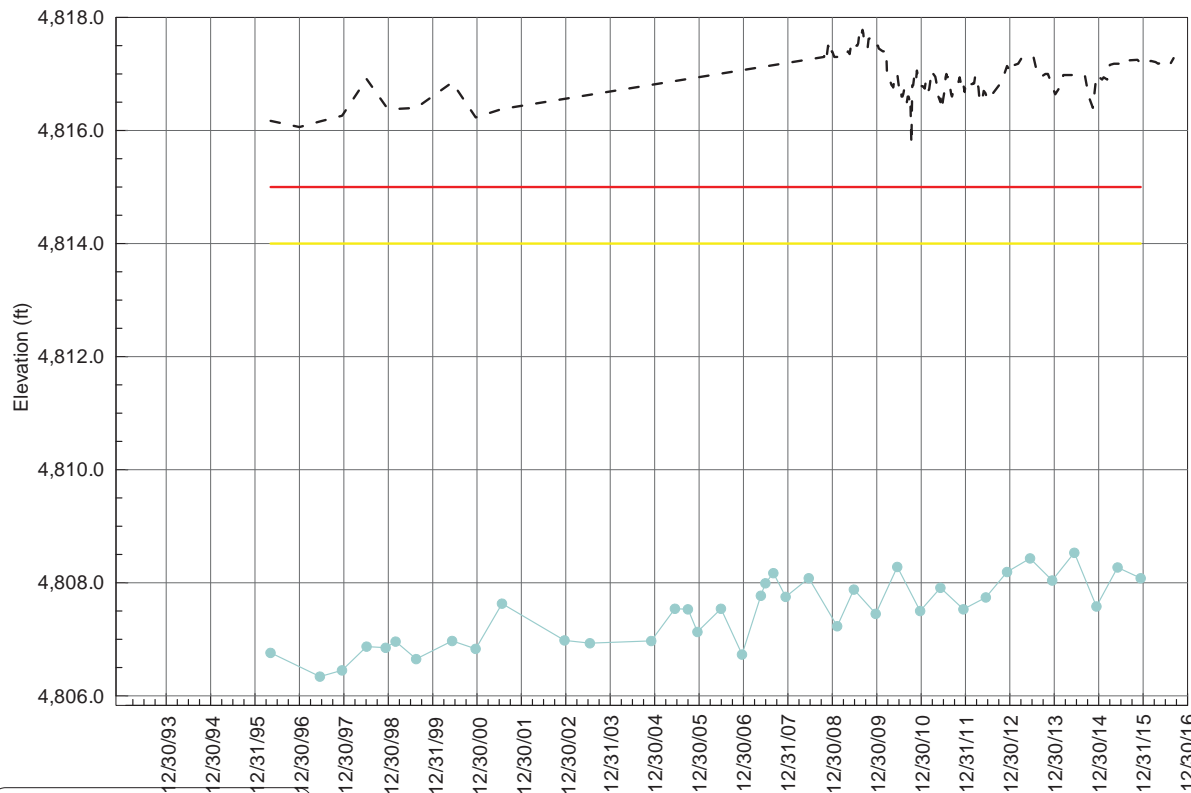
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- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH1-A50
POND 1**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



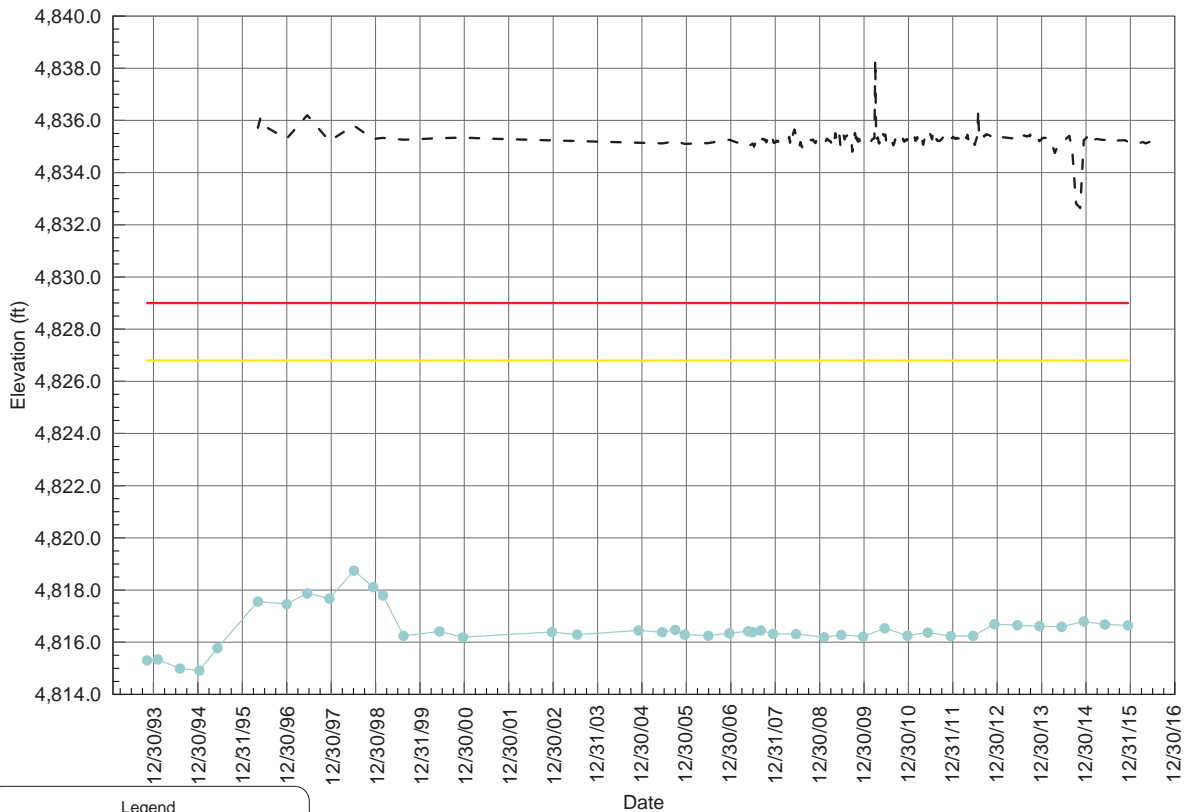
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- Yellow Flag Level
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Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH1-A51
POND 1**

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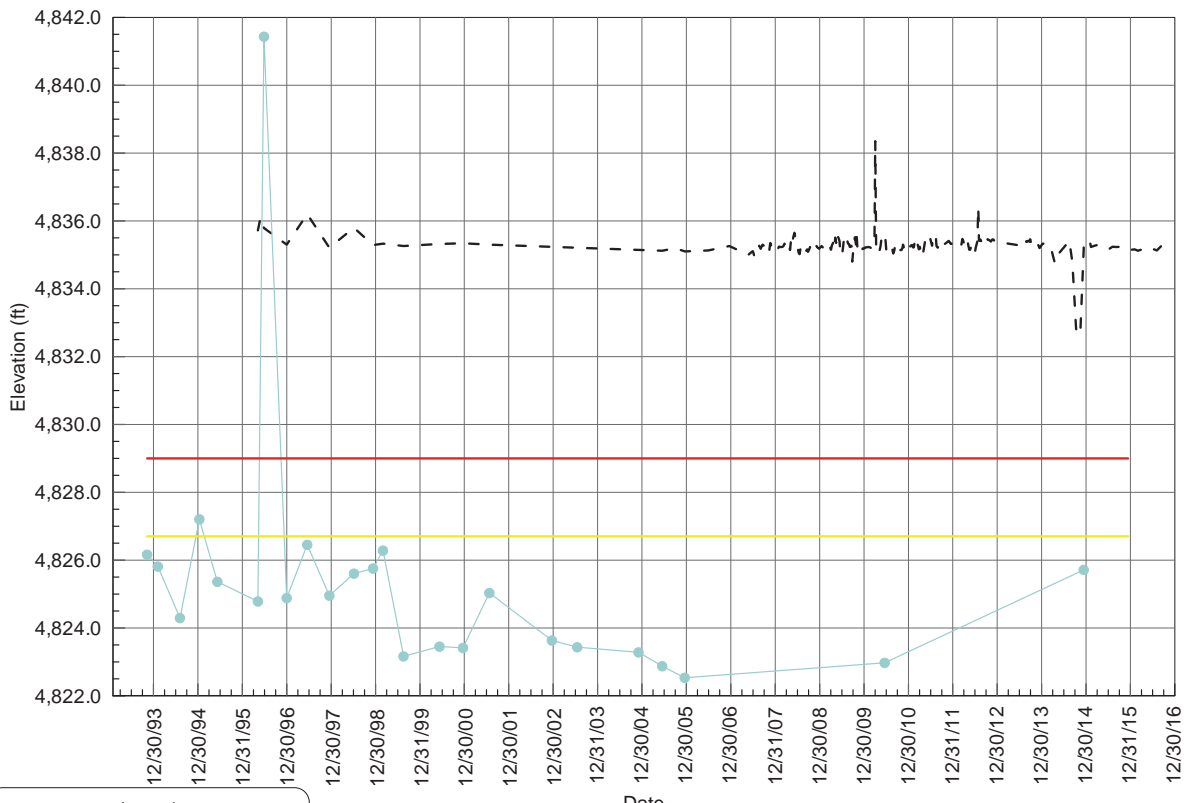
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- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Date

Atlantic Richfield Company Warm Springs Ponds	PIEZOMETER AH-B1R POND 2

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



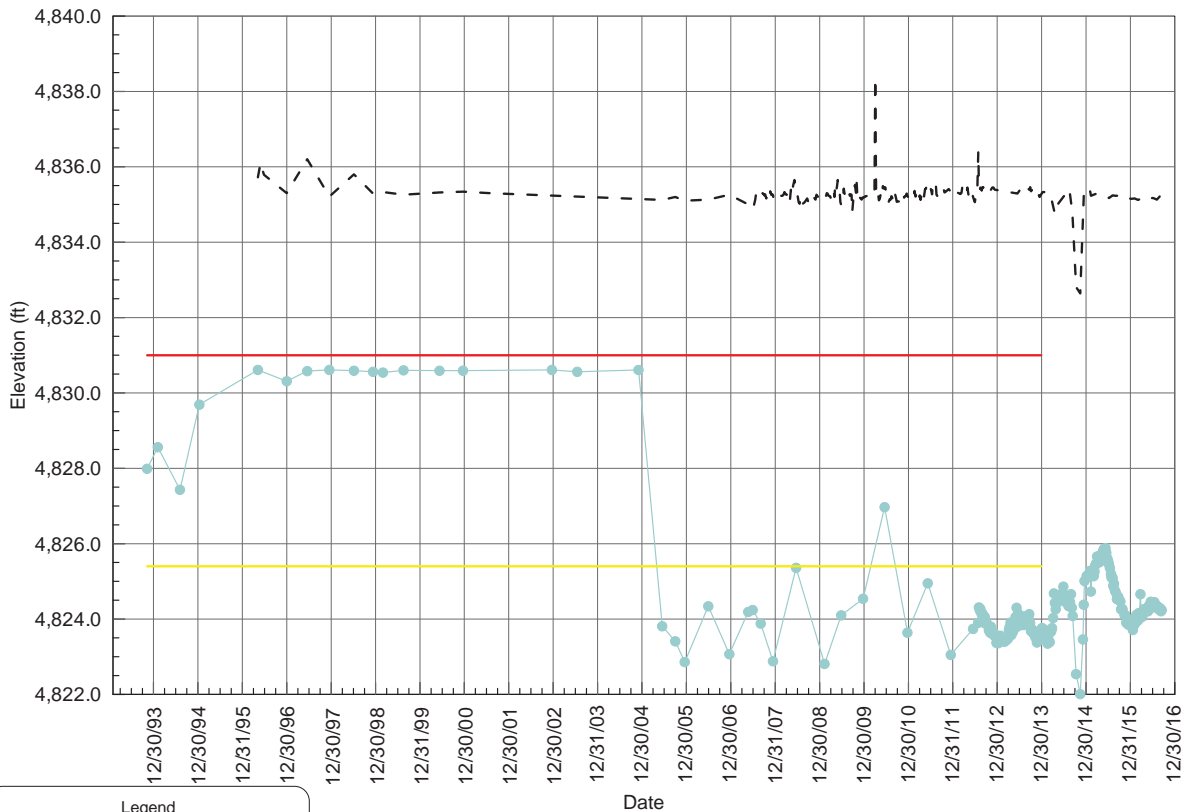
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- Yellow Flag Level
- Red Flag Level

Date

Atlantic Richfield Company Warm Springs Ponds	PIEZOMETER AH-B2 POND 2

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



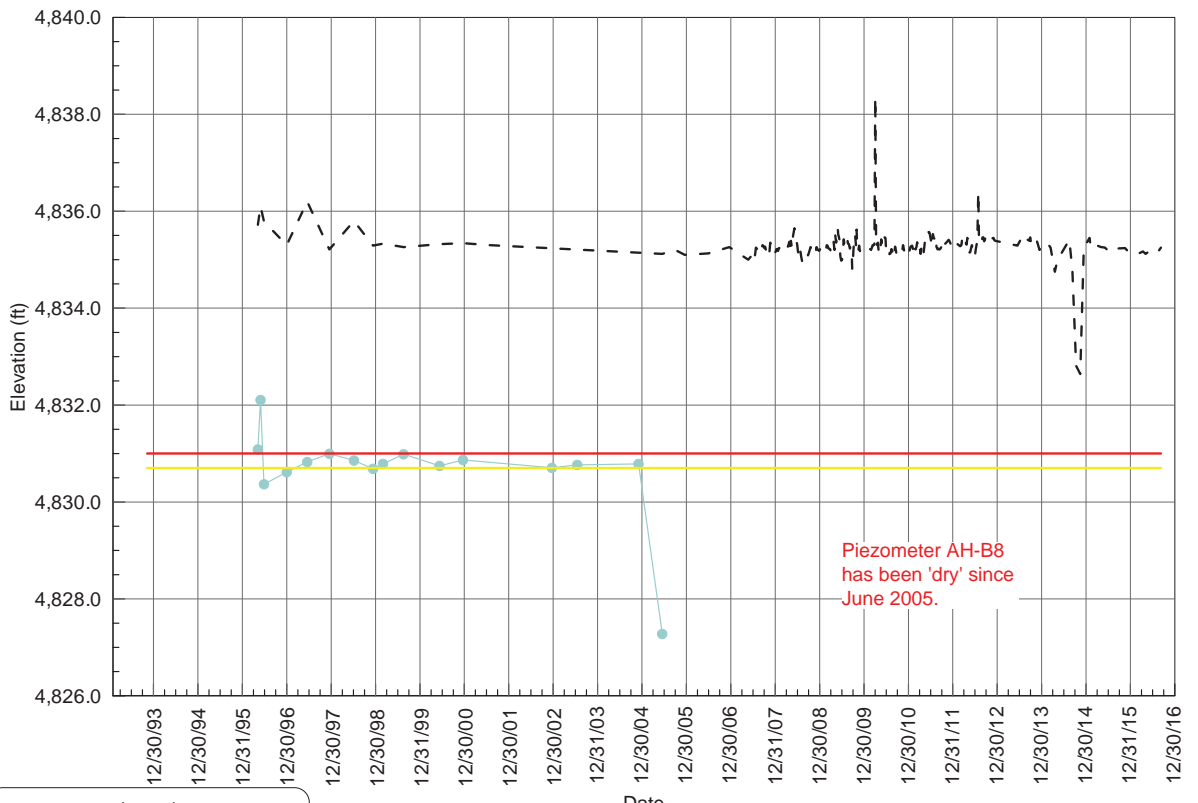
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- Pond Elevation
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- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B7
POND 2**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



Legend

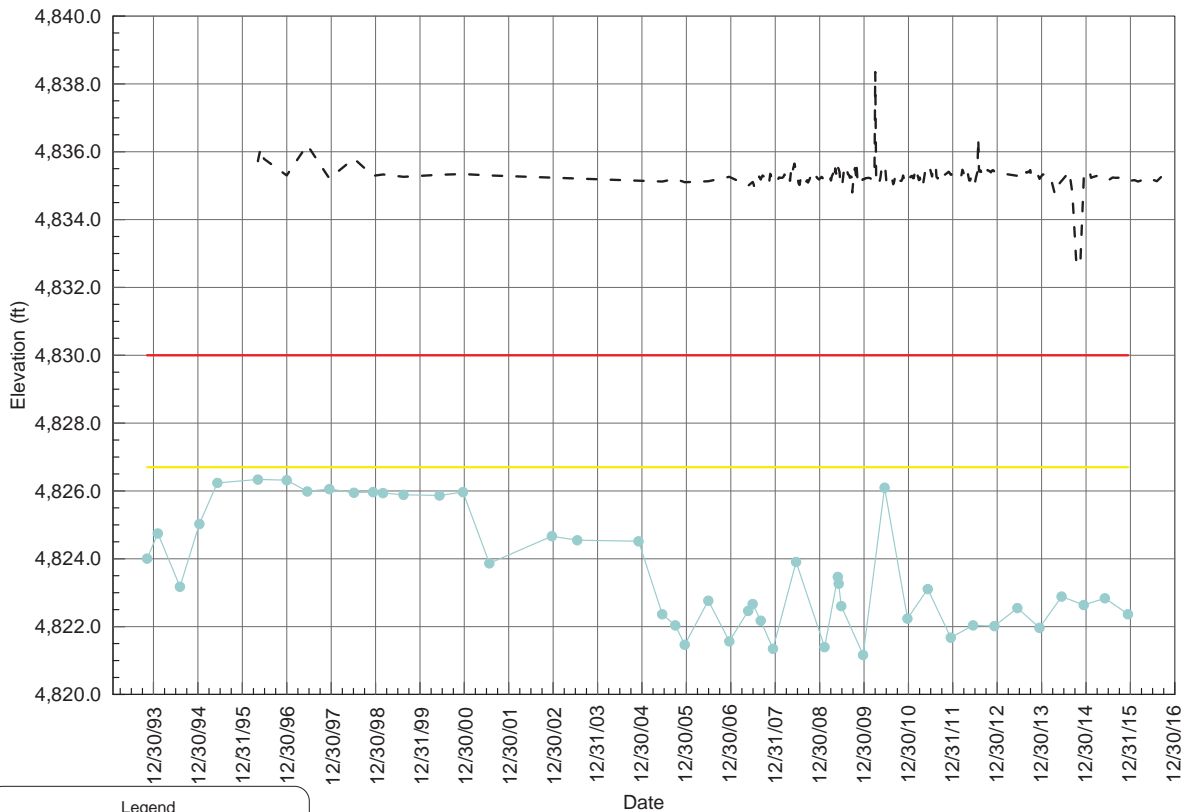
- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B8
POND 2**

Piezometer AH-B8
has been 'dry' since
June 2005.

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



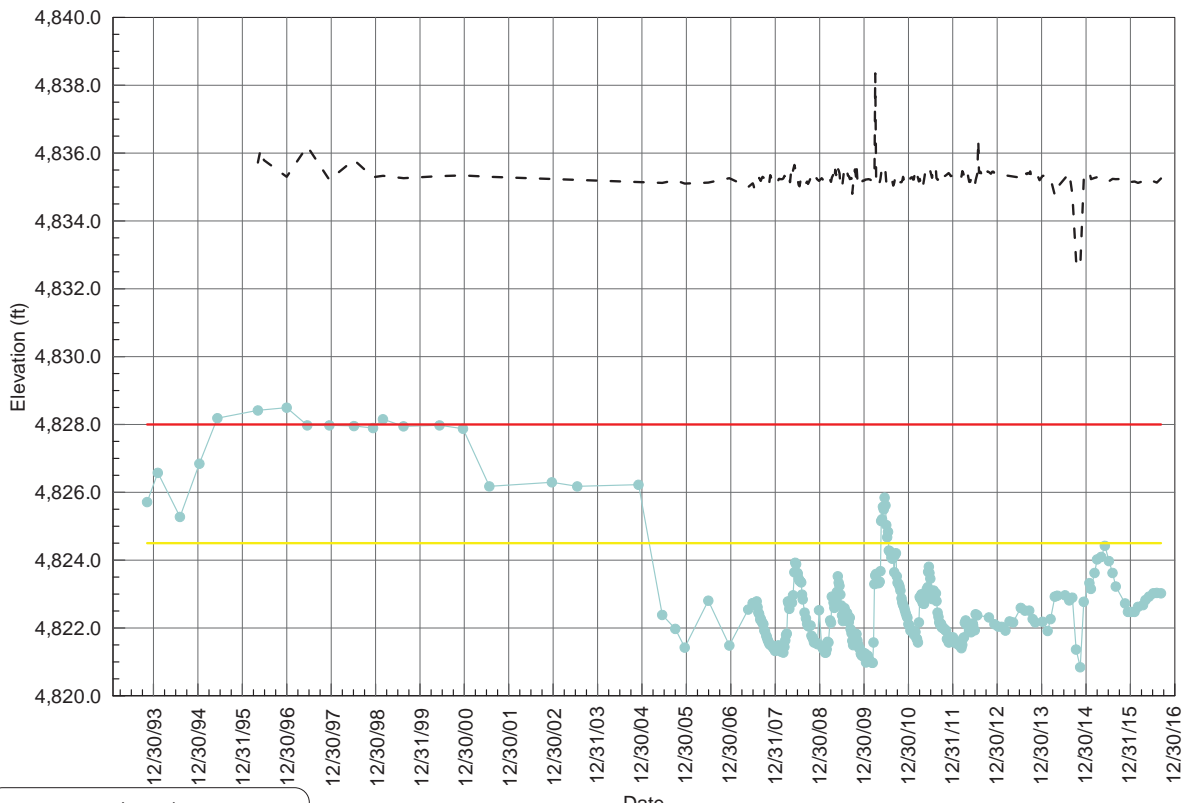
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- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B9
POND 2**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



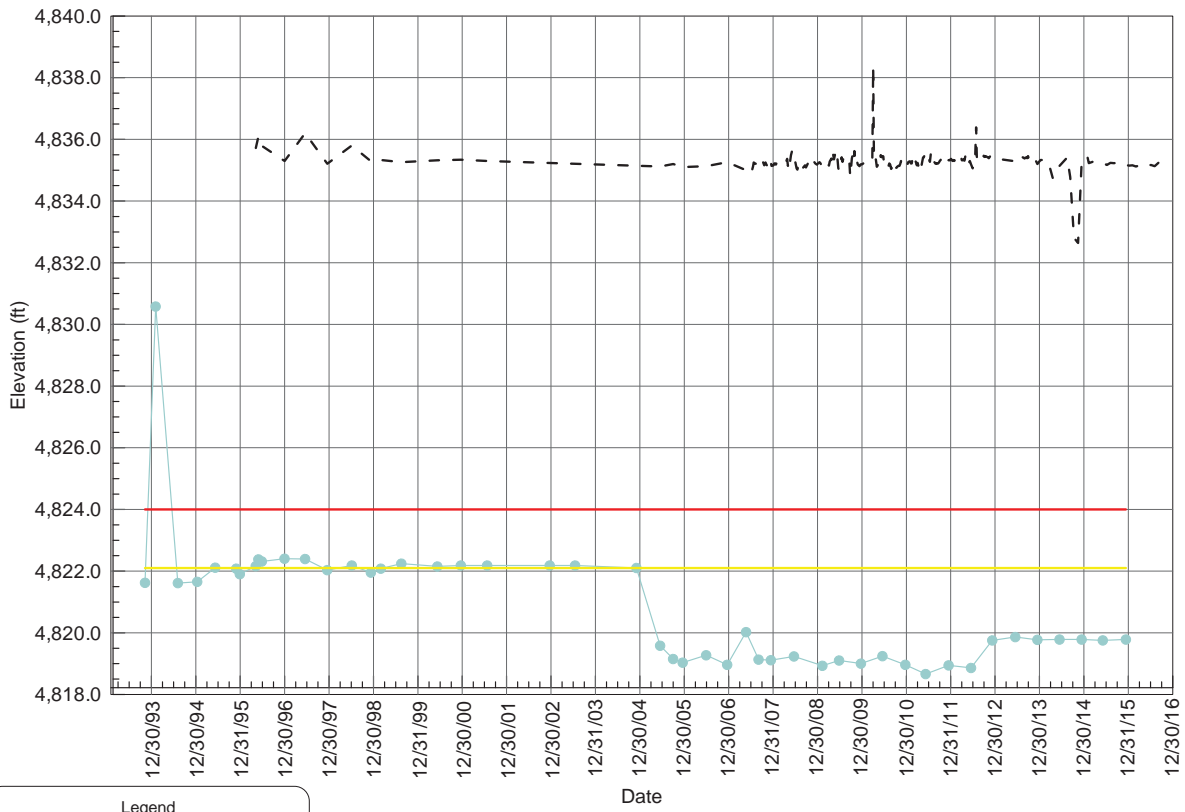
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B10
POND 2**

Ball's Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2_0_DATA\Piezometers



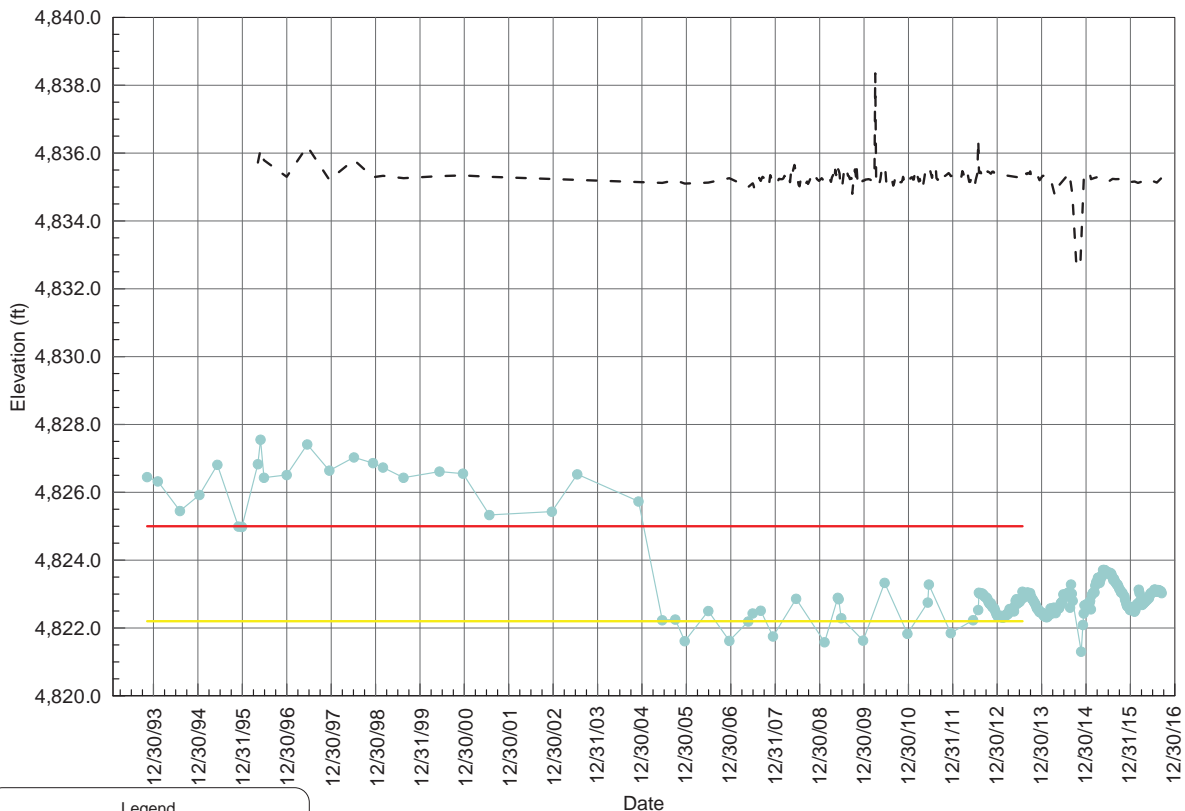
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B12
POND 2**

Ball's Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2_0_DATA\Piezometers



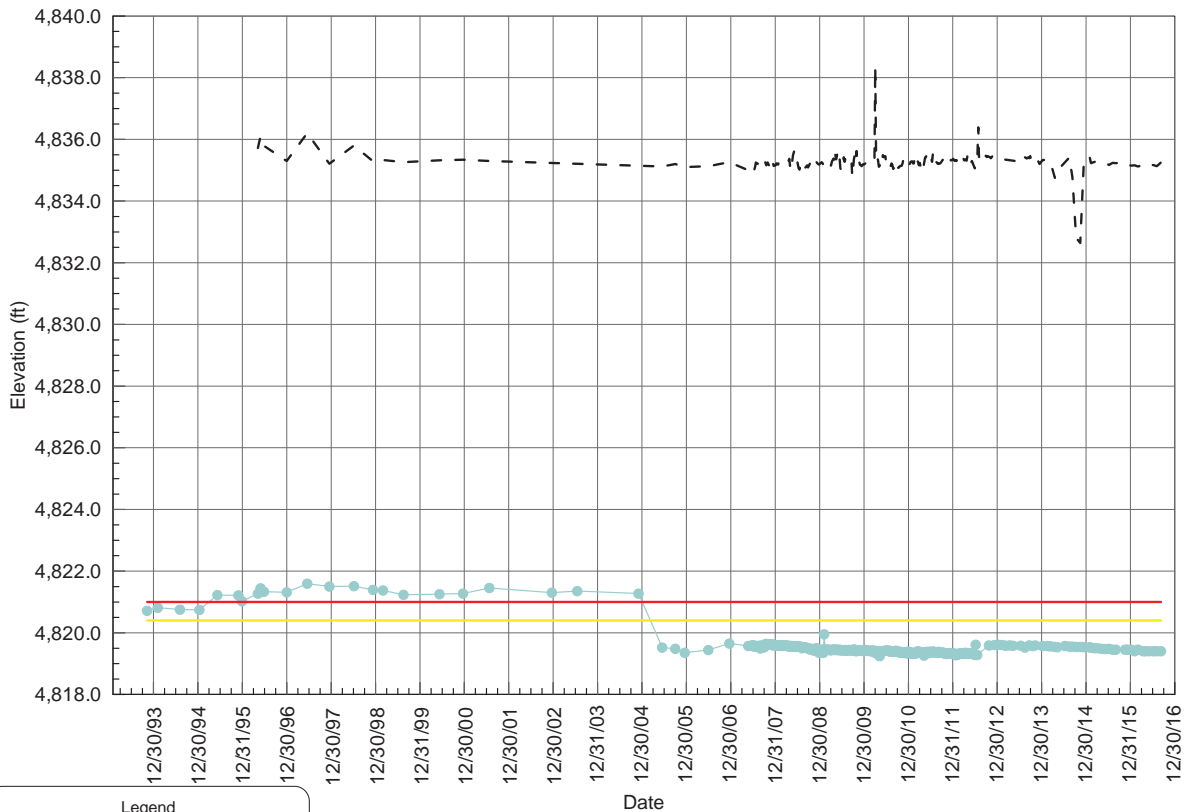
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B13
POND 2**

Baffle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



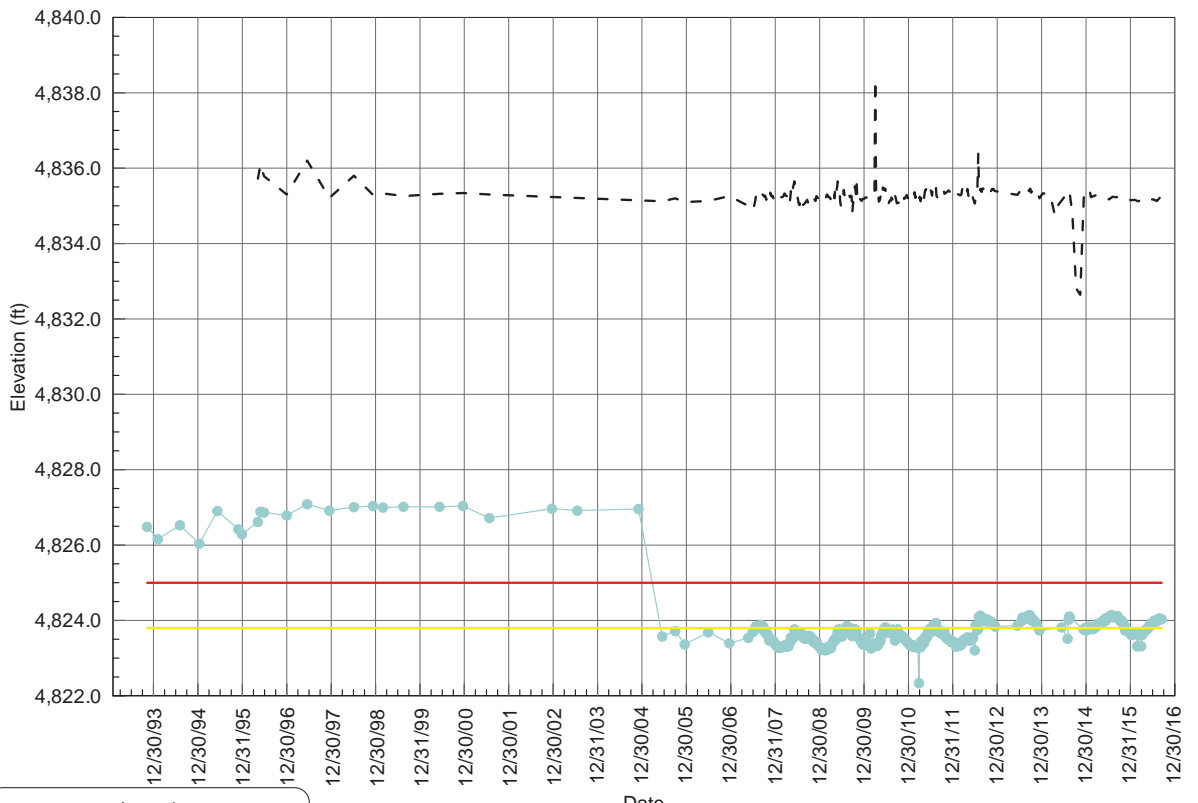
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B14
POND 2**

Baffle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



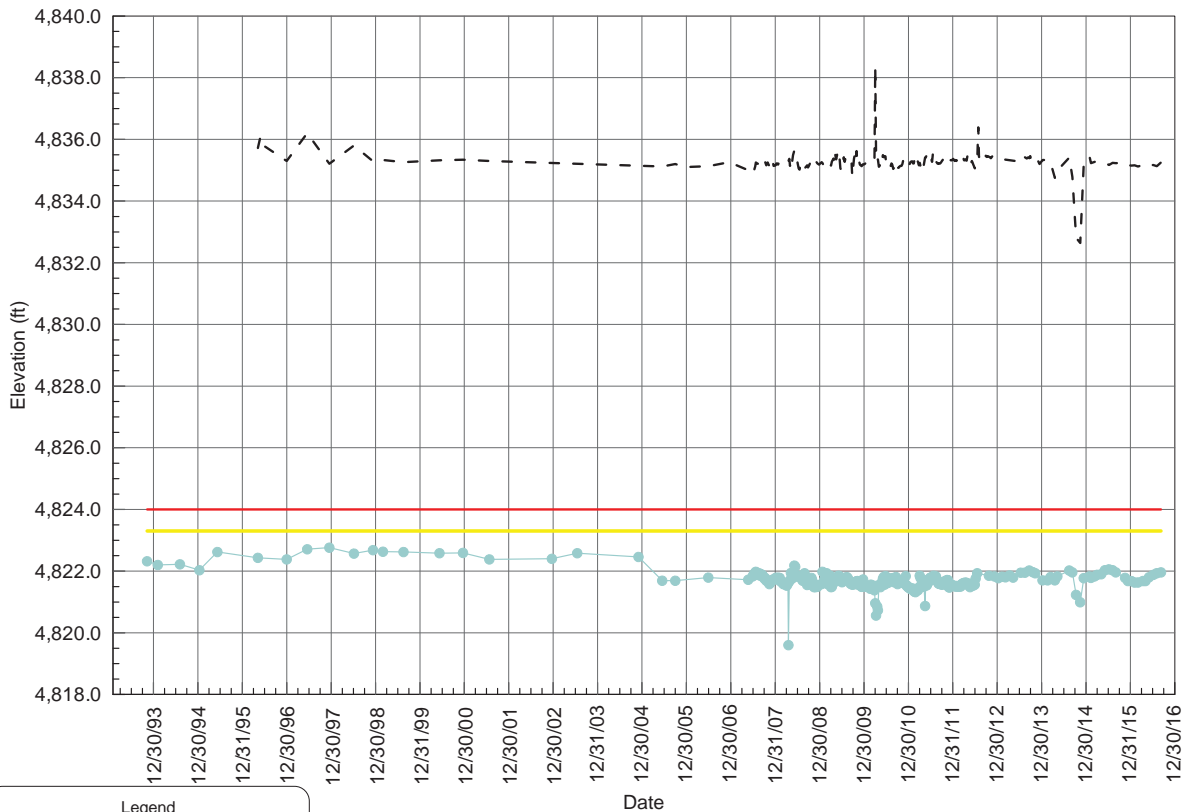
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B15
POND 2**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers




Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

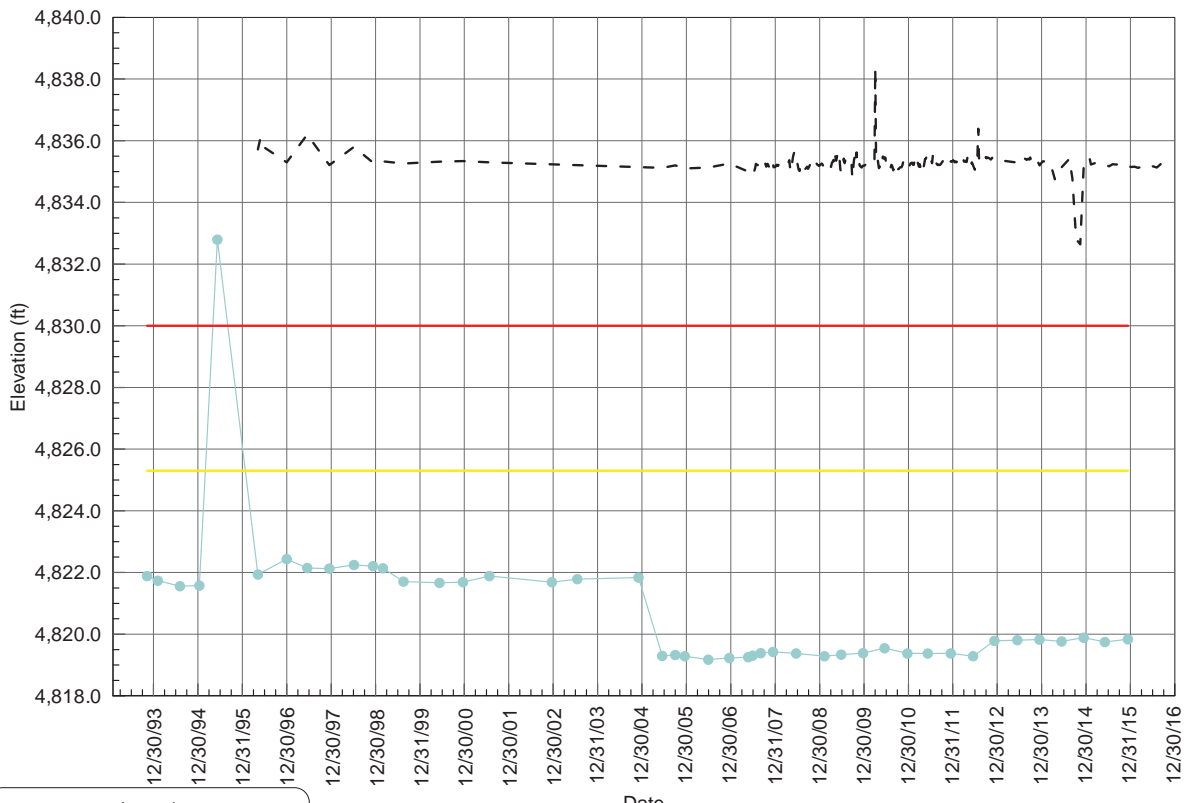
Date

Atlantic Richfield Company
Warm Springs Ponds



**PIEZOMETER
AH-B16
POND 2**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers




Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

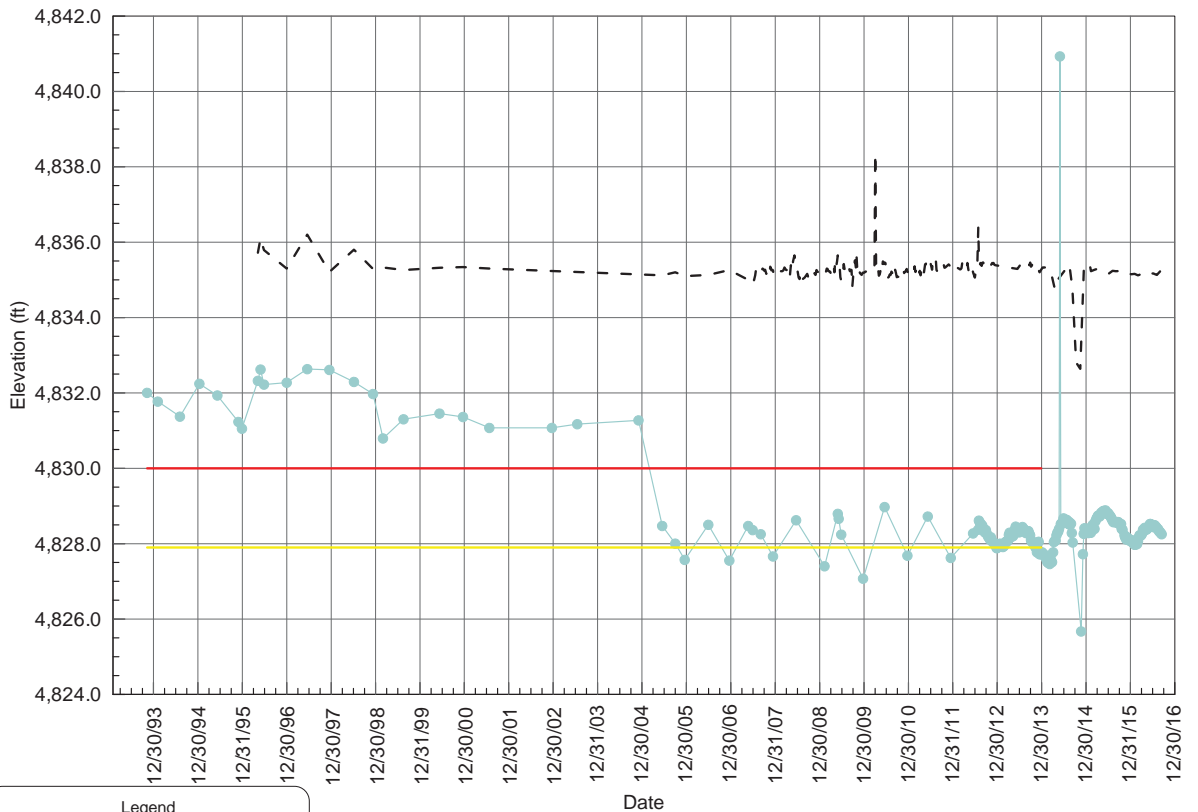
Date

Atlantic Richfield Company
Warm Springs Ponds



**PIEZOMETER
AH-B18
POND 2**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



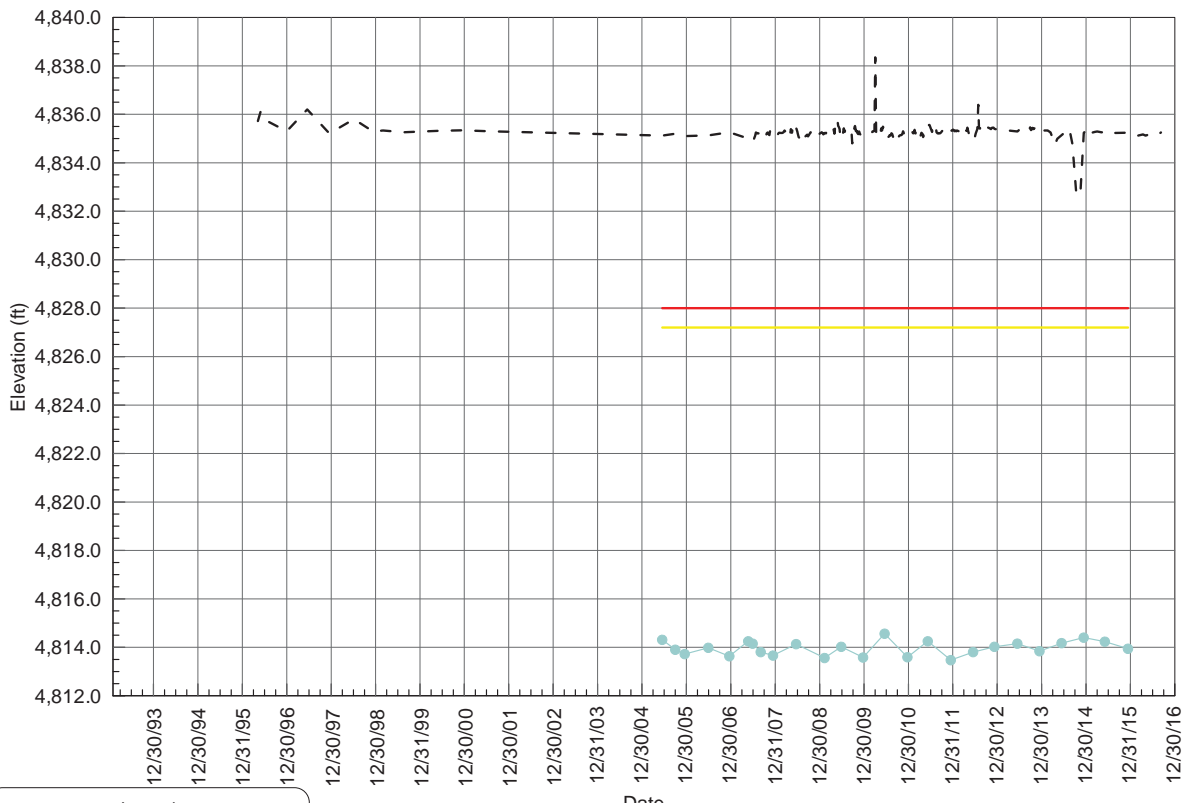
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B19
POND 2**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



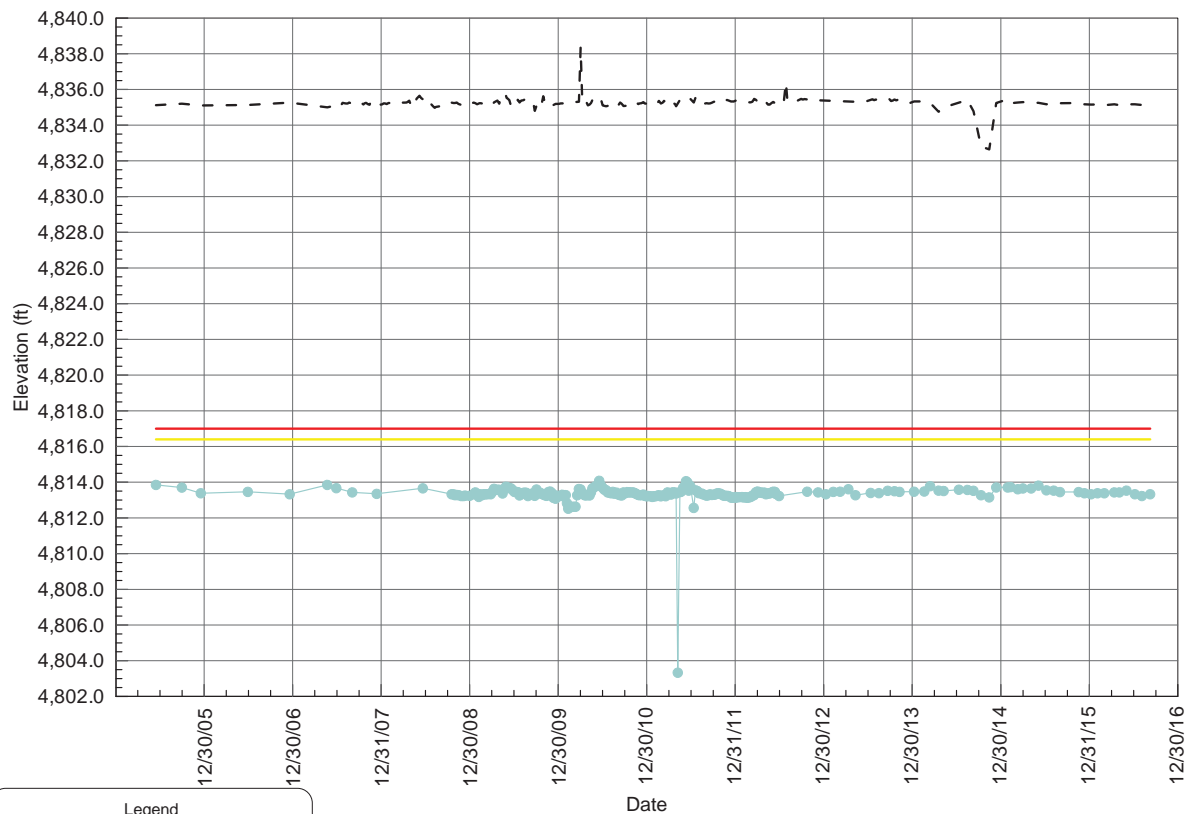
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B20
POND 2**

Baffle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



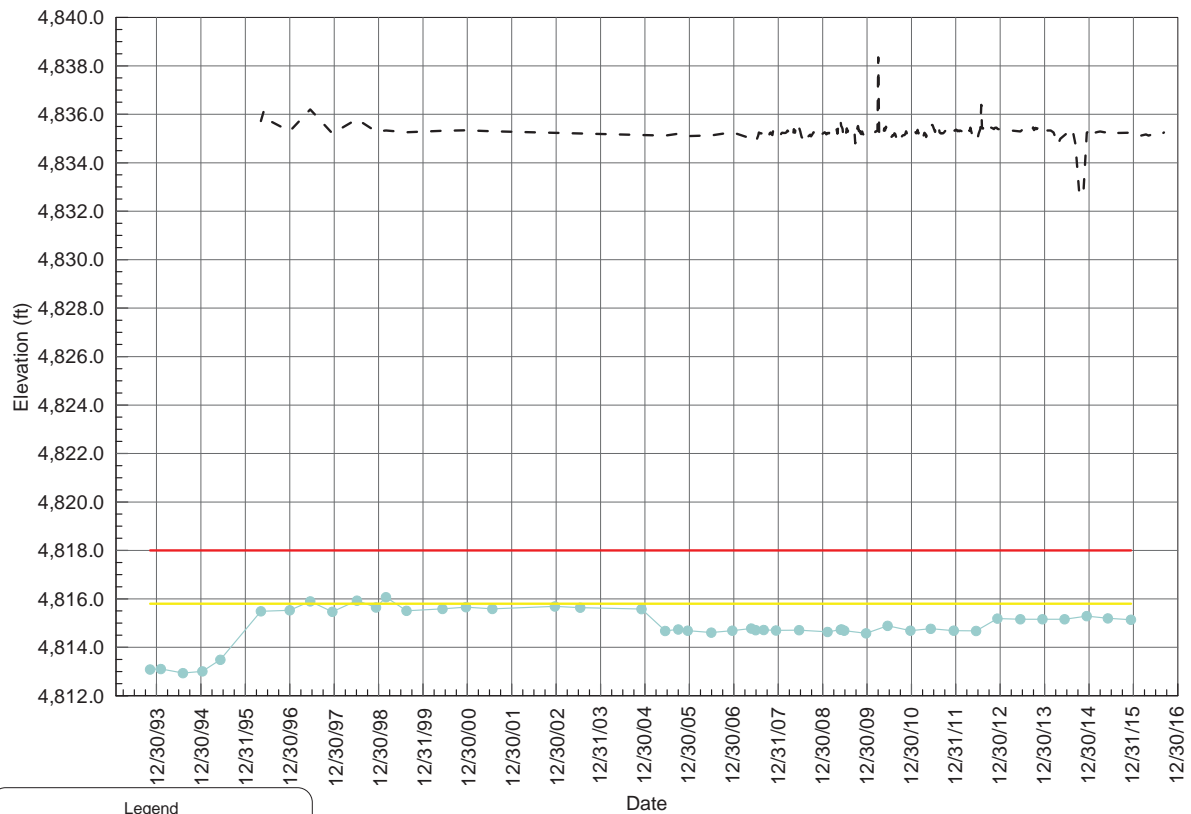
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B22
POND 2**

Baffle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



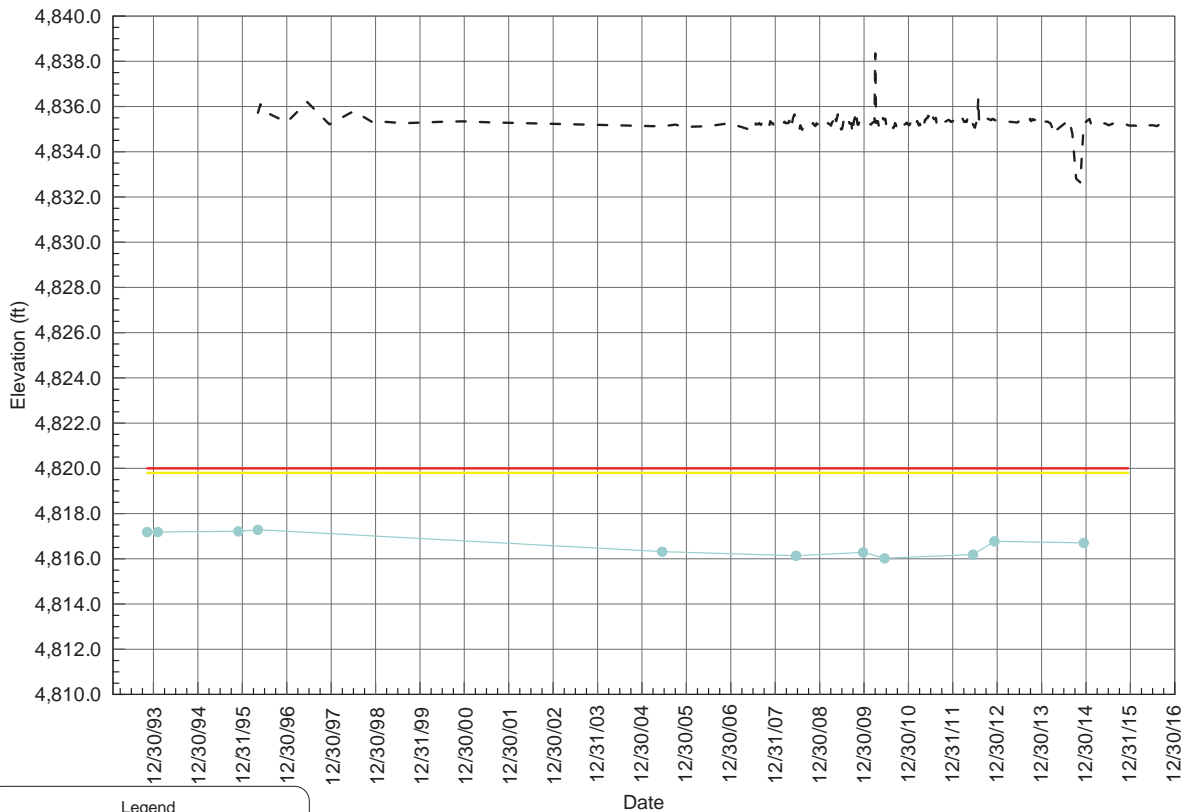
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B23
POND 2**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



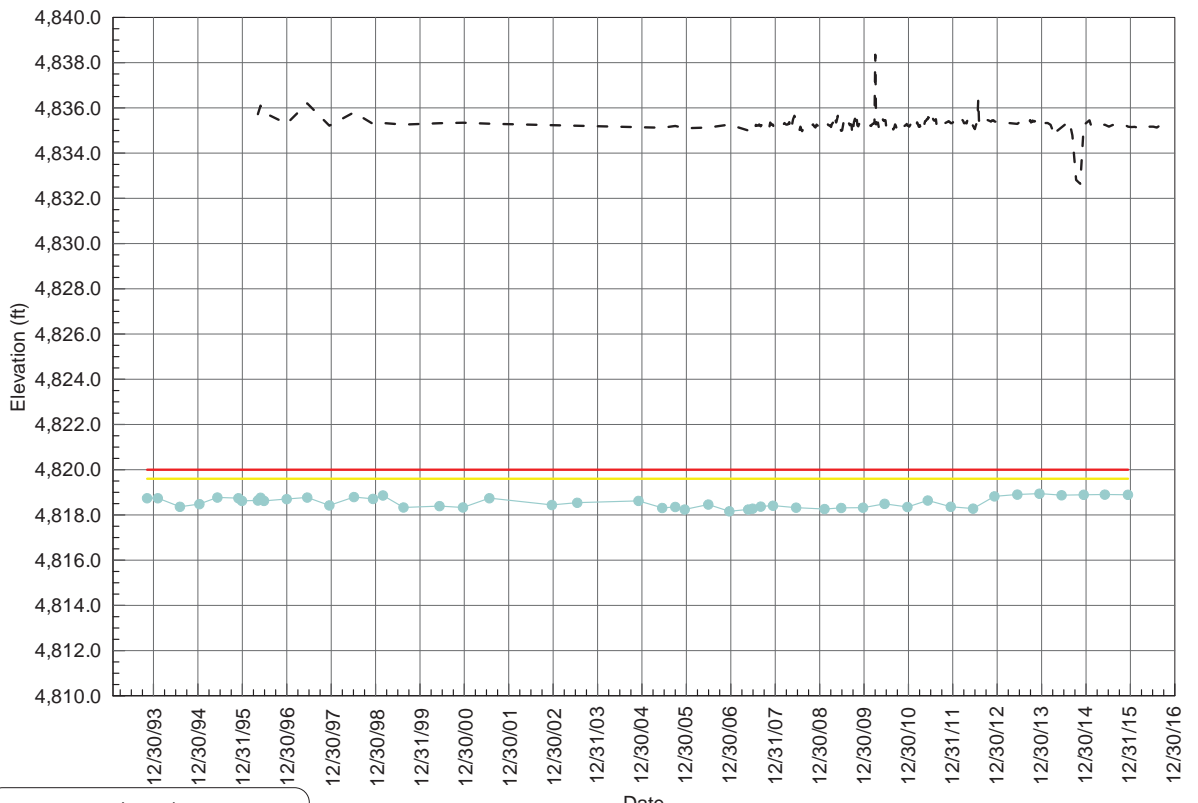
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B24
POND 2**

Belle River Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



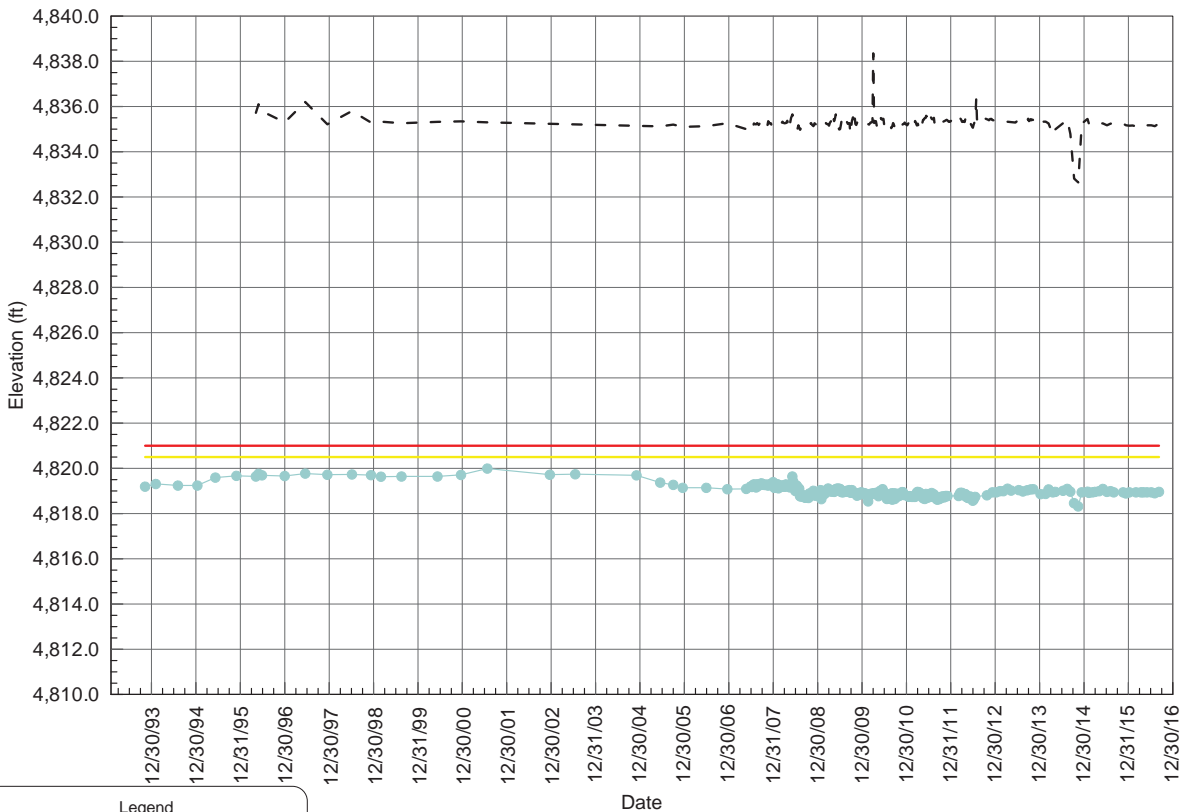
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-B25
POND 2**

Bulle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers




Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

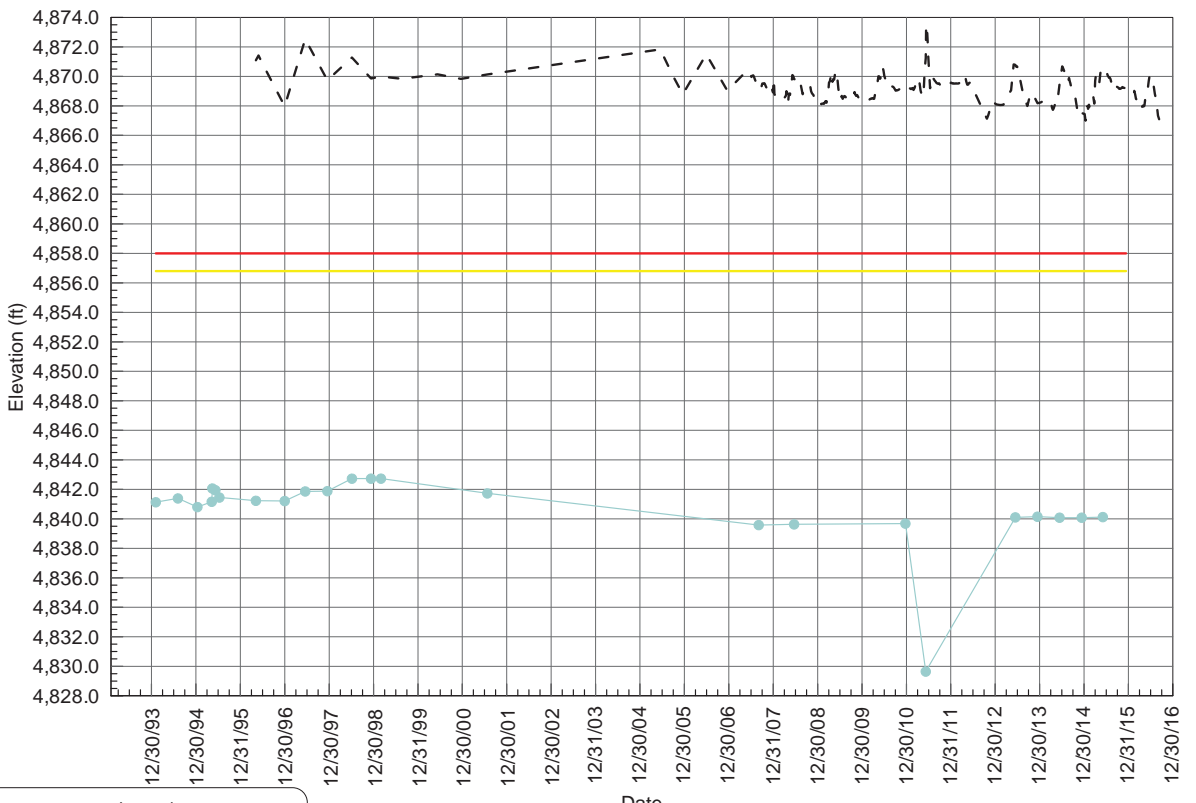
Date

Atlantic Richfield Company
Warm Springs Ponds



**PIEZOMETER
AH-B26
POND 2**

Bulle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers




Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

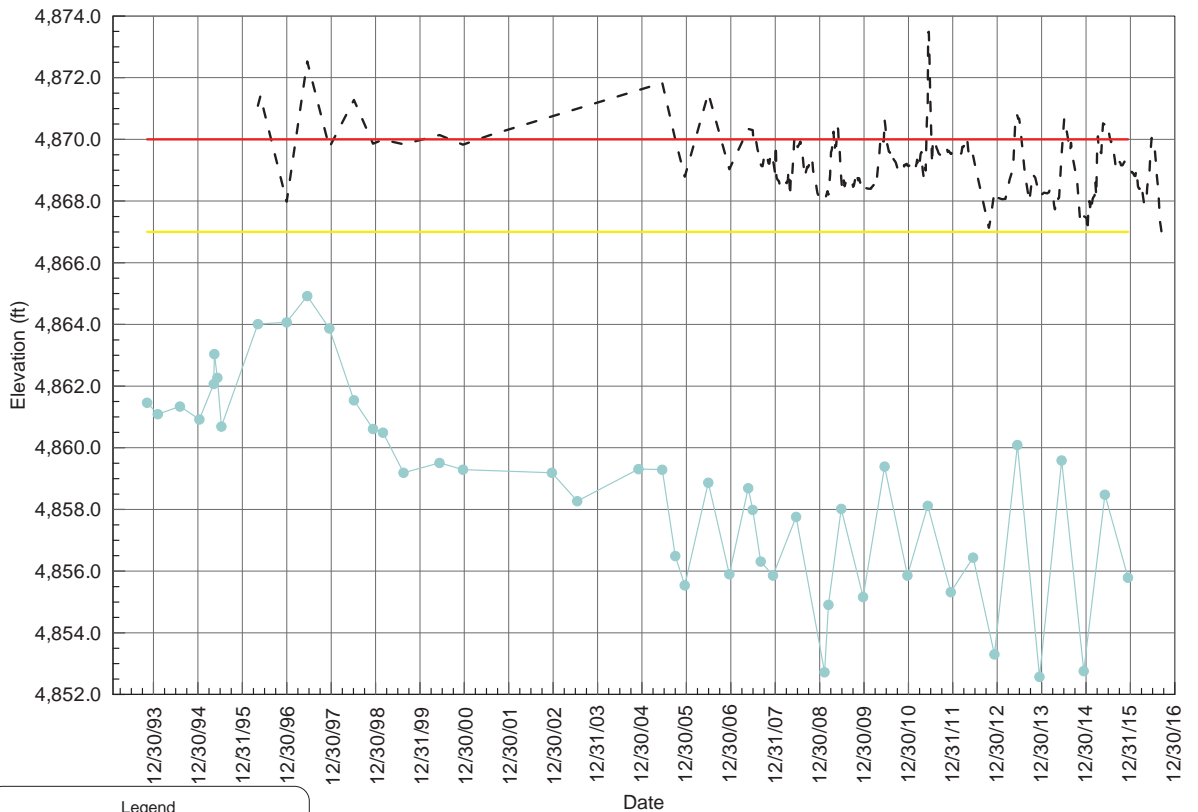
Date

Atlantic Richfield Company
Warm Springs Ponds



**PIEZOMETER
AH-A1
POND 3**

Belle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



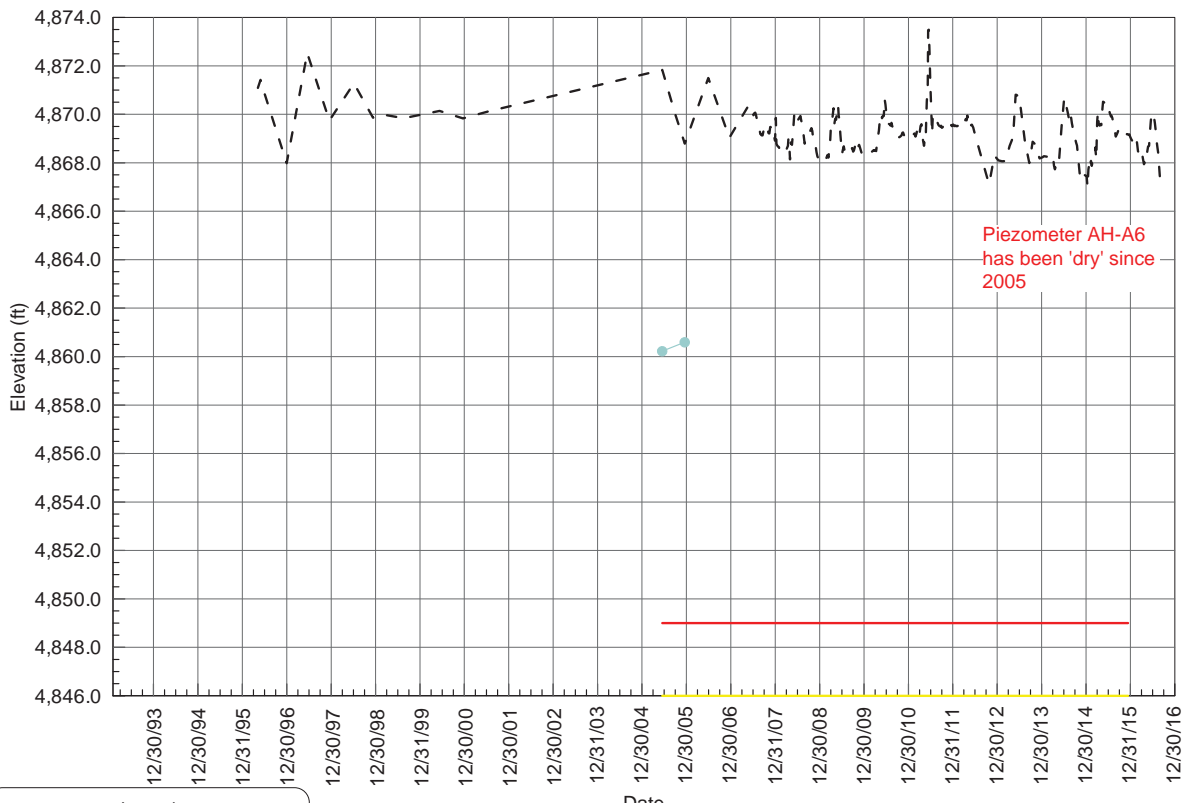
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A2
POND 3**

Belle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



Legend

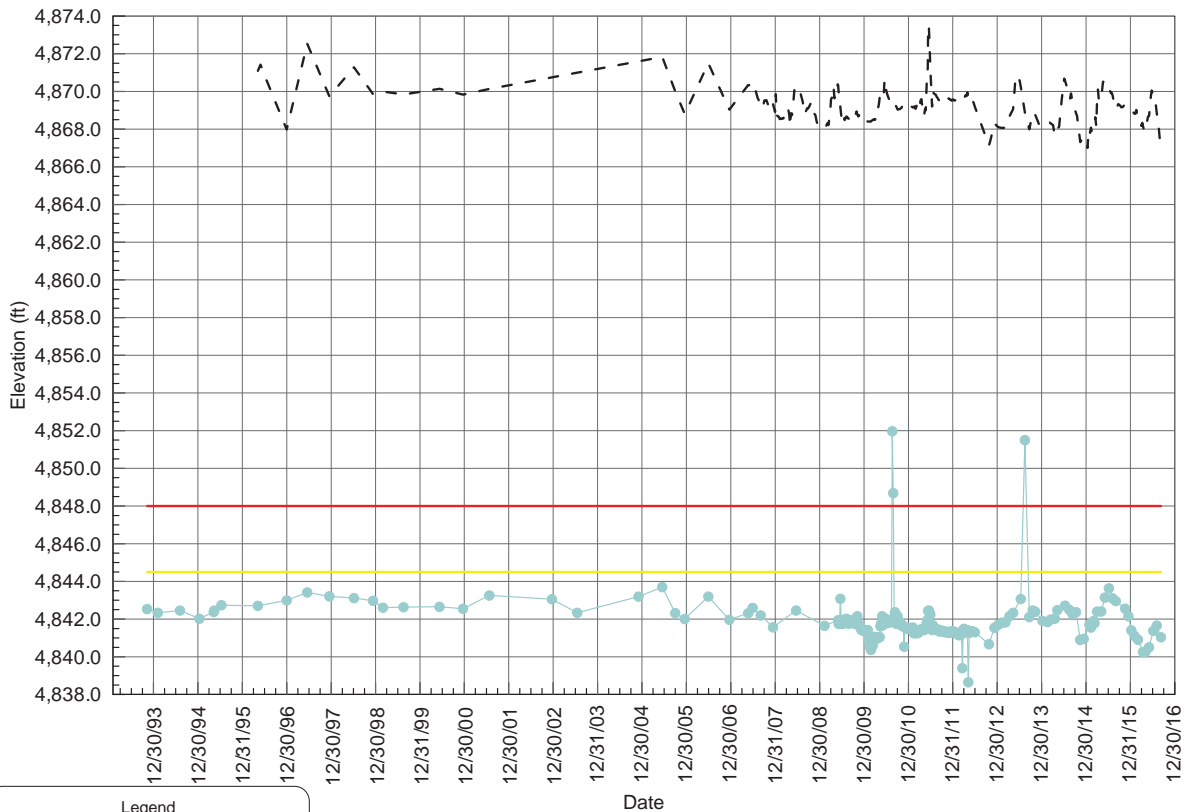
- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A6
POND 3**

Piezometer AH-A6
has been 'dry' since
2005

Baffle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers




Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

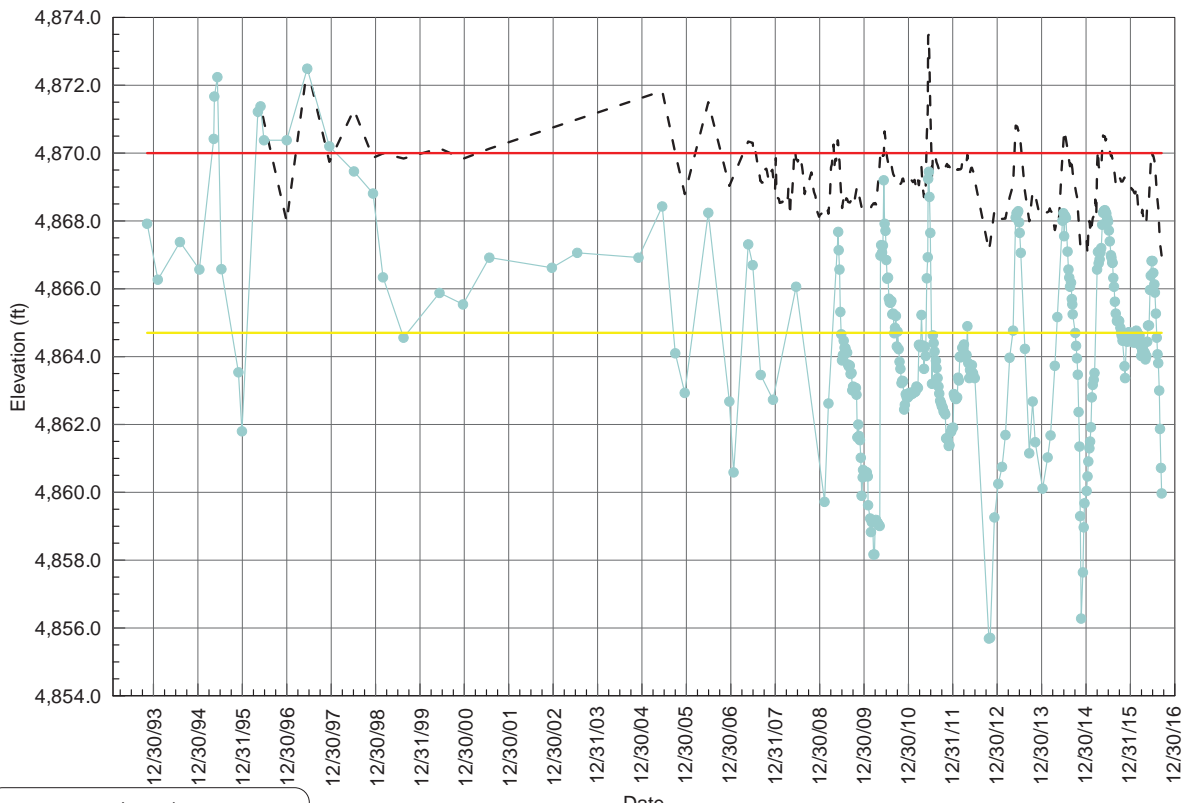
Date

Atlantic Richfield Company
Warm Springs Ponds



**PIEZOMETER
AH-A12
POND 3**

Baffle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers




Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

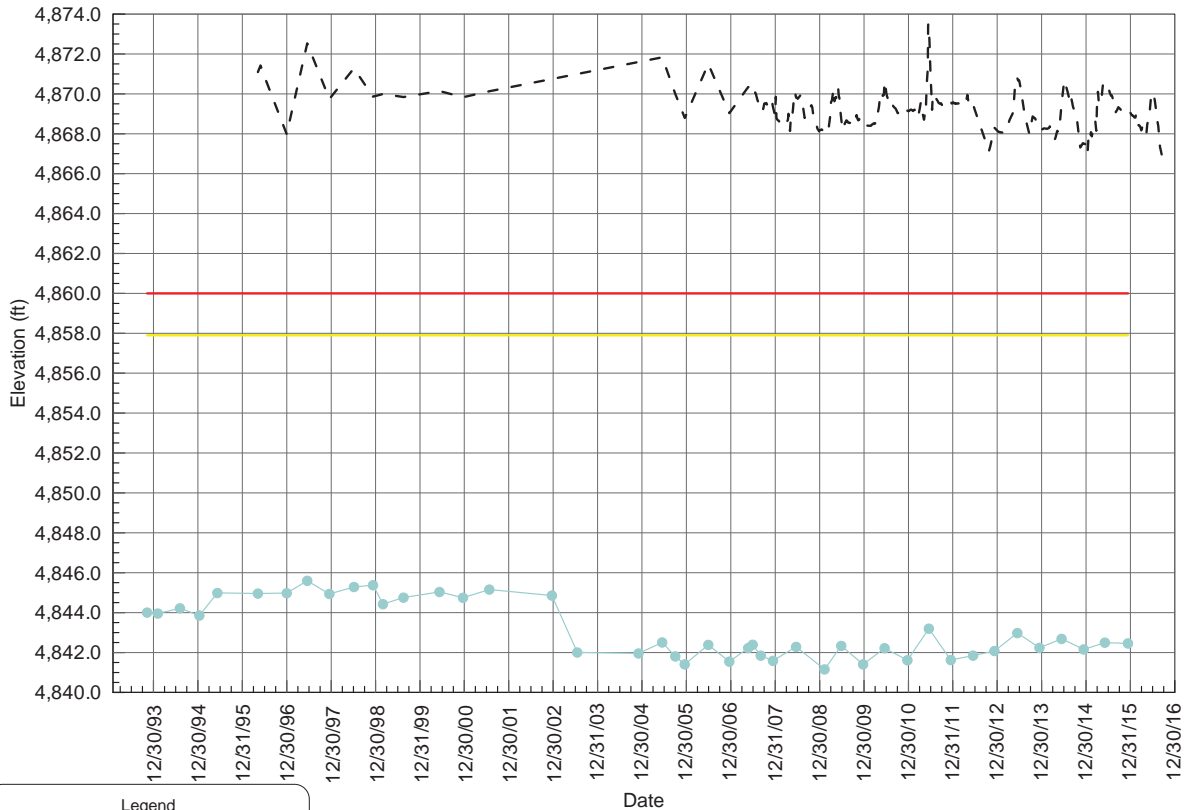
Date

Atlantic Richfield Company
Warm Springs Ponds



**PIEZOMETER
AH-A13
POND 3**

Baffle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



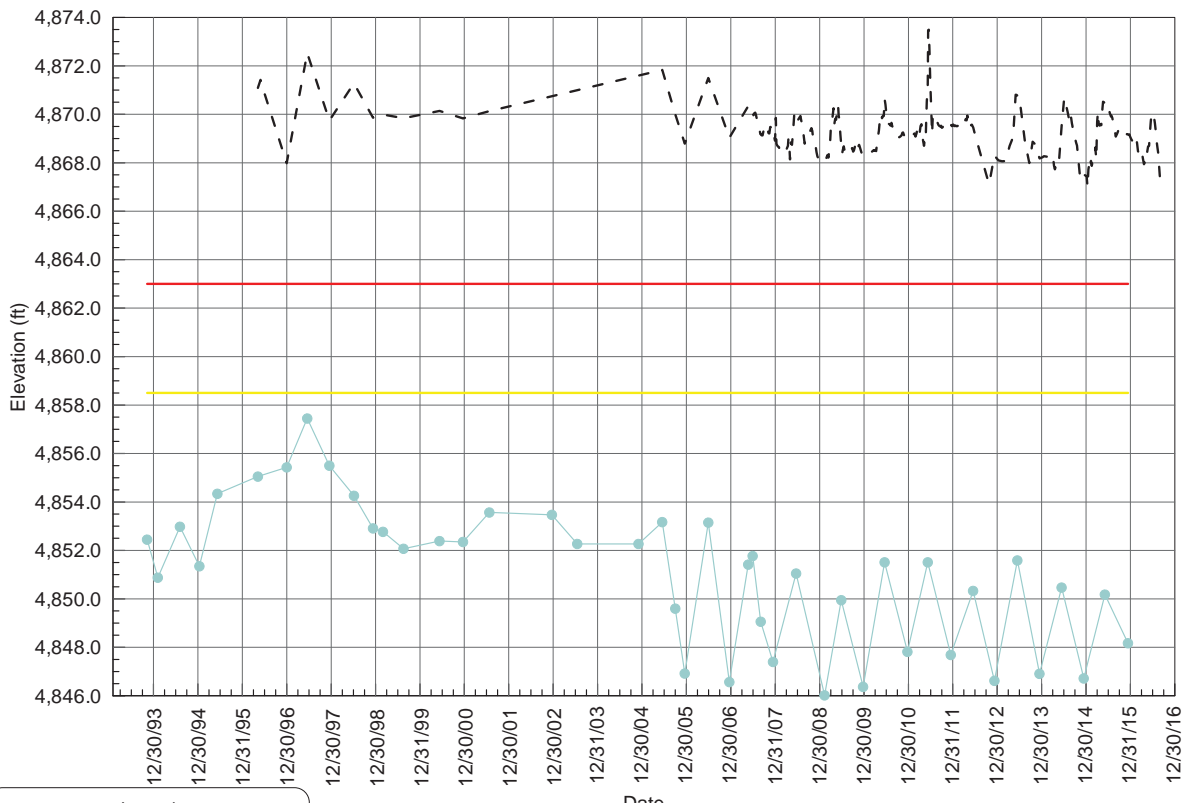
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A16
POND 3**

Baffle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



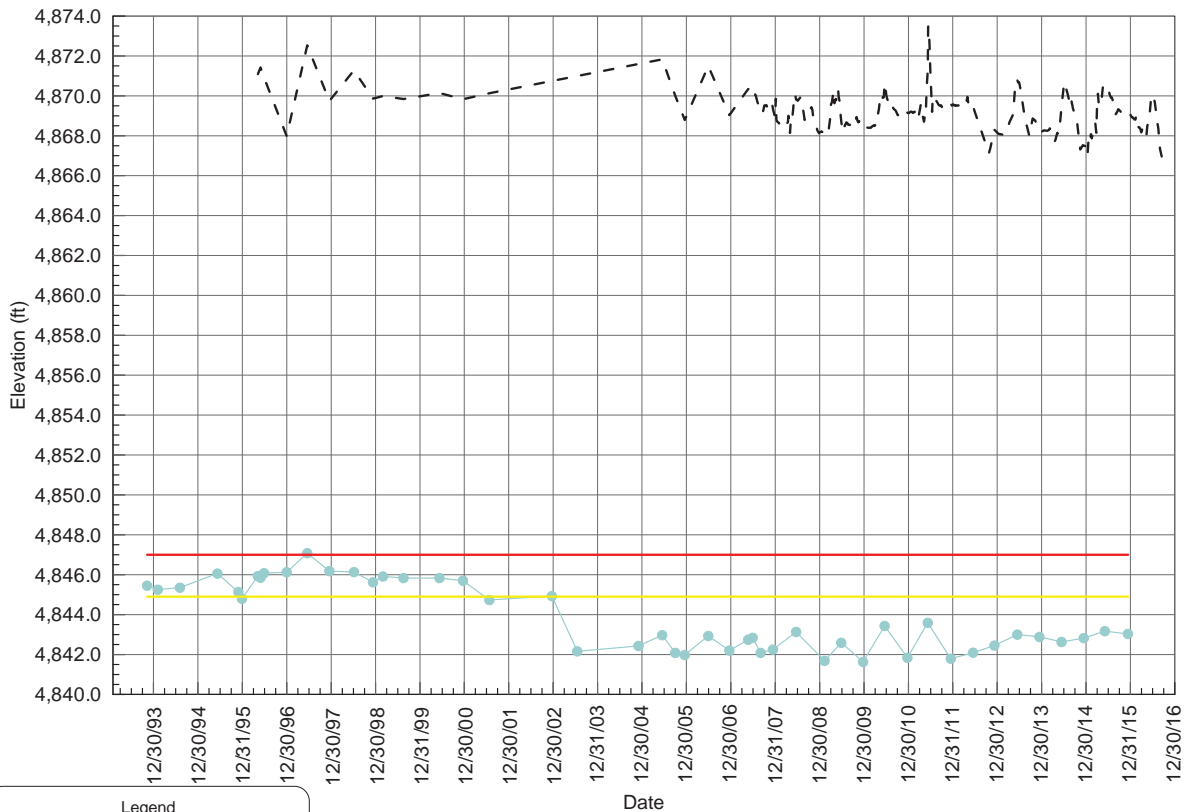
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A17
POND 3**

Bulle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



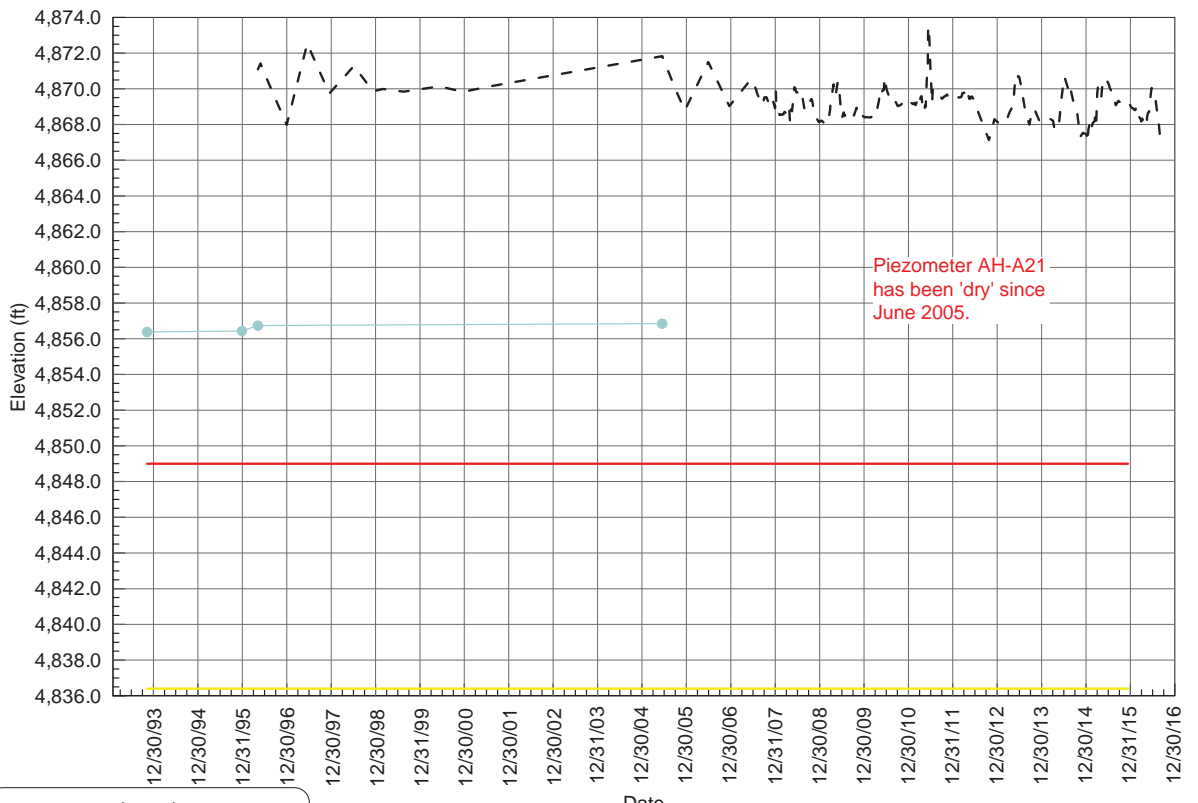
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A18
POND 3**

Bulle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



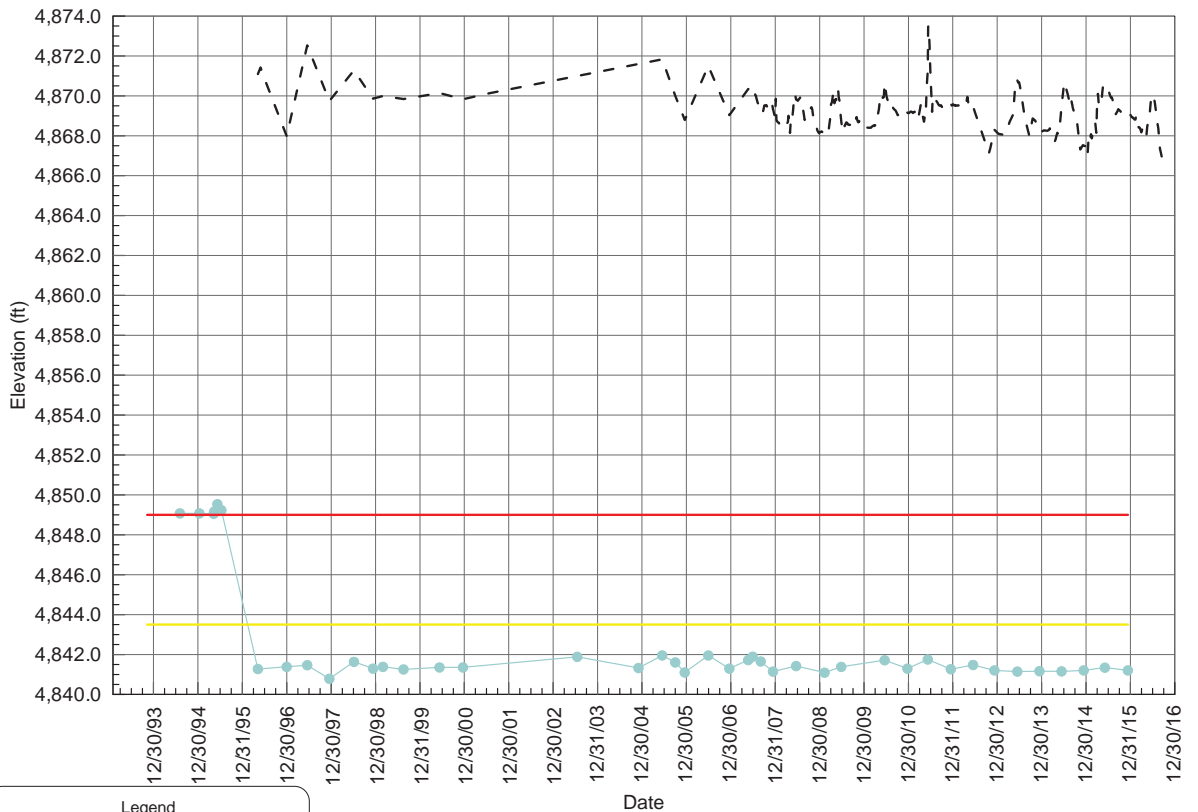
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A21
POND 3**

Bulle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



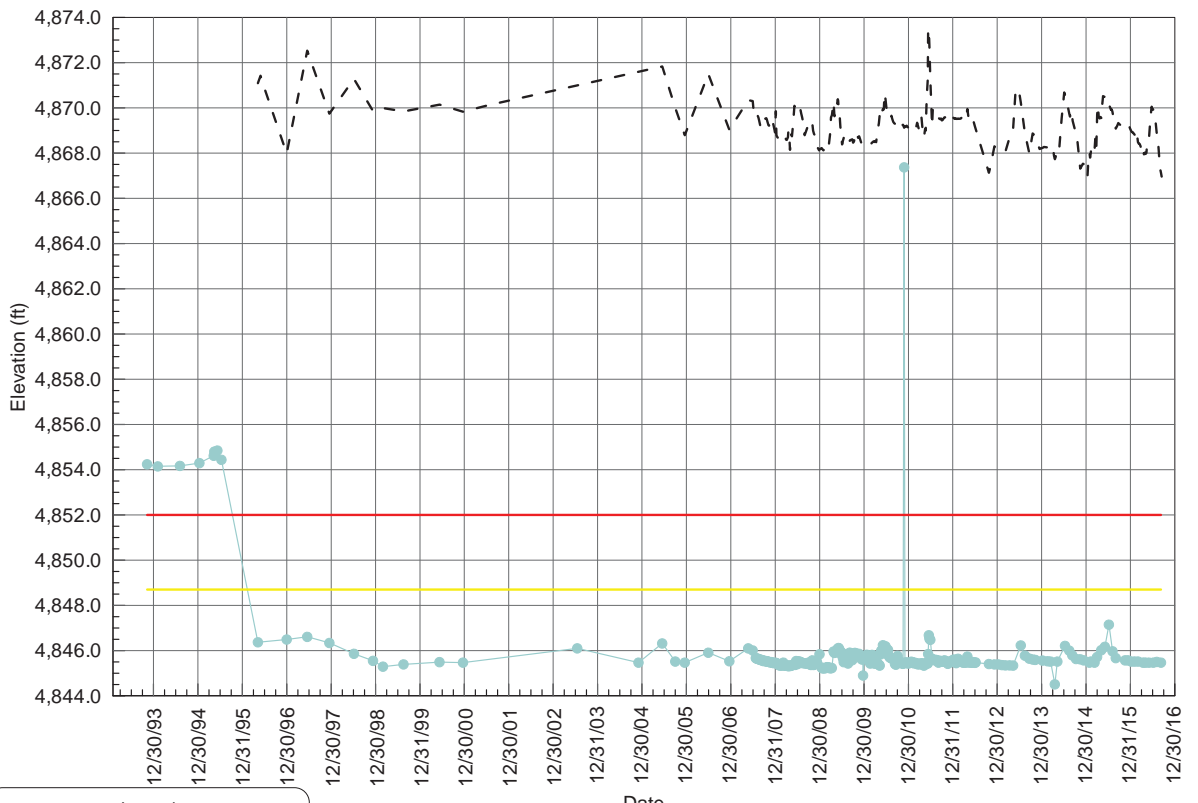
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A22
POND 3**

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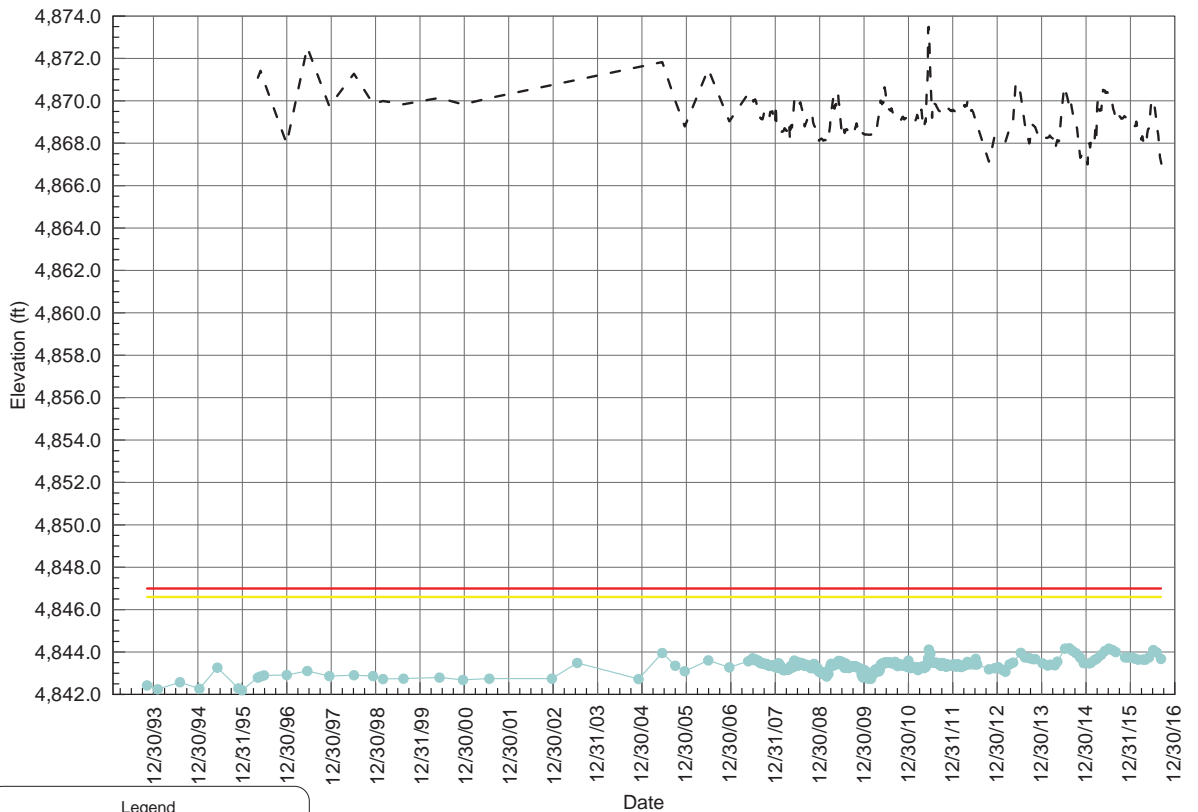
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A23
POND 3**

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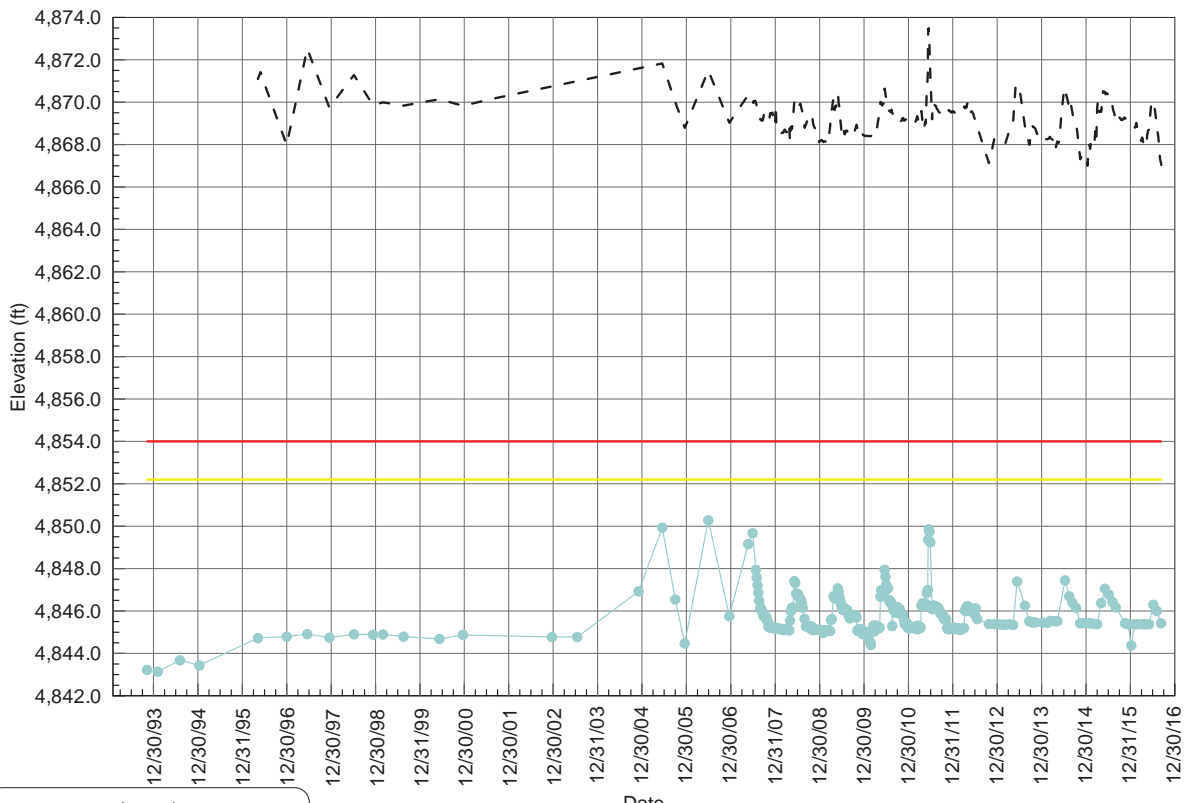
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A27
POND 3**

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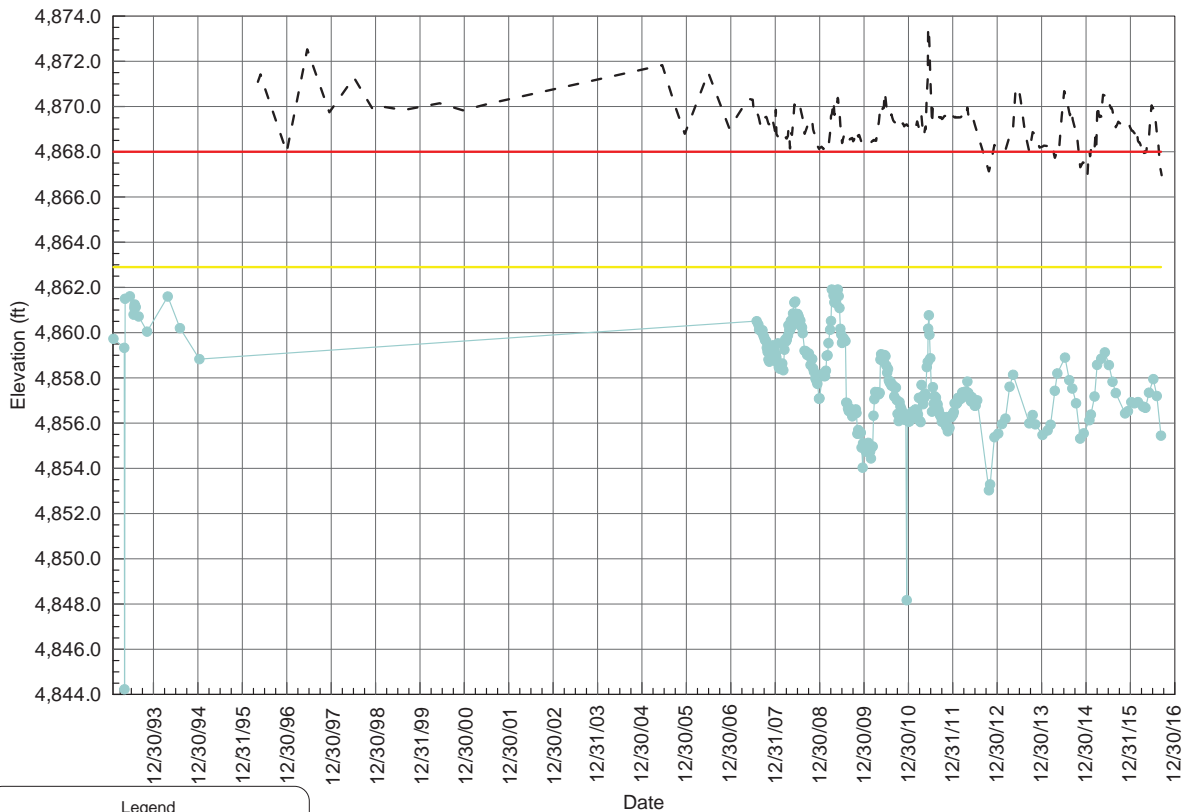
Legend

- - - Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
AH-A28
POND 3**

Bulle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



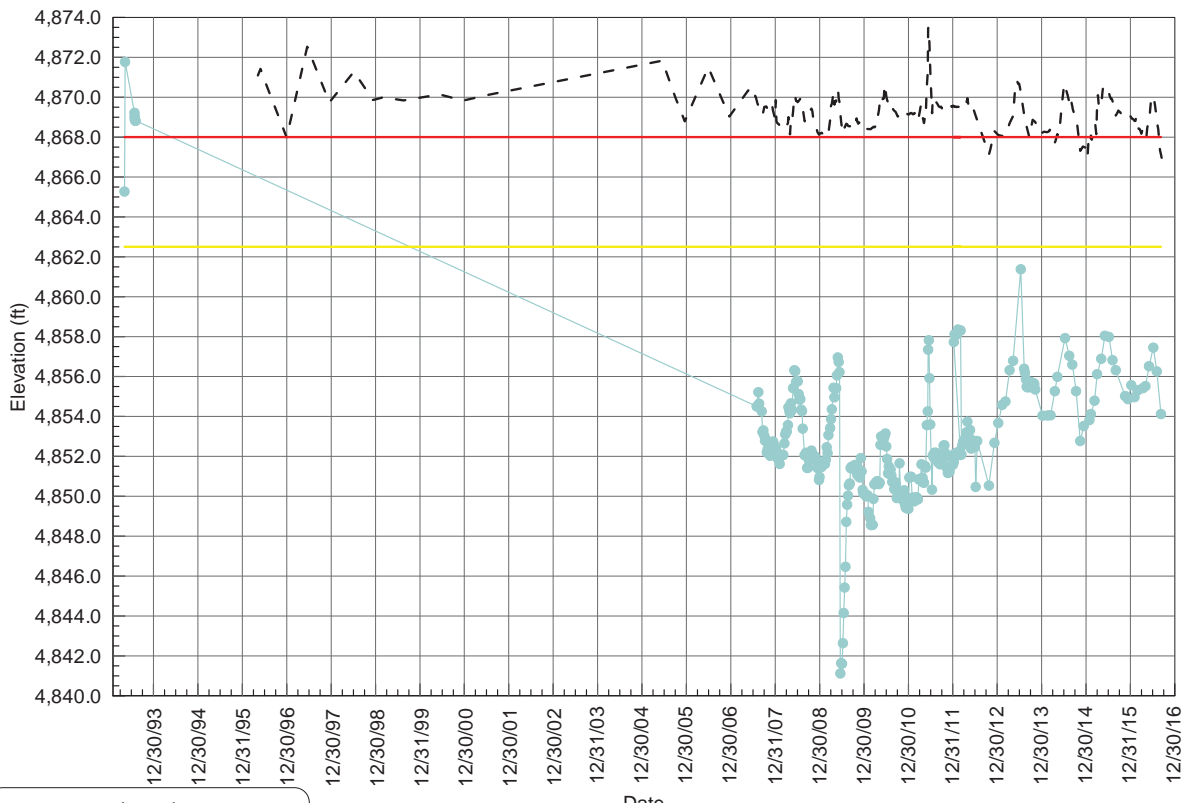
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
RW-A1
POND 3**

Bulle Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



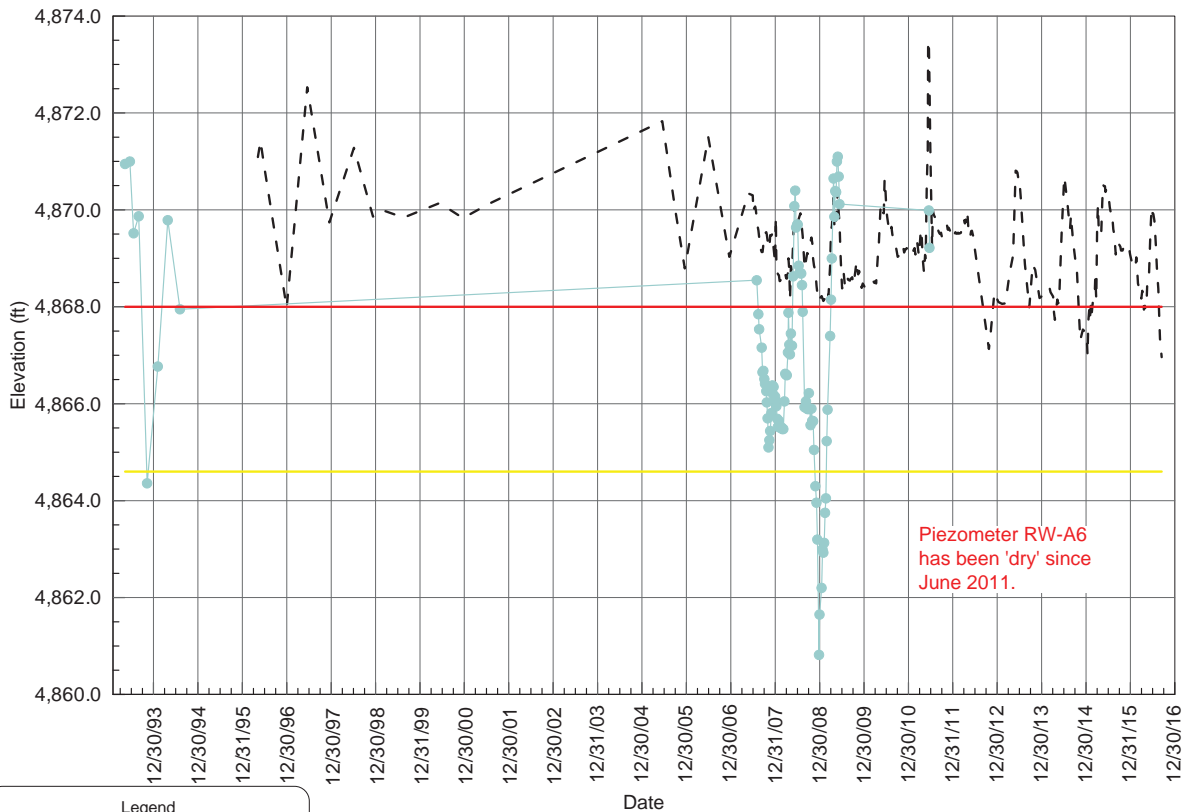
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

**PIEZOMETER
RW-A5
POND 3**

Build Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



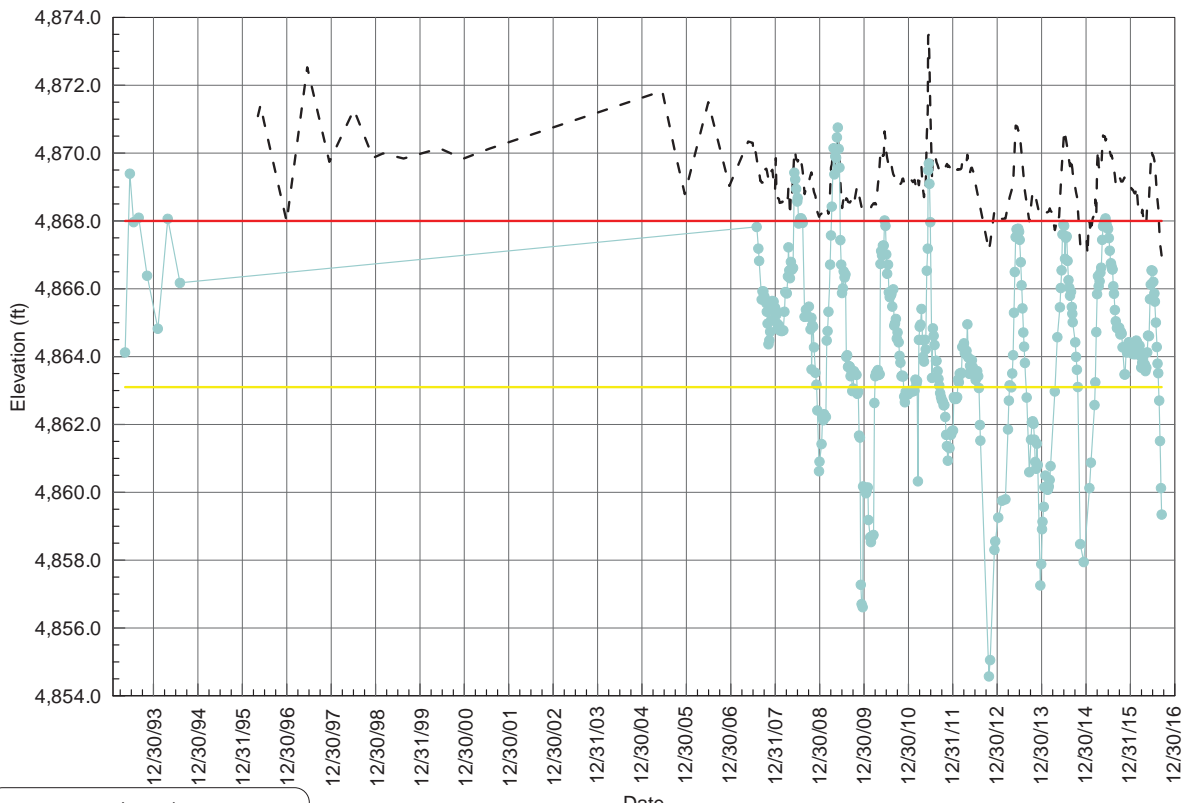
Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

PIEZOMETER RW-A6 POND 3

Build Server Data\ARCO\Warm Springs Ponds_OU2012\Piezometer Manual\2.0_DATA\Piezometers



Legend

- Pond Elevation
- Piezometer Phreatic Elevation
- Yellow Flag Level
- Red Flag Level

Atlantic Richfield Company
Warm Springs Ponds

PIEZOMETER RW-A7 POND 3

APPENDIX D

DRY CLOSURE INSPECTION FORMS AND PHOTO LOG

DRY-CLOSURE VEGETATION INSPECTION REPORT

JOB: WSP Dry-Closure Inspection

LOCATION: Warm Springs Ponds

SITE NAME: Pond 1 Dry-Closure

DATE: 8/19/2016

EVALUATORS: Cole Dallaserra

DRY-CLOSURE AREA INSPECTION SUMMARY

	Evaluation Date	Recommendation
Vegetation Inspection	8/19/2016	1
Erosion inspection	8/19/2016	0

Recommendation Key
0 = No Action - Site Complete
1 = Minor Action - Site Stable
2 = Small Areas Require Action - Site at Risk
3 = Significant Action Required - Site Unstable

VEGETATION INSPECTION

Estimated Canopy Cover	Uniformity of Vegetative Cover	Litter Accumulation	Evidence of Barren Areas (% Bare Area)
60-100%	Very Uniform	Heavy	None
40-59%	Cover Varies but no Significant barren areas	x Moderate	x <1-5%
x 30-39%		Light	5-10%
20-29%		Negligible	>10%
10-19%	Barren Areas present		
0-9%			

Evidence of Reproduction	Species Richness	Presence of Noxious Weeds
None	Were multiple species seeded? Yes	None
x Evidence of: seed head production, new plants from seed, new shoots from rhizomatous plants or tillering by bunchgrasses and shrubs	Are multiple species present? Yes	Infrequent
	See Species List Below	x Moderate
		Frequent
		Dominant
		See Species List

EROSION INSPECTION

Topography: Site is primarily flat and within a depression of surrounding dikes.

Evidence of Soil Movement	Evidence of Surface litter Movement	Presence of Rills and/or Gullies
x None	None	x None
Slight soil movement/translocation	x (mostly due to wind)	<5% of litter translocated/deposited
Moderate soil movement/translocation		5-25% of litter translocated/deposited
Sever soil movement/translocation		>25% of litter translocated/deposited

Evidence of Coarse Fragment Movement	Erosion Potential of Site
x None	x Site is Stable
<5% of coarse fragment translocated/redeposited	Slight potential
5-25% of coarse fragment translocated/redeposited	Site is at risk
>25% of coarse fragment translocated/redeposited	Site is in Critical Condition
	Site is in Sever Condition

OBSEVED SPECIES LIST						
(m= major species; c = common species; x = other species)						
COMMON NAME	SCIENTIFIC NAME	Year				
		2014	2015	2016		
GRASS SPECIES						
Great Basin Wildrye	<i>Elymus cinereus</i>	m	m	m		
Sheep's Fescue	<i>Festuca ovina</i>	x	x	x		
Crested Wheatgrass	<i>Agropyron cristatum</i>	c	c	x		
Slender Wheatgrass	<i>Agropyron trachycaulum</i>	c	c	c		
Western Wheatgrass	<i>Agropyron smithii</i>	x	x	x		
Smooth Brome	<i>Bromus inermis</i>	c	x	x		
Red Top	<i>Agrostis alba</i>	m	c	c		
Sandberg bluegrass	<i>Poa secunda</i>		x	c		
Idaho Fescue	<i>Festuca idahoensis</i>		x	c		
Tufted Hair Grass	<i>Deschampsia cespitosa</i>	x	x	x		
Kentucky Bluegrass	<i>Poa pratensis</i>	c	x	x		
Needle N Thread	<i>Stipa viridula</i>			x		
Indian Ricegrass	<i>Oryzopsis hymenoides</i>	x	x	x		
Foxtail Barley	<i>Hordeum jubatum</i>	x	x	x		
Tickle grass	<i>Agrostis scabra</i>			x		
Garrison Meadow grass	<i>Alopecurus pratensis</i>			x		
Baltic Rush	<i>Juncus balticus</i>	x	x	x		
FORB SPECIES						
Yellow Sweetclover	<i>Melilotus officinalis</i>	x	x	x		
Salsify (Goats-Beard)	<i>Tragopogon dubius</i>	x	x			
Milkvetch	<i>Astragalus spp.</i>	x	x	x		
Alfalfa	<i>Medicago sativa</i>		x	x		
Fringed sage	<i>Artemisia fridgida</i>		x	x		
Aster	<i>Aster conspicuus</i>		x			
SHRUB and TREE SPECIES						
Rubber Rabbitbrush	<i>Chrysothamnus nauseosus</i>	x		x		
Cottonwood	<i>Populus spp.</i>			x		
Booth Willow	<i>Salix boothii</i>	x				
UNDESIRABLE WEEDY SPECIES						
Common Mullein	<i>Verbascum thapsus</i>	x	c	c		
Cheatgrass	<i>Bromus tectorum</i>	x	x	x		
Common Dandelion	<i>Taraxacum officinale</i>	x	x	x		
Tumbling Hedge Mustard	<i>Sisymbrium altissimum</i>	x	x			
Common Tansy Mustard	<i>Descurainia richardsonii</i>	x	x	x		
Russian Thistle	<i>Salsola iberica</i>	x	x			
Prickly Lettuce	<i>Lactuca serriola</i>		x	x		
Russian Olive	<i>Elaeagnus angustifolia</i>	x	x	x		
NOXIOUS WEEDS (I=Infrequent; F=Frequent; C=Common; D=Dominant)						
White Top	<i>Cardaria draba</i>	F	I	I		
Spotted Knapweed	<i>Centuarea maculosa</i>	I	F	I		
Canada Thistle	<i>Cirsium arvense</i>		I	I		
Perennial Pepperweed	<i>Lepidium latifolium</i>		I	C		
Yellow Toadflax	<i>Linaria vulgaris</i>		I			
Leafy Spurge	<i>Euphorbia esula</i>	C	I	C		

SUMMARY:

Pond 1 Dry Closure is a relatively flat area with good vegetative cover. The site is predominantly vegetated with grasses with Big Basin Wildrye the dominant species. Cover is fairly uniform with some areas less densely vegetated, primarily due to the very rocky substrate present at the site. There are a few sporadic occurrences of barren areas present (see figure for location), but nothing that merits immediate remedial action. Bare area 2 identified in 2014 continues to improve and appears to be trending upward (see photos). The locations should continue to be monitored to determine trend and if any remedial action is necessary. Minimal occurrences of noxious weeds occur throughout the site with some communities more dense than others. The southeast quadrant (also called out in 2014 and improved in 2015) has some high occurrences of leafy spurge. It is recommended that the site be sprayed with an appropriate herbicide twice annual. Once in the early vegetative stages of the weeds and once before the weeds flower out and seed. The northeast quadrant is also experiencing some higher densities of perennial pepperweed and should be sprayed with herbicide twice annually as well. The site is relatively flat and has low erosion potential. There are some areas with miscellaneous debris and trash that could be cleaned out. There area also some soil cement chunks, primarily northwest quadrant, left on site from clean-up during dike construction. See attached photo log for site pictures and their descriptions.

DRY-CLOSURE VEGETATION INSPECTION REPORT

JOB: WSP Dry-Closure Inspection

LOCATION: Warm Springs Ponds

SITE NAME: Pond 2 East Dry-Closure

DATE: 8/19/2016

EVALUATORS: Cole Dallaserra

DRY-CLOSURE AREA INSPECTION SUMMARY

	Evaluation Date	Recommendation
Vegetation Inspection	8/19/2016	2
Erosion inspection	8/19/2016	0

Recommendation Key

0 = No Action - Site Complete
 1 = Minor Action - Site Stable
 2 = Small Areas Require Action - Site at Risk
 3 = Significant Action Required - Site Unstable

VEGETATION INSPECTION

Estimated Canopy Cover		Uniformity of Vegetative Cover		Litter Accumulation		Evidence of Barren Areas (% Bare Area)	
	60-100%	x	Very Uniform		Heavy		None
x	40-59%		Cover Varies but no Significant barren areas	x	Moderate	x	<1-5%
	30-39%				Light		5-10%
	20-29%				Negligible		>10%
	10-19%		Barren Areas present				
	0-9%						

Evidence of Reproduction		Species Richness		Presence of Noxious Weeds	
	None	Were multiple species seeded?	Yes		None
x	Evidence of: seed head production, new plants from seed, new shoots from rhizomatous plants or tillering by bunchgrasses and shrubs	Are multiple species present?	Yes		Infrequent
		See Species List Below			Moderate
				x	Frequent
					Dominant
				See Species List	

EROSION INSPECTION

Topography: Site is primarily flat and at the toe of surrounding dikes.

Evidence of Soil Movement		Evidence of Surface litter Movement		Presence of Rills and/or Gullies	
x	None	x	None	x	None
	Slight soil movement/translocation		<5% of litter translocated/deposited		Few
	Moderate soil movement/translocation		5-25% of litter translocated/deposited		Some
	Sever soil movement/translocation		>25% of litter translocated/deposited		Frequent
					Sever

Evidence of Coarse Fragment Movement		Erosion Potential of Site	
x	None	x	Site is Stable
	<5% of coarse fragment translocated/redeposited		Slight potential
	5-25% of coarse fragment translocated/redeposited		Site is at risk
	>25% of coarse fragment translocated/redeposited		Site is in Critical Condition
			Site is in Sever Condition

OBSEVED SPECIES LIST						
(m= major species; c = common species; x = other species)						
COMMON NAME	SCIENTIFIC NAME	Year				
		2014	2015	2016		
GRASS SPECIES						
Great Basin Wildrye	<i>Elymus cinereus</i>	m	m	c		
Sheep's Fescue	<i>Festuca ovina</i>	m	m	x		
Smooth Brome	<i>Bromus inermis</i>	m	m	c		
Red Top	<i>Agrostis alba</i>	m	m	m		
Western Wheatgrass	<i>Agropyron smithii</i>	x	x	x		
Slender Wheatgrass	<i>Agropyron trachyculum</i>	x	x	x		
Red Top	<i>Agrostis alba</i>	x	x	x		
Baltic Rush	<i>Juncus balticus</i>	x	x	x		
Tickle Grass	<i>Agrostis scabra</i>		x	x		
Tuft hairgrass	<i>Deschampsia cespitosa</i>			x		
FORB SPECIES						
Yellow Sweetclover	<i>Melilotus officinalis</i>	x	x	x		
Salsify (Goats-Beard)	<i>Tragopogon dubius</i>	x	x			
Aster	<i>Aster asendens</i>		x			
Western Yarrow	<i>Achillea millefolium</i>		x			
Curlycup gumweed	<i>Grindelia squarrosa</i>			x		
SHRUB and TREE SPECIES						
Rubber Rabbitbrush	<i>Chrysothamnus nauseosus</i>	x	x	c		
Booth Willow	<i>Salix boothii</i>	x	x	x		
Finged Sagewort	<i>Artemisia frigida</i>	x	x	x		
Common Juniper	<i>Juniperus communis</i>			x		
UNDESIRABLE WEEDY SPECIES						
Common Mullein	<i>Verbascum thapsus</i>	x	x	x		
Tumbling Hedge Mustard	<i>Sisymbrium altissimum</i>	x	x			
Tansy Mustard	<i>Descurainia richardsonii</i>	x	x			
Russian Olive	<i>Elaeagnus angustifolia</i>	x	x	c		
Common peppergrass	<i>Lepidium densiflorum</i>		x			
NOXIOUS WEEDS (I=Infrequent; F=Frequent; C=Common; D=Dominant)						
White Top	<i>Cardaria draba</i>	I	I	I		
Dalmatian Toadflax	<i>Linaria dalmatica</i>	I	I	I		
Spotted Knapweed	<i>Centuarea maculosa</i>	I	I	F		
Prennial Pepperweed	<i>Lepidium latifolium</i>		I			
Canada thistle	<i>Cirsium arvense</i>		I	I		
Leafy Spurge	<i>Euphorbia esula</i>	I	I	I		

SUMMARY:

Pond 2 East Dry-Closure is a relatively flat area located at the toe of the dike between Pond 2 and 3. The site has experienced an infestation of spotted knapweed (*Centuarea maculosa*) this past year with frequent occurrences at high densities. The site still has a good composition of desirable species and should be sprayed twice annually (once during the early vegetative stages and once before targeted species flower and go to seed) to help suppress the spotted knapweed infestation. If left untreated, the knapweed will out compete the native vegetative community and would cause a undesirable shift in the vegetative composition of the site. Also noted, was the occurrence of Russian olive (*Elaeagnus angustifolia*) seedlings on the site. Though these are not a listed noxious weed, they are still undesirable and should be controlled. The observation point called out it 2014 (presence of drill seed rows) has complete grown in and the rows are not evident.

DRY-CLOSURE VEGETATION INSPECTION REPORT

JOB: WSP Dry-Closure Inspection

LOCATION: Warm Springs Ponds

SITE NAME: Pond 2 East Wildlife Dry-Closure

DATE: 8/19/2016

EVALUATORS: Cole Dallaserra

DRY-CLOSURE AREA INSPECTION SUMMARY

	Evaluation Date	Recommendation
Vegetation Inspection	8/19/2016	2
Erosion inspection	8/19/2016	2

Recommendation Key
0 = No Action - Site Complete
1 = Minor Action - Site Stable
2 = Small Areas Require Action - Site at Risk
3 = Significant Action Required - Site Unstable

VEGETATION INSPECTION

Estimated Canopy Cover	Uniformity of Vegetative Cover	Litter Accumulation	Evidence of Barren Areas (% Bare Area)
60-100%	Very Uniform	Heavy	None
40-59%	Cover Varies but no Significant barren areas	Moderate	<1-5%
30-39%		x Light	5-10%
x 20-29%		Negligible	x >10%
10-19%	Barren Areas present		
0-9%		x	

Evidence of Reproduction	Species Richness	Presence of Noxious Weeds
None	Were multiple species seeded? Yes	None
x Evidence of: seed head production, new plants from seed, new shoots from rhizomatous plants or tillering by bunchgrasses and shrubs	Are multiple species present? Yes	x Infrequent
	See Species List Below	Moderate
		Frequent
		Dominant
		See Species List

EROSION INSPECTION

Topography: Site is primarily flat and within a depression of surrounding dikes.

Evidence of Soil Movement	Evidence of Surface litter Movement	Presence of Rills and/or Gullies
None	None	x None
x Slight soil movement/translocation	x <5% of litter translocated/deposited	Few
Moderate soil movement/translocation	5-25% of litter translocated/deposited	Some
Sever soil movement/translocation	>25% of litter translocated/deposited	Frequent
		Sever

Evidence of Coarse Fragment Movement	Erosion Potential of Site
x None	Site is Stable
<5% of coarse fragment translocated/redeposited	Slight potential
5-25% of coarse fragment translocated/redeposited	x Site is at risk
>25% of coarse fragment translocated/redeposited	Site is in Critical Condition
	Site is in Sever Condition
	See Summary below for details

OBSEVED SPECIES LIST						
(m= major species; c = common species; x = other species)						
COMMON NAME	SCIENTIFIC NAME	Year				
		2014	2015	2016		
GRASS SPECIES						
Great Basin Wildrye	<i>Elymus cinereus</i>	c	c	c		
Sheep's Fescue	<i>Festuca ovina</i>	c	x	x		
Crested Wheatgrass	<i>Agropyron cristatum</i>	x	x	x		
Prairie Junegrass	<i>Koeleria macrantha</i>	x	x	x		
Western Wheatgrass	<i>Agropyron smithii</i>	x	x	x		
Smooth Brome	<i>Bromus inermis</i>	x	x	x		
Needle and Thread	<i>Hesperostipa comota</i>	x	x	x		
Baltic Rush	<i>Juncus balticus</i>	x	x	x		
Red Top	<i>Agrostis alba</i>	x	x	x		
Slender Wheatgrass	<i>Agropyron trachyculum</i>		x	x		
Tickle grass	<i>Agrostis scabra</i>		x	x		
Intermediate Wheatgrass	<i>Thinopyrum intermedium</i>			x		
FORB SPECIES						
Yellow Sweetclover	<i>Melilotus officinalis</i>		x	x		
Scorpion weed	<i>Phacelia hastata</i>		x			
SHRUB and TREE SPECIES						
Rubber Rabbitbrush	<i>Chrysothamnus nauseosus</i>		x	x		
UNDESIRABLE WEEDY SPECIES						
Common Mullein	<i>Verbascum thapsus</i>	x	c	c		
Cheatgrass	<i>Bromus tectorum</i>	x	x	x		
Tansy Mustard	<i>Descurainia richardsonii</i>			x		
NOXIOUS WEEDS (I=Infrequent; F=Frequent; C=Common; D=Dominant)						
Kochia	<i>Kochia scoparia</i>	I	I	c		
Leafy Spurge	<i>Euphorbia esula</i>	I	I	I		
Black Henbane	<i>Hyoscyamus niger</i>		I			
Yellow Toadflax	<i>Linaria vulgaris</i>		I	I		

SUMMARY:

Pond 2 East Wildlife Dry-Closure is a relatively flat site at the toe of the dike between Pond 2 and 3. The site has a very rocky substrate with minimal topsoil. Vegetative cover across that site has continued to improve from the 2014 and 2015 evaluations. Evidence of the drill seed lines are still persistent at the site. The primary concern with the site, is the unvegetated area at the east end of the site. Due to the condition of the east side of the site during the timing of the inspection, resulted in the determination of the site being at risk for the high erosion potential of the exposed bare ground. The unvegetated area on the east end is also experiencing some issues with Kochia starting to establish. This area should be reclaimed and re-vegetated following appropriate re-vegetation standard practices and seeded with a native seed-mix during the fall seeding period. The site should be monitored frequently after the reclamation effort to monitor success and any occurrences of noxious weeds that may hinder desirable species establishment. This area should also be spot sprayed twice annually for noxious weeds. Once during the early vegetative stages of the weeds, and again before the weeds flower and go to seed to ensure complete coverage. Additionally, as noted in the species list, the occurrence of Common mullein has continued to increase at the site especially along the toe of the dike. Mullien is not a listed noxious weed but is an undesirable nuisance weed. See attached photo log for associated pictures and their descriptions.

DRY-CLOSURE VEGETATION INSPECTION REPORT

JOB: WSP Dry-Closure Inspection

LOCATION: Warm Springs Ponds

SITE NAME: Pond 3 Inlet Dry-Closure

DATE: 8/16/2016

EVALUATORS: Cole Dallaserra

DRY-CLOSURE AREA INSPECTION SUMMARY

	Evaluation Date	Recommendation
Vegetation Inspection	8/16/2016	1
Erosion inspection	8/16/2016	0

Recommendation Key

0 = No Action - Site Complete
 1 = Minor Action - Site Stable
 2 = Small Areas Require Action - Site at Risk
 3 = Significant Action Required - Site Unstable

VEGETATION INSPECTION

Estimated Canopy Cover		Uniformity of Vegetative Cover		Litter Accumulation		Evidence of Barren Areas (% Bare Area)	
	60-100%	x	Very Uniform		Heavy		None
x	40-59%		Cover Varies but no Significant barren areas	x	Moderate	x	<1-5%
	30-39%				Light		5-10%
	20-29%				Negligible		>10%
	10-19%		Barren Areas present				
	0-9%						

Evidence of Reproduction		Species Richness		Presence of Noxious Weeds	
	None	Were multiple species seeded?	Yes		None
x	Evidence of: seed head production, new plants from seed, new shoots from rhizomatous plants or tillering by bunchgrasses and shrubs	Are multiple species present?	Yes	x	Infrequent
		See Species List Below			Moderate
					Frequent
					Dominant
				See Species List	

EROSION INSPECTION

Topography: Site is primarily flat

Evidence of Soil Movement		Evidence of Surface litter Movement		Presence of Rills and/or Gullies	
x	None	x	None	x	None
	Slight soil movement/translocation		<5% of litter translocated/deposited		Few
	Moderate soil movement/translocation		5-25% of litter translocated/deposited		Some
	Sever soil movement/translocation		>25% of litter translocated/deposited		Frequent
					Sever

Evidence of Coarse Fragment Movement		Erosion Potential of Site	
x	None	x	Site is Stable
	<5% of coarse fragment translocated/redeposited		Slight potential
	5-25% of coarse fragment translocated/redeposited		Site is at risk
	>25% of coarse fragment translocated/redeposited		Site is in Critical Condition
			Site is in Sever Condition

OBSEVED SPECIES LIST						
(m= major species; c = common species; x = other species)						
COMMON NAME	SCIENTIFIC NAME	Year				
		2014	2015	2016		
GRASS SPECIES						
Great Basin Wildrye	<i>Elymus cinereus</i>	m	m	m		
Sheep's Fescue	<i>Festuca ovina</i>	x	x	x		
Crested Wheatgrass	<i>Agropyron cristatum</i>	c	c	c		
Slender Wheatgrass	<i>Agropyron trachycaulum</i>	c	c	c		
Western Wheatgrass	<i>Agropyron smithii</i>	x	x	x		
Smooth Brome	<i>Bromus inermis</i>	c	c	c		
Indian Ricegrass	<i>Oryzopsis hymenoides</i>	x	x	x		
Sandber Bluegrass	<i>Poa secunda</i>	x	x	c		
Kentucky Bluegrass	<i>Poa pratensis</i>	x	x	x		
Needle and Thread	<i>Hesperostipa comata</i>	x	x	x		
Baltic Rush	<i>Juncus balticus</i>	x	x			
Red Top	<i>Agrostis alba</i>			x		
FORB SPECIES						
Yellow Sweetclover	<i>Melilotus officinalis</i>		x			
Salsify (Goats-Beard)	<i>Tragopogon dubius</i>		x			
SHRUB and TREE SPECIES						
Rubber Rabbitbrush	<i>Chrysothamnus nauseosus</i>	x	x	x		
UNDESIRABLE WEEDY SPECIES						
Common Mullein	<i>Verbascum thapsus</i>	x	x	x		
Cheatgrass	<i>Bromus tectorum</i>	x	x	x		
Tansy Mustard	<i>Descurainia richardsonii</i>	x	x	x		
Common Dandelion	<i>Taraxacum officinale</i>		x			
Halogeton	<i>Halogeton glomeratus</i>		x			
Common Pepperweed	<i>Lepidium densiflorum</i>			x		
NOXIOUS WEEDS (I=Infrequent; F=Frequent; C=Common; D=Dominant)						
White Top	<i>Cardaria draba</i>	I	I	I		
Leafy Spurge	<i>Euphorbia esula</i>	I	I	I		

SUMMARY:

Pond 3 Inlet Dry Closure is a relatively flat area with good vegetative cover. The site is predominantly vegetated with grasses with Big Basin Wildrye the dominant species. Cover is uniform with minimal occurrences of noxious weeds. The site has good litter accumulation and biotic crusting. The scar on the southwest side of the site called out in 2014 has continued to improve with even more desirable cover than noted in 2015. However, the windrow from the blade from cutting in the access road is still prevalent. It is recommended that the site be spot sprayed twice annually for noxious weeds. Once in the early vegetative stages of the weeds and once before the weeds flower out and seed. The site is relatively flat and has low erosion potential. There area also some soil cement chunks left on site from clean-up during dike construction that could removed and disposed of. See attached photo log for site pictures and their descriptions.

DRY-CLOSURE VEGETATION INSPECTION REPORT

JOB: WSP Dry-Closure Inspection

LOCATION: Warm Springs Ponds

SITE NAME: Pond 3 Main Dry-Closure

DATE: 8/18/2016

EVALUATORS: Cole Dallaserra

DRY-CLOSURE AREA INSPECTION SUMMARY

	Evaluation Date	Recommendation
Vegetation Inspection	8/18/2016	1
Erosion inspection	8/18/2016	0

Recommendation Key

0 = No Action - Site Complete
 1 = Minor Action - Site Stable
 2 = Small Areas Require Action - Site at Risk
 3 = Significant Action Required - Site Unstable

VEGETATION INSPECTION

Estimated Canopy Cover		Uniformity of Vegetative Cover	Litter Accumulation	Evidence of Barren Areas (% Bare Area)			
	60-100%	x	Very Uniform	Heavy	None		
x	40-59%		Cover Varies but no Significant barren areas	x	Moderate	x	<1-5%
	30-39%				Light		5-10%
	20-29%				Negligible		>10%
	10-19%		Barren Areas present				
	0-9%						

Evidence of Reproduction		Species Richness		Presence of Noxious Weeds	
	None	Were multiple species seeded?	Yes		None
x	Evidence of: seed head production, new plants from seed, new shoots from rhizomatous plants or tillering by bunchgrasses and shrubs	Are multiple species present?	Yes	x	Infrequent
		See Species List Below			Moderate
					Frequent
					Dominant
					See Species List

EROSION INSPECTION

Topography: Site is primarily flat

Evidence of Soil Movement		Evidence of Surface litter Movement		Presence of Rills and/or Gullies	
x	None	X	None	x	None
	Slight soil movement/translocation		<5% of litter translocated/deposited		Few
	Moderate soil movement/translocation		5-25% of litter translocated/deposited		Some
	Sever soil movement/translocation		>25% of litter translocated/deposited		Frequent
					Sever

Evidence of Coarse Fragment Movement		Erosion Potential of Site	
x	None	x	Site is Stable
	<5% of coarse fragment translocated/redeposited		Slight potential
	5-25% of coarse fragment translocated/redeposited		Site is at risk
	>25% of coarse fragment translocated/redeposited		Site is in Critical Condition
			Site is in Sever Condition

OBSEVED SPECIES LIST						
(m= major species; c = common species; x = other species)						
COMMON NAME	SCIENTIFIC NAME	Year				
		2014	2015	2016		
GRASS SPECIES						
Great Basin Wildrye	<i>Elymus cinereus</i>	m	m	m		
Sheep's Fescue	<i>Festuca ovina</i>	x	x	x		
Crested Wheatgrass	<i>Agropyron cristatum</i>	x	x	x		
Slender Wheatgrass	<i>Agropyron trachycaulum</i>	x	x	x		
Western Wheatgrass	<i>Agropyron smithii</i>	x	x	x		
Smooth Brome	<i>Bromus inermis</i>	c	c	m		
Prairie Junegrass	<i>Koeleria macrantha</i>	x	x	x		
Beardless Wildrye	<i>Elymus triticoides</i>			x		
FORB SPECIES						
Dock	<i>Rumex hymenosepalus</i>	x				
Salsify (Goats-Beard)	<i>Tragopogon dubius</i>		x			
SHRUB and TREE SPECIES						
Rubber Rabbitbrush	<i>Chrysothamnus nauseosus</i>	x		x		
UNDESIRABLE WEEDY SPECIES						
Common Mullein	<i>Verbascum thapsus</i>	x		x		
Tansy Mustard	<i>Descurainia richardsonii</i>	x				
NOXIOUS WEEDS (I=Infrequent; F=Frequent; C=Common; D=Dominant)						
White Top	<i>Cardaria draba</i>	I	I	I		
Perennial Pepperweed	<i>Lepidium latifolium</i>		I	I		
Spotted Knapweed	<i>Centuarea maculosa</i>	I	I	I		
Leafy Spurge	<i>Euphorbia esula</i>	I	I			

SUMMARY:

Pond 3 Main Dry Closure is a relatively flat area with good vegetative cover and litter accumulation. The site is predominantly vegetated with grasses with Big Basin Wildrye and Smooth Brome the most dominant species. Cover is uniform with minimal barren areas. The site has some infrequent occurrences of noxious weeds, and should be spot sprayed to prevent infestation. It is recommended that the site be spot sprayed twice annually. Once in the early vegetative stages of the weeds and once before the weeds flower out and seed. The site is relatively flat and has low erosion potential. The observation point (OP4) and bare area (BA 5) called out in 2014 appear to be continuously improving. See attached photo log for site pictures and their descriptions.



Picture # 1

Description: Pond 3 Main Dry-Closure, general site view looking northeast from southwest.



Picture # 2

Description: Pond 3 Main Dry-Closure, general view of site looking northwest from southeast corner.



Picture # 3

Description: Pond 3 Main-Dry Closure, general view of cover looking west from center of east side.



Picture # 4

Description: Pond 3 Main Dry-Closure, general view of site cover looking southwest from northeast corner.



Picture # 5

Description: Pond 3 Main Dry-Closure, general view of site looking southeast from northwest corner.



Picture # 6

Description: Pond 3 Inlet Dry-Closure, general site view from northwest corner looing southeast.



Picture # 7

Description: Pond 3 Inlet Dry-Closure, general view of site looking southwest from northeast corner.



Picture # 8

Description: Pond 3 Inlet Dry-Closure, general view of site looking northwest from southeast corner.



Picture # 9

Description: Pond 3 Inlet Dry-Closure, general site view from southwest corner looking southeast.



Picture # 10

Description: Pond 3 Inlet Dry Closure, general view of old access road and recovering vegetation.



Picture # 11

Description: Pond 3 Inlet Dry-Closure, general view of old access road looking southwest.



Picture # 12

Description: Pond 3 Inlet Dry-Closure, general view of old access road looing northwest.



Picture # 13

Description: Pond 1 Dry-Closure, general view of site looking northeast from southwest corner.



Picture # 14

Description: Pond 1 Dry-Closure, general view of site cover looking east.



Picture # 15

Description: Pond 1 Dry-Closure, general view of site looking northwest from southeast corner.



Picture # 16

Description: Pond 1 Dry-Closure, general view of Bare Area 2 looking southwest.



Picture # 17

Description: Pond 1 Dry-Closure, general view of site looking southwest from northeast corner.



Picture # 18

Description: Pond 1 Dry-Closure, general view of cover looking south from north end.



Picture # 19

Description: Description: Pond 1 Dry-Closure, general view of site looking southeast from northwest corner.



Picture # 20

Description: Pond 2 East Wildlife Dry-Closure, general view of site looking east from west.



Picture # 21

Description: Pond 2 East Wildlife Dry-Closure, general view of site looking east across site from dike road.



Picture # 22

Description: Pond 2 East Wildlife Dry-Closure, general view of site looking northwest from dike road.



Picture # 23

Description: Pond 2 East Wildlife Dry-Closure, General view of site cover looking west (note: Common Mullien encroachment).



Picture # 24

Description: Pond 2 East Wildlife Dry-Closure, view of cover on east end of site looking east.



Picture # 25

Description: Pond 2 East Dry-Closure, general view looking east from west end of site.



Picture # 26

Description: Pond 2 East Wildlife Dry-Closure, view of Spotted Knapweed throughout site looking east.



Picture # 27

Description: Pond 2 East Dry-Closure, view looking west from east end of site.



Picture # 28

Description: Pond 2 East Dry-Closure, general view of site from dike road looking down on dry closure.

APPENDIX E
MILL-WILLOW BYPASS FORMS AND PHOTO LOG

MILL-WILLOW BYPASS INSPECTION REPORT

Job: Warm Springs Ponds Operable Units Remedial Action

Date: 9-22-2016

Inspector: John Mike Downey

Page: _____

Reason for inspection: Annual Report

Describe any potential maintenance problems below (continue on additional sheets as necessary):

Location: Exact Location of Problem (stream station and effect along the Bypass)

Partial Beaver Dams (see photos)

Russian Olive Trees (see photo) Slight Under cut of Streambank -

Extent: Measurements of the problem, including depth, height, width, length, and/or flow quantity as applicable.

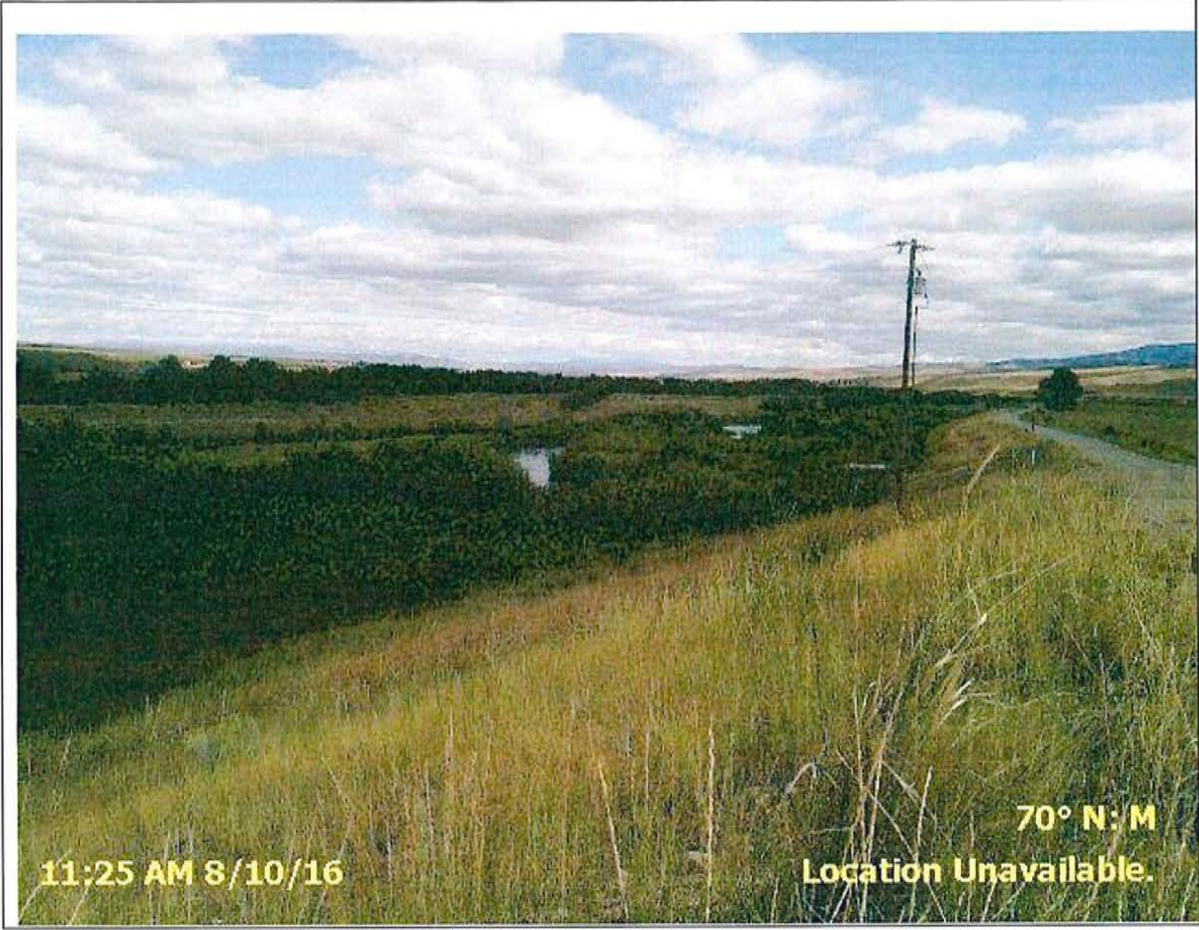
see photos

Description: Include any descriptive detail such as color or quantity of sediment in water, configuration of slopes, or other relevant information.

see photos

If photos are appropriate, record and attach Photo Log sheet.

Signature: John Mike Downey

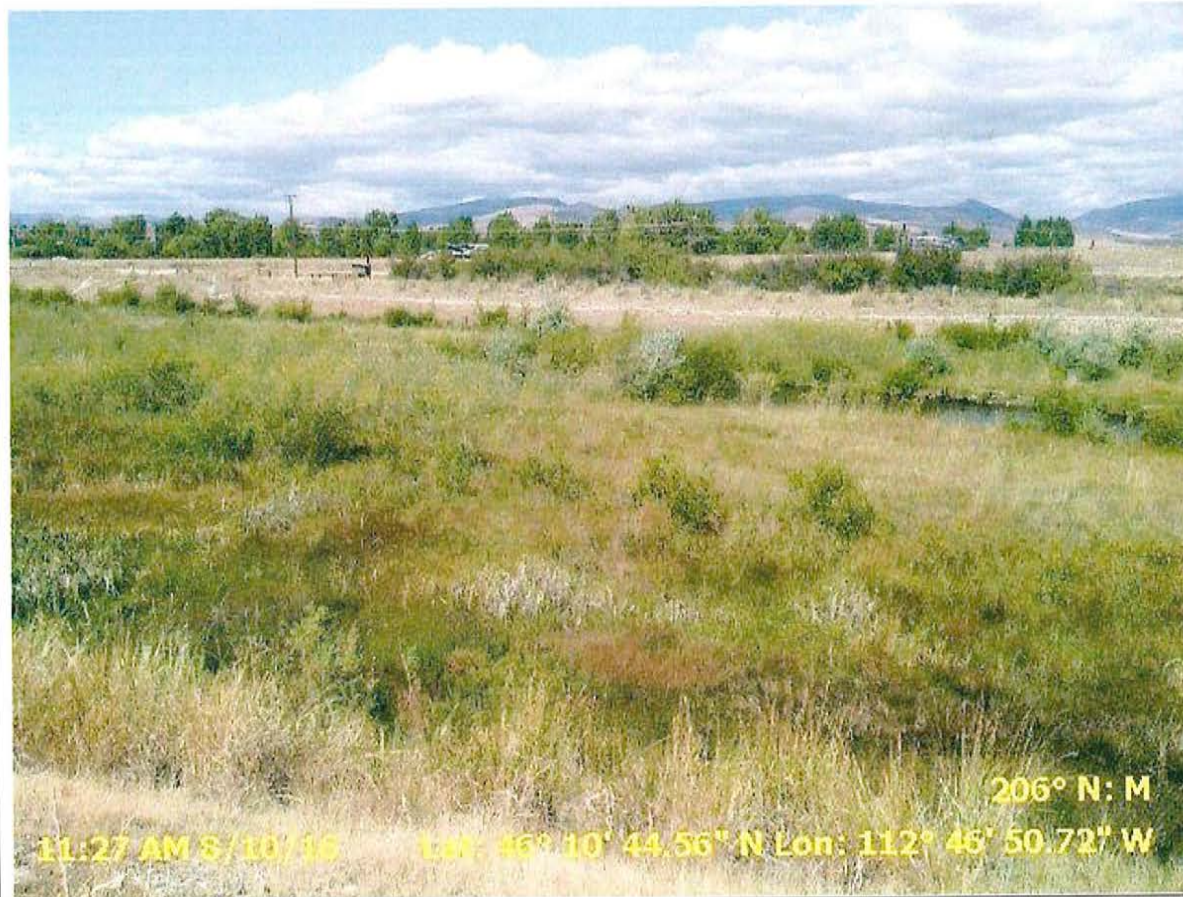


11:25 AM 8/10/16

70° N: M
Location Unavailable.



Picture: 055 Reference Photo Figure 1.a.
Date: 8-10-2016
Description: View looking north downstream from west berm at Mill-Willow Bypass Section XC1.5.
Site: Warm Springs Ponds – Mill Willow Bypass
Project: Mill-Willow Bypass Flood Plain Management IMP-4



Picture: 056

Date: 8-10-2016

Description: View looking west from west berm. Photo of Russian Olive trees within Mill-Willow Bypass Section XC 1.5

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



11:27 AM 8/10/16

Lat: 46° 10' 44.49" N Lon: 112° 46' 50.73" W

245° N: M



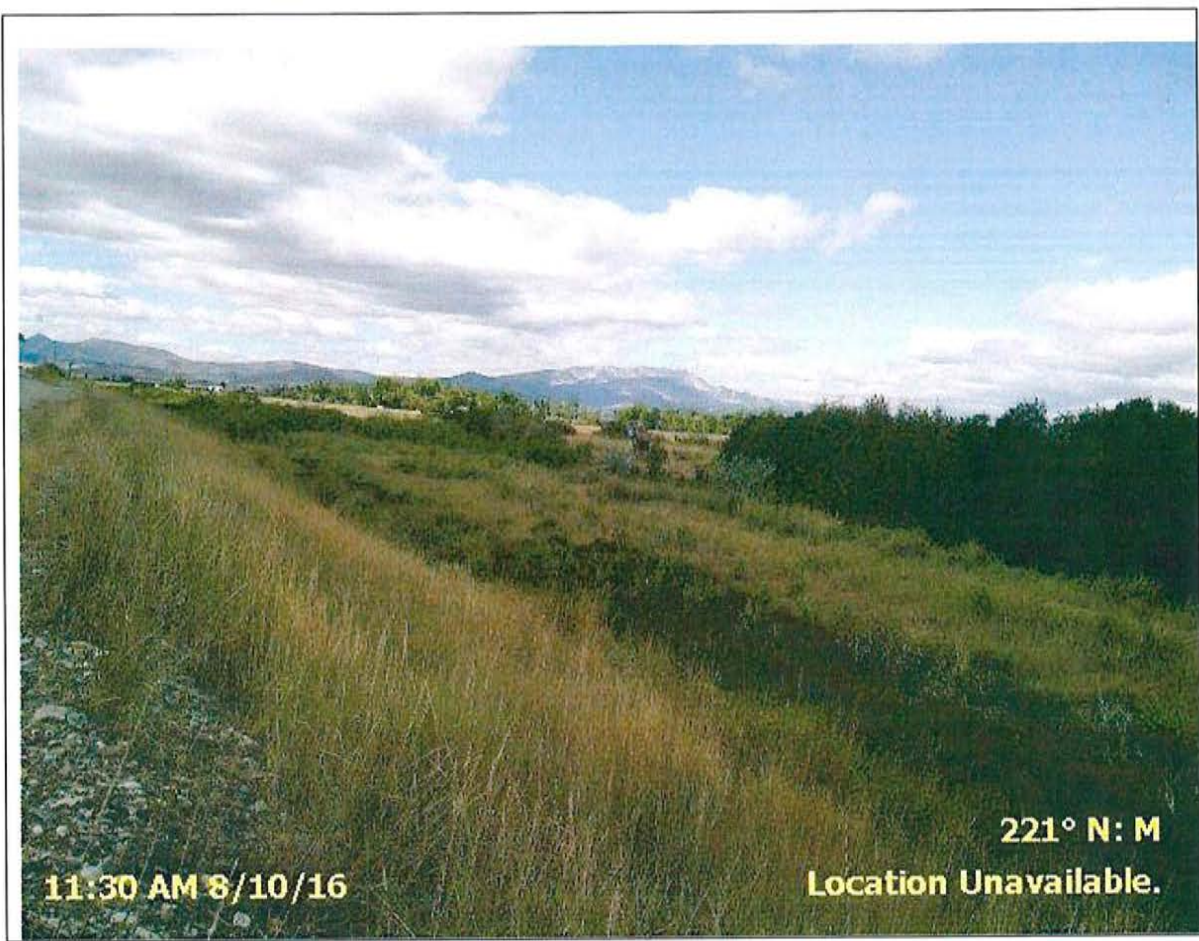
Picture: 057

Date: 8-10-2016

Description: View looking northwest. Photo of Russian Olive trees within Mill Willow Bypass Section between XC 1.5 and XC 1.6

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



Picture: 059
Date: 8-10-2016
Description: View looking southwest from west berm. Photo of Russian Olive Trees within Mill Willow Bypass Section Between XC 1.6 and XC 1.7.
Site: Warm Springs Ponds – Mill Willow Bypass
Project: Mill-Willow Bypass Flood Plain Management IMP-4



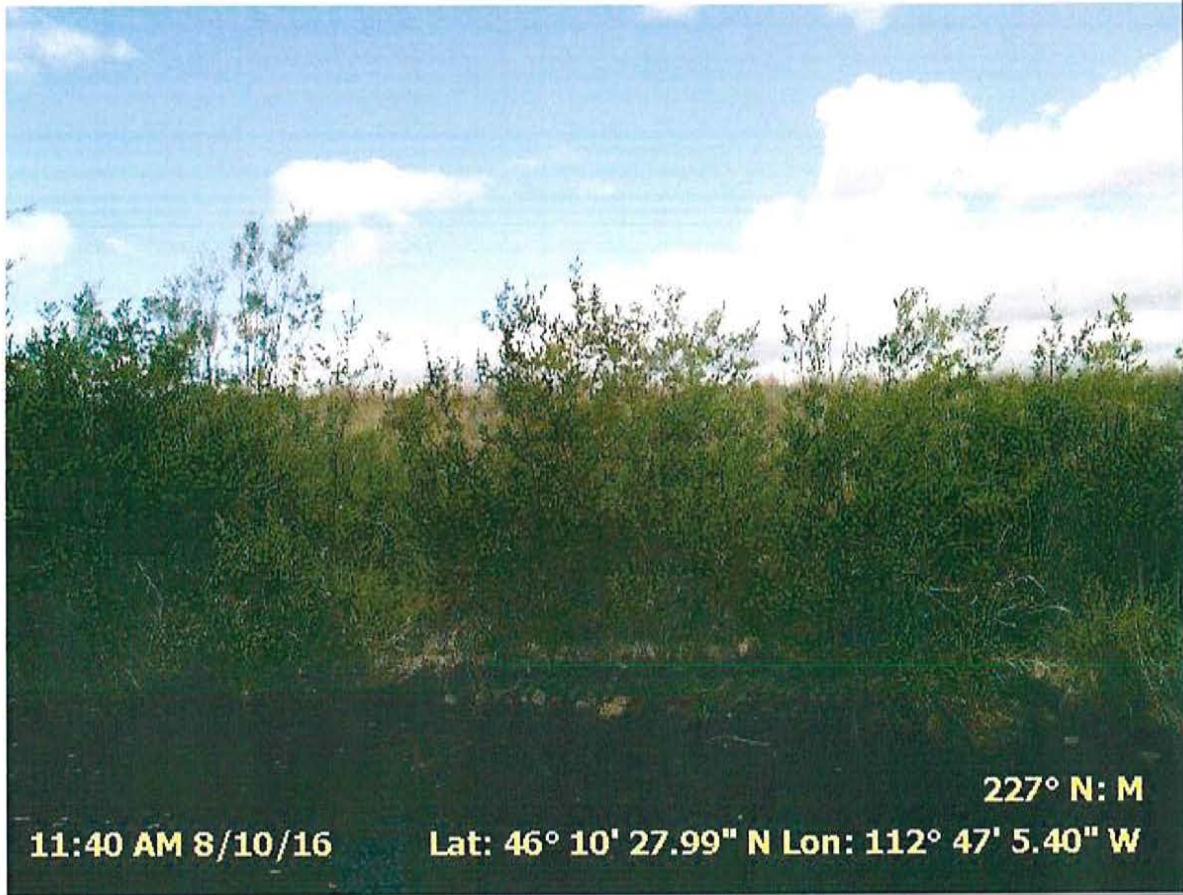
Picture: 060 Reference Photo Figure 1.b.

Date: 8-10-2016

Description: View looking northwest. Looking downstream from XC 1.6. Mill Willow Bypass Section XC 1.6

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



Picture: 061

Date: 8-10-2016

Description: View looking west. Mill Willow Bypass Section near XC 1.8. Photo of undercut portion of west bank.

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



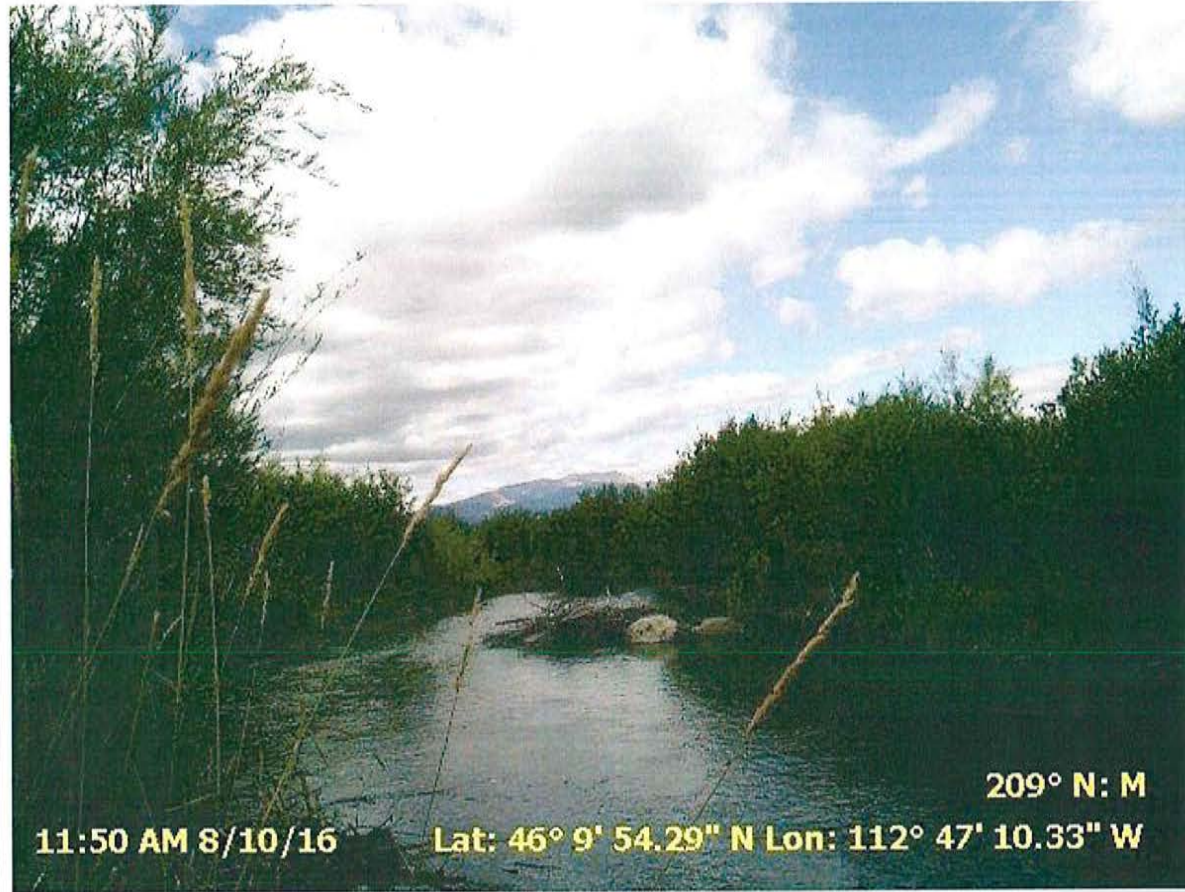
Picture: 062

Date: 8-10-2016

Description: View looking west. Mill Willow Bypass Section Between XC 1.8. Photo of undercut stream bank.

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



11:50 AM 8/10/16

Lat: 46° 9' 54.29" N Lon: 112° 47' 10.33" W

209° N: M



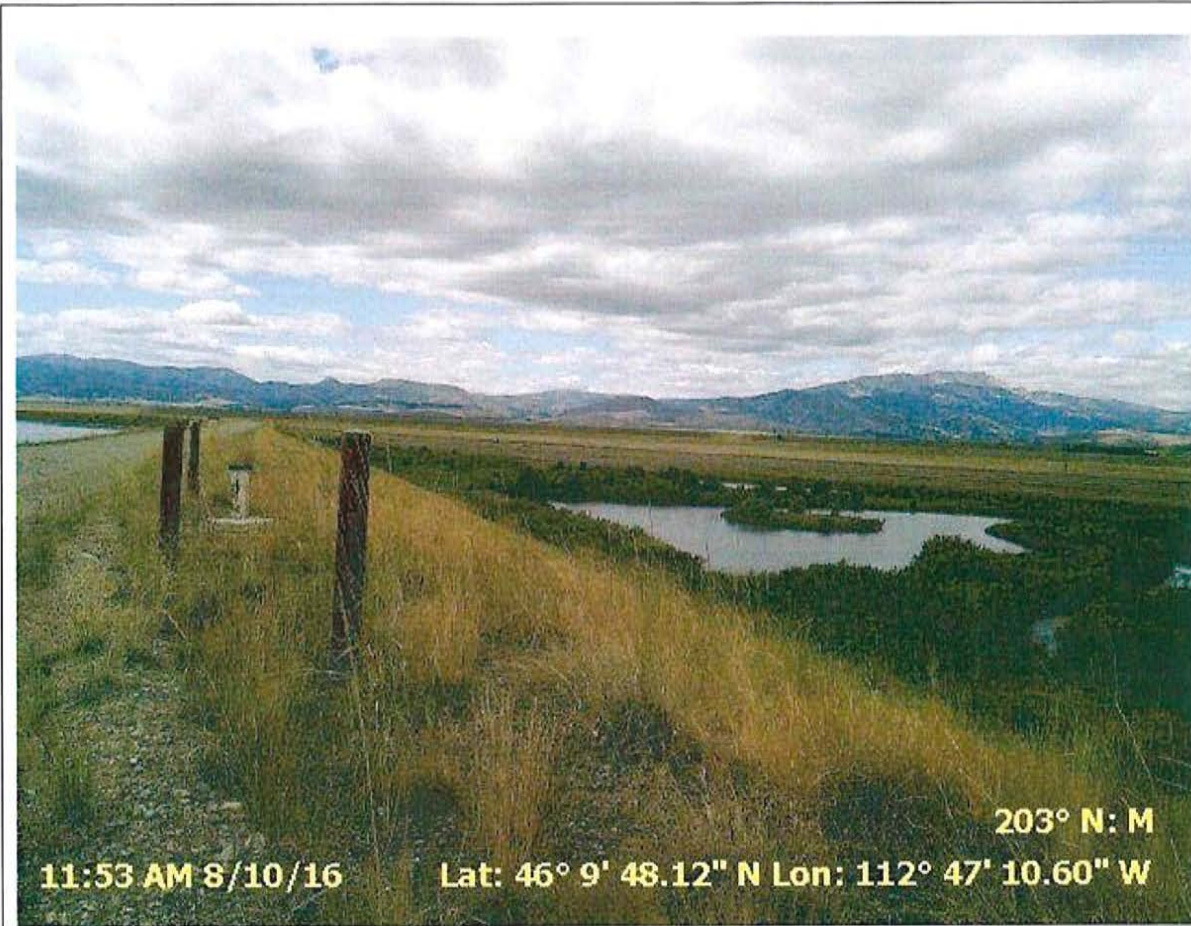
Picture: 064

Date: 8-10-2016

Description: View looking southwest. Mill Willow Bypass Section near XC 1.9. Photo of partial beaver dam within Mill Willow Bypass.

Site: Warm Springs Ponds – Mill Willow Bypass

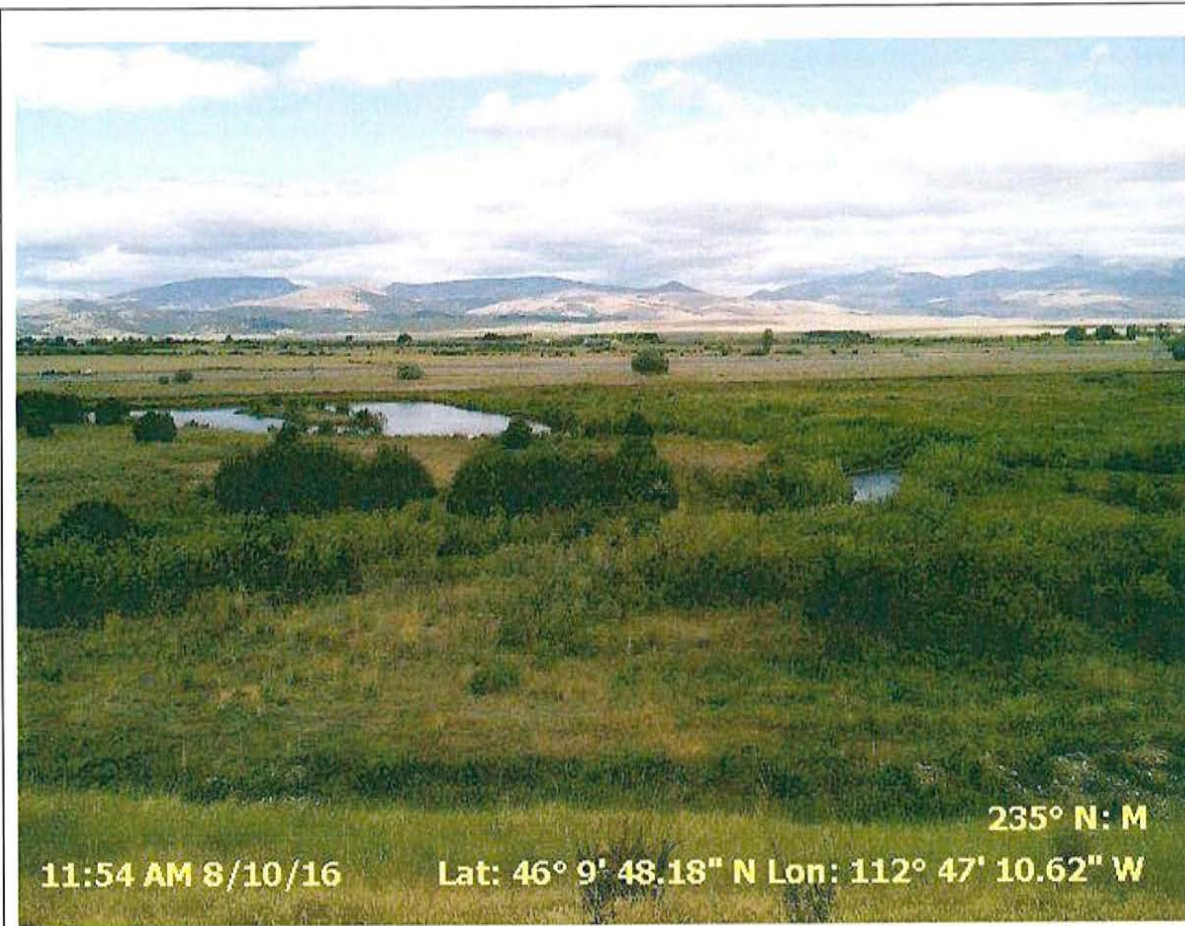
Project: Mill-Willow Bypass Flood Plain Management IMP-4



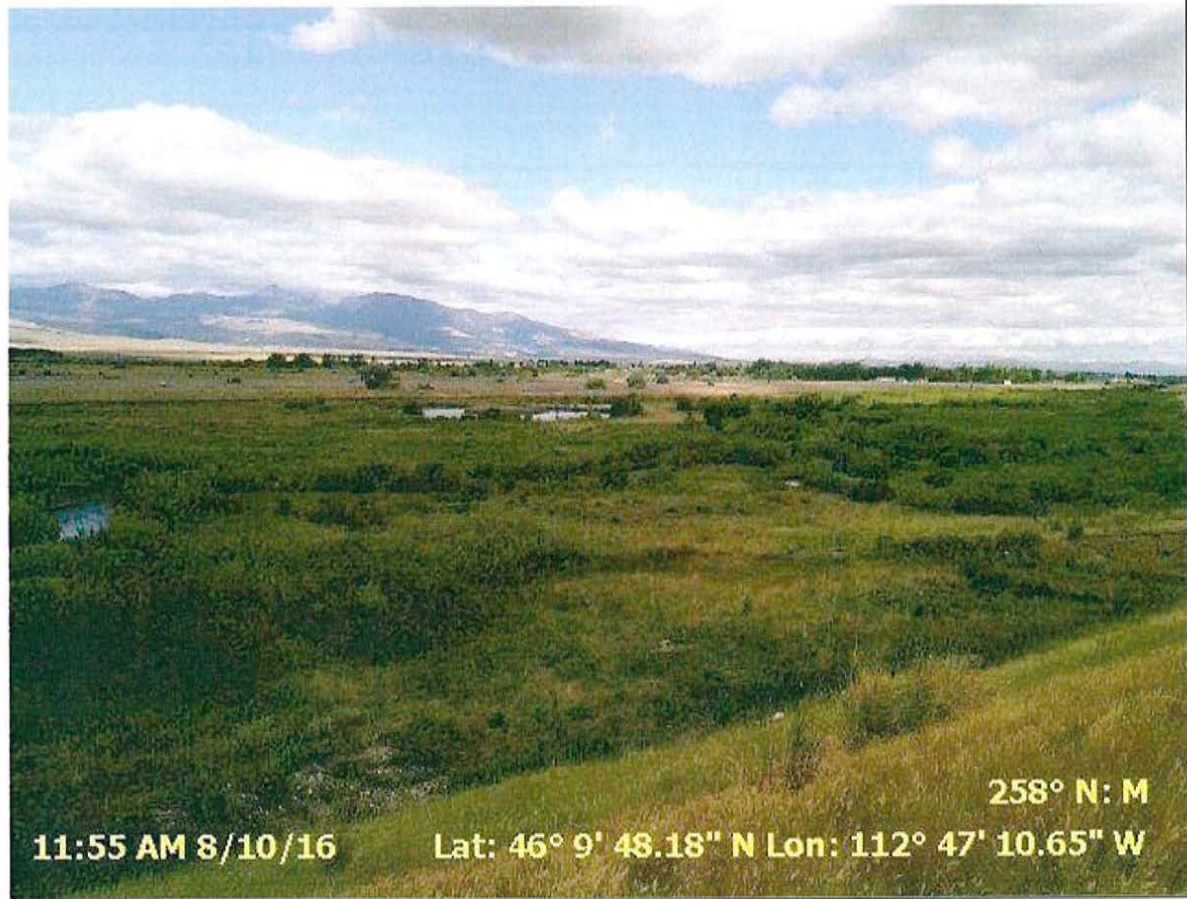
Picture: 067 Reference Photo Figure 1.d.
Date: 8-10-2016
Description: View looking southwest. Mill Willow Bypass Section near XC 2.2.
Site: Warm Springs Ponds – Mill Willow Bypass
Project: Mill-Willow Bypass Flood Plain Management IMP-4



Picture: 068 Reference Photo Figure 1.c.
Date: 8-10-2016
Description: View looking northwest. Mill Willow Bypass Section Between XC 2.2
Site: Warm Springs Ponds – Mill Willow Bypass
Project: Mill-Willow Bypass Flood Plain Management IMP-4



Picture: 069
Date: 8-10-2016
Description: View looking northwest. New Willow growth within Mill Willow Bypass Section near XC 2.2.
Site: Warm Springs Ponds – Mill Willow Bypass
Project: Mill-Willow Bypass Flood Plain Management IMP-4



11:55 AM 8/10/16

Lat: 46° 9' 48.18" N Lon: 112° 47' 10.65" W

258° N: M



Picture: 070 Reference Photo Figure 1.c.

Date: 8-10-2016

Description: View looking northwest. Mill Willow Bypass Section near XC 2.2

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



Picture: 072 Reference Photo Figure 1.f.

Date: 8-10-2016

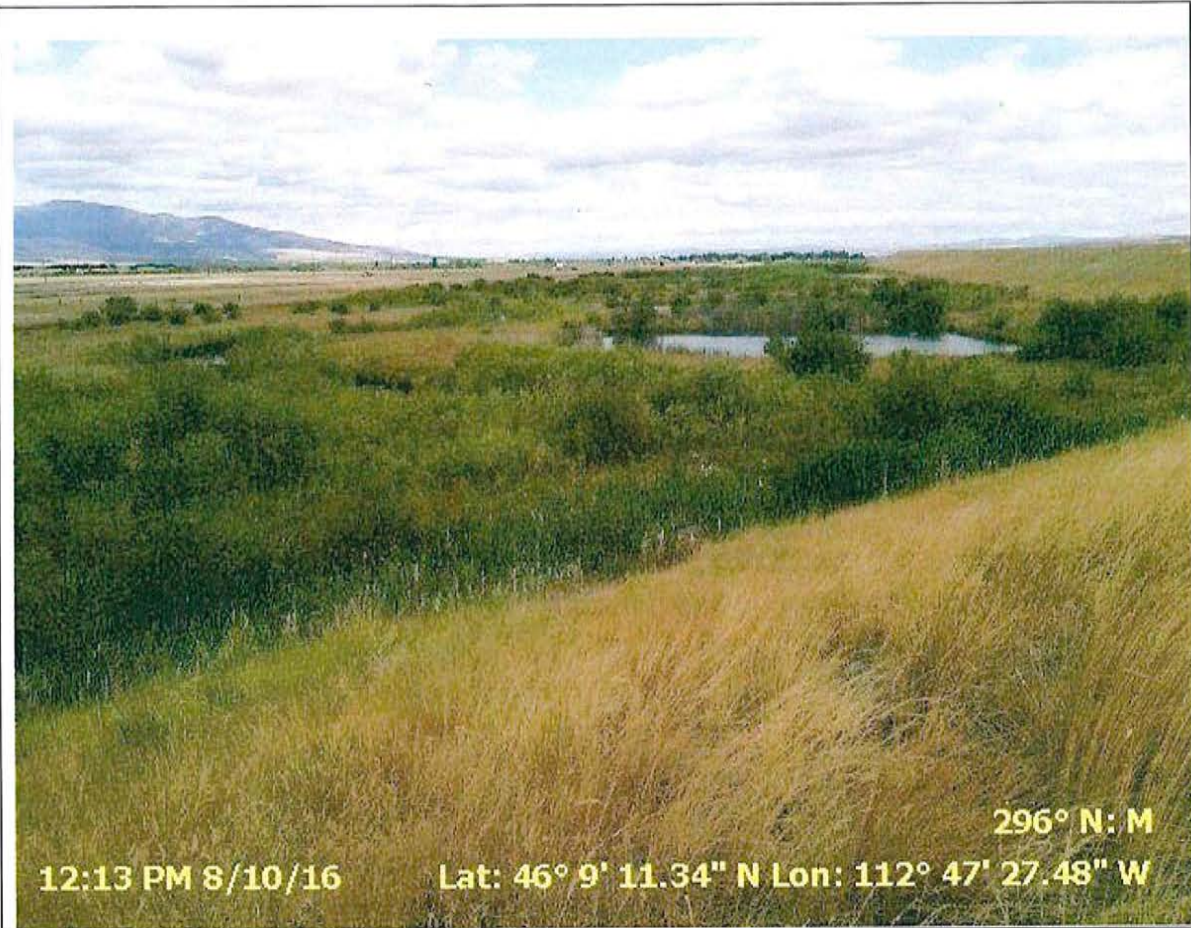
Description: View looking northwest. Mill Willow Bypass Section Between XC 1.2 and XC 1.3.

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



Picture: 074
Date: 8-10-2016
Description: View looking northwest. Photo of partial Beaver Dam near Mill Willow Bypass Section XC 2.4
Site: Warm Springs Ponds – Mill Willow Bypass
Project: Mill-Willow Bypass Flood Plain Management IMP-4



12:13 PM 8/10/16

Lat: 46° 9' 11.34" N Lon: 112° 47' 27.48" W

296° N: M



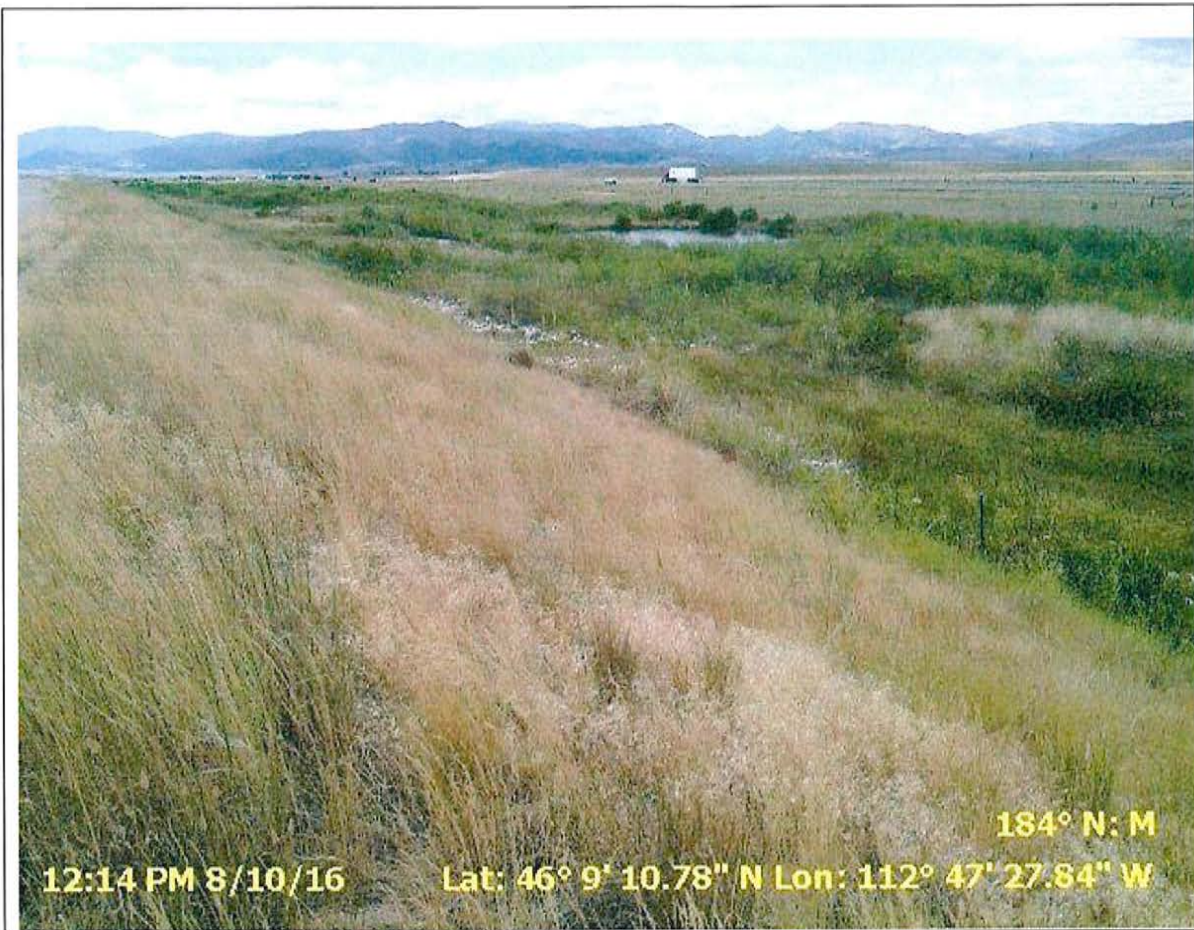
Picture: 075 Reference Photo Figure 1.e.

Date: 8-10-2016

Description: View looking northwest. Mill Willow Bypass Section near XC 3.0

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



Picture: 076 Reference Photo Figure 1.f.

Date: 8-10-2016

Description: View looking southwest. Mill Willow Bypass Section near XC 3.0.

Site: Warm Springs Ponds – Mill Willow Bypass

Project: Mill-Willow Bypass Flood Plain Management IMP-4



12:17 PM 8/10/16

Lat: 46° 8' 38.72" N Lon: 112° 47' 33.78" W

252° N: M



Picture: 077

Date: 8-10-2016

Description: View looking northwest. New Willow growth within Mill Willow Bypass Section near XC 5.0.

Site: Warm Springs Ponds – Mill Willow Bypass

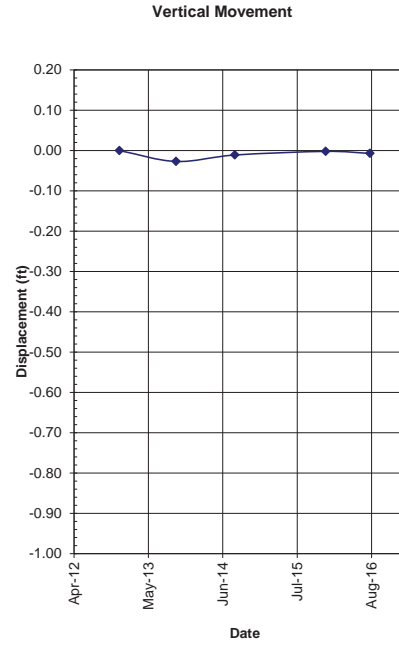
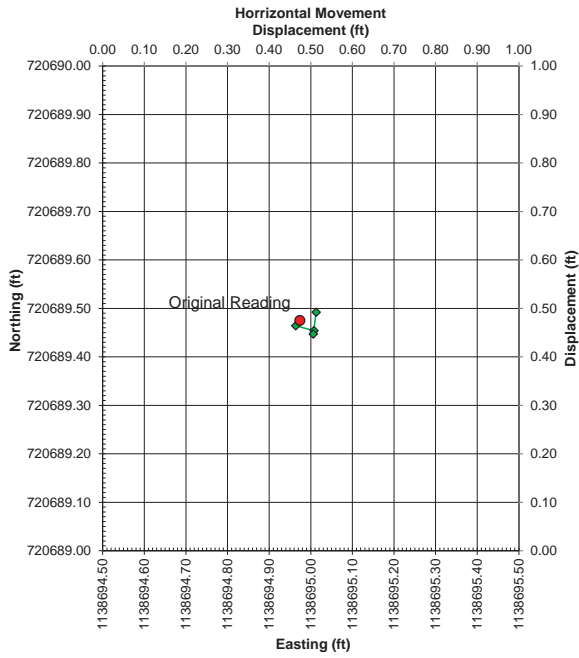
Project: Mill-Willow Bypass Flood Plain Management IMP-4



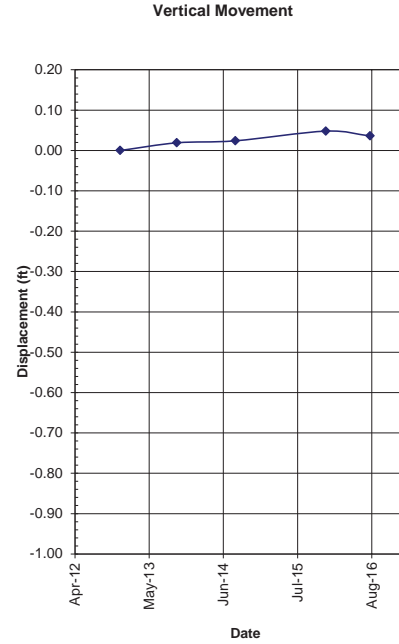
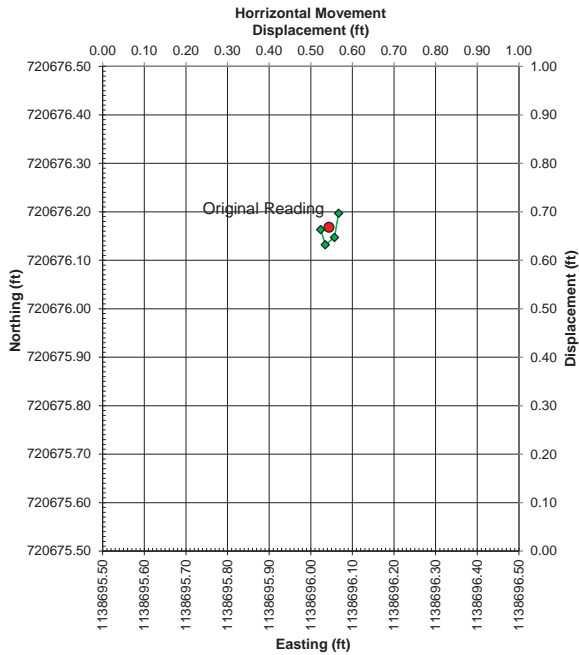
Picture: 078
Date: 8-10-2016
Description: View looking southwest. Mill Willow Bypass Section Between XC 5.0.
Site: Warm Springs Ponds – Mill Willow Bypass
Project: Mill-Willow Bypass Flood Plain Management IMP-4

APPENDIX F
DEFORMATION SURVEY DATA

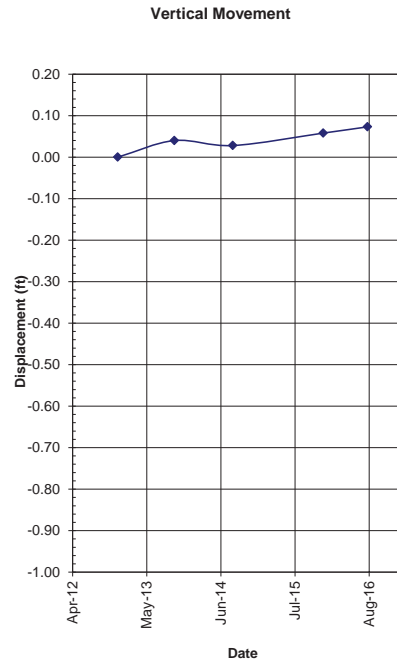
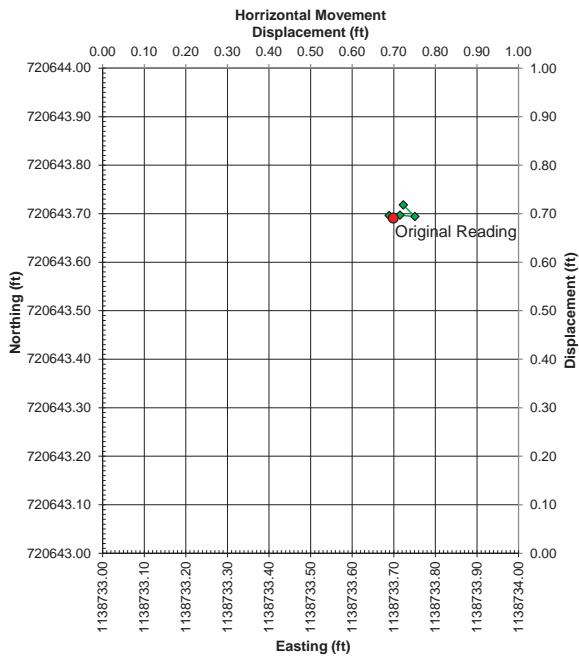
**Displacement Vectors DEF-13
On Top of Left Pond 2 Service Spillway Wing Wall**



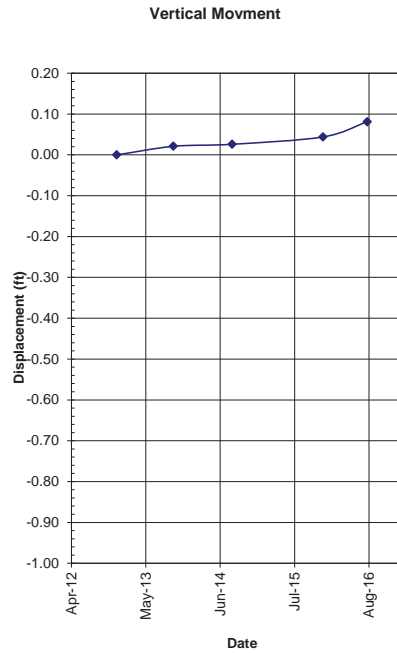
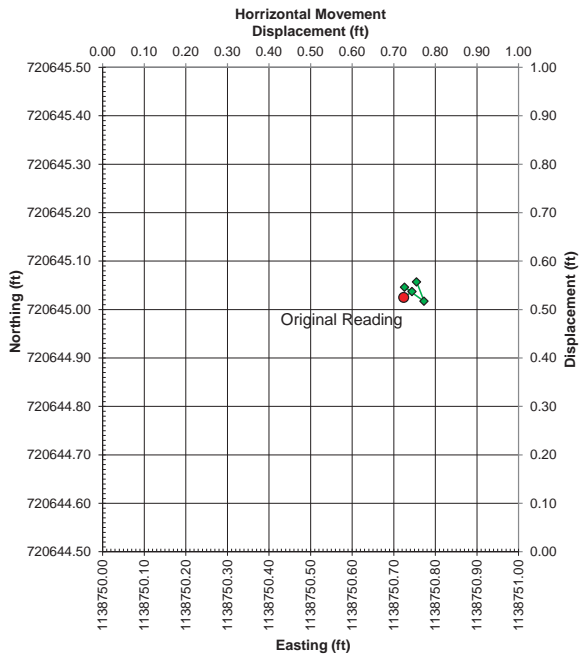
**Displacement Vectors DEF-14
On Top of Left Pond 2 Service Spillway Wing Wall**



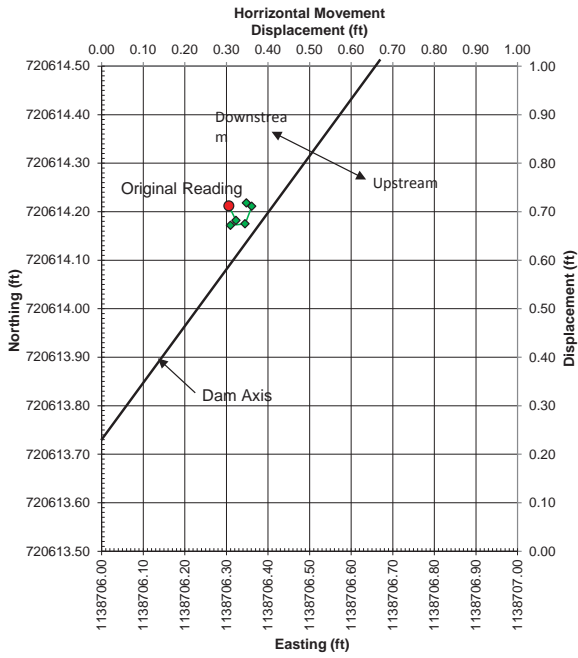
**Displacement Vectors DEF-15
On Top of Right Pond 2 Service Spillway Wing Wall**



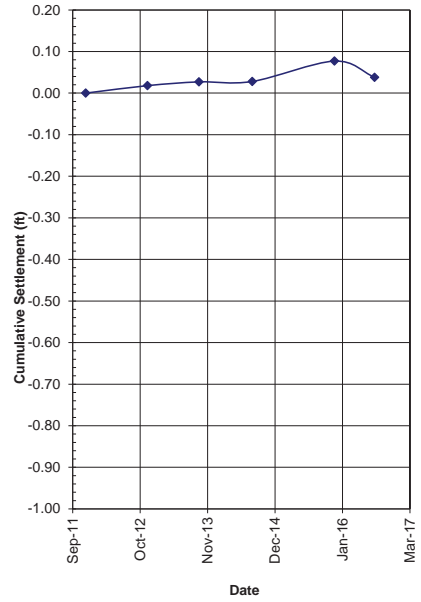
**Displacement Vectors DEF-16
On Top of Right Pond 2 Service Spillway Wing Wall**



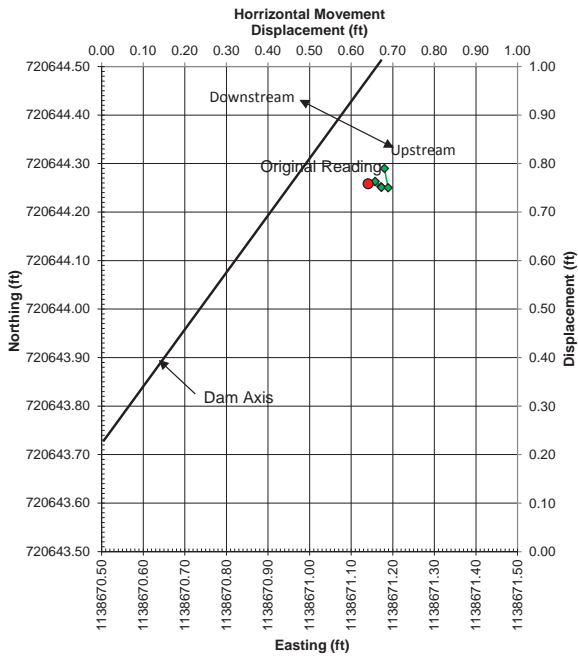
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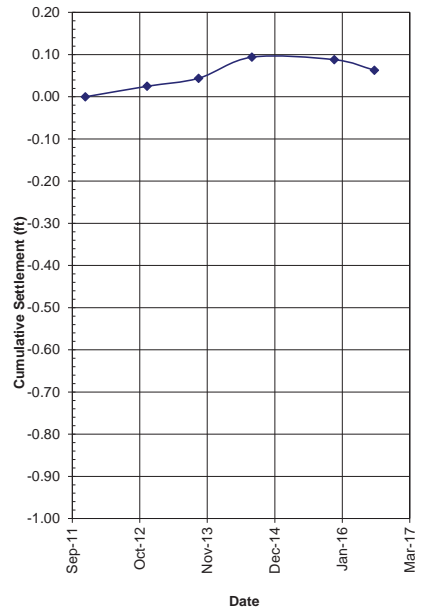
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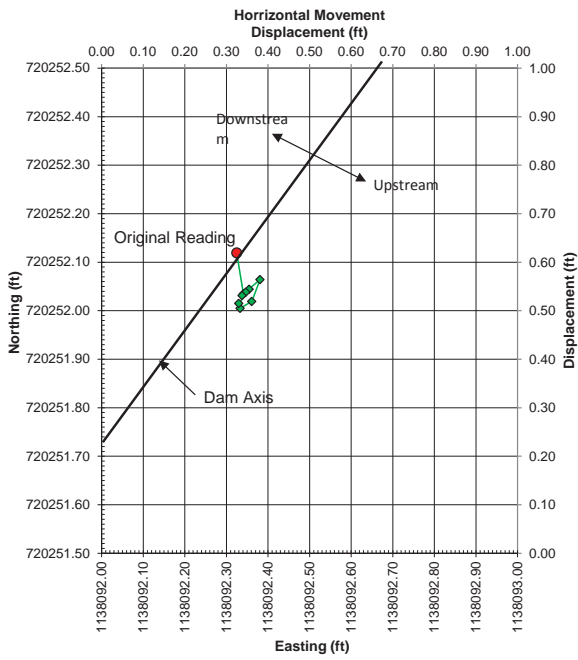
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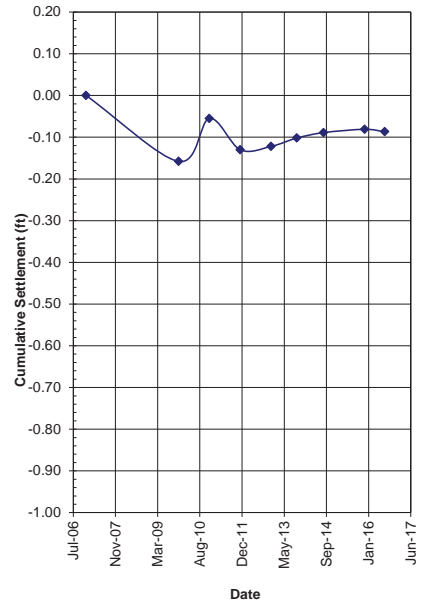
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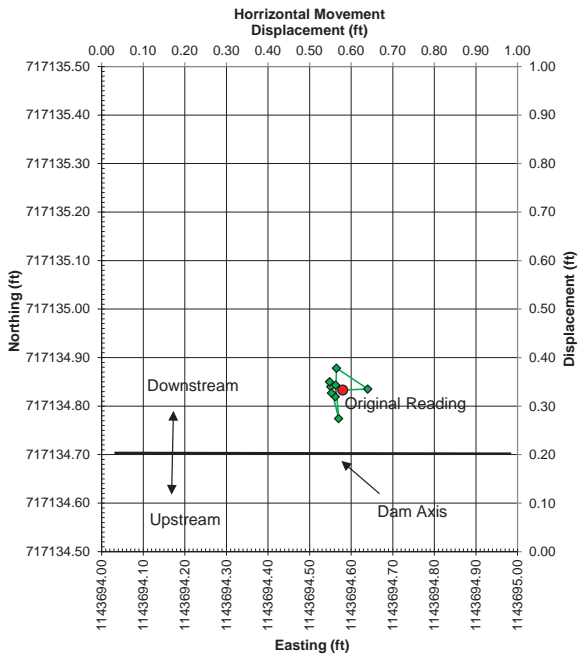
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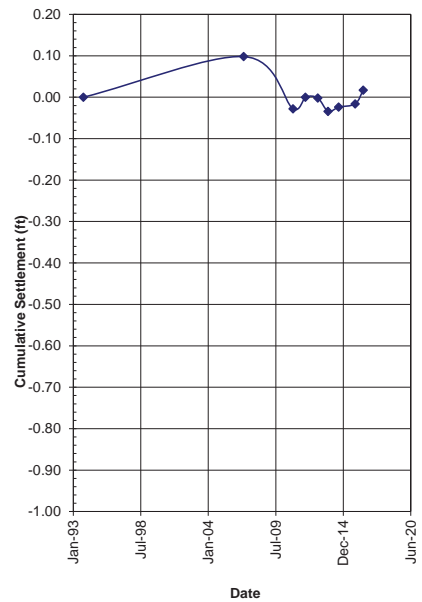
Vertical Movement



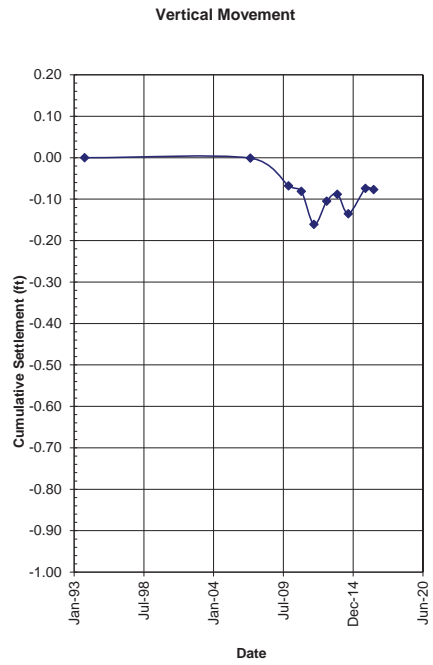
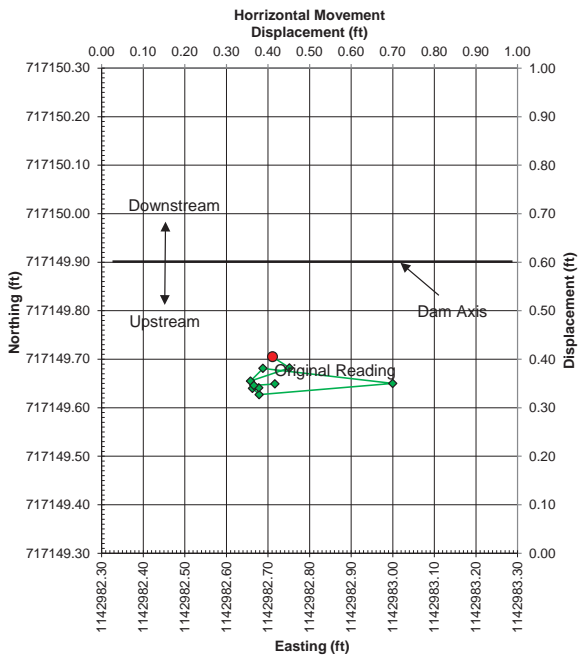
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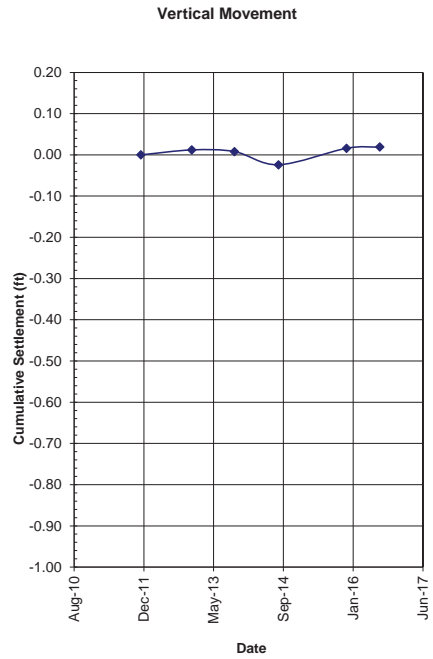
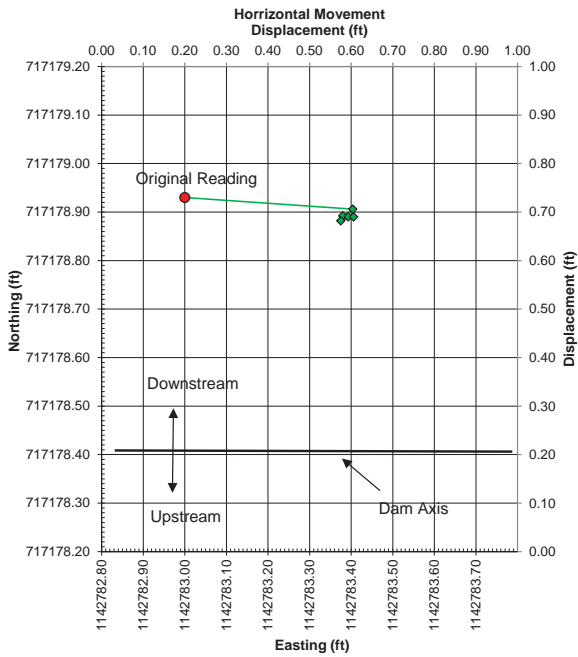
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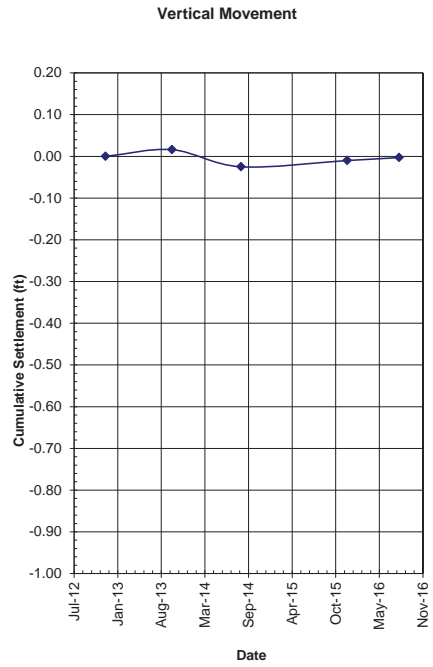
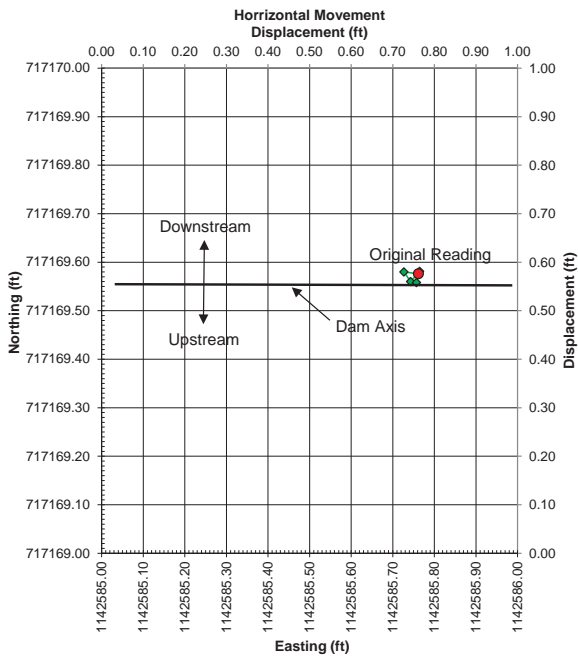
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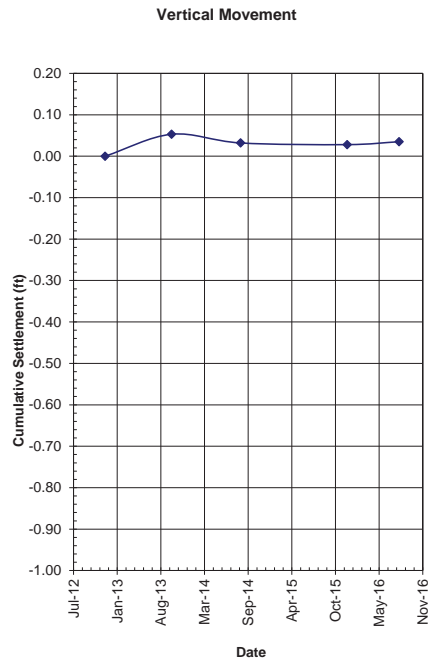
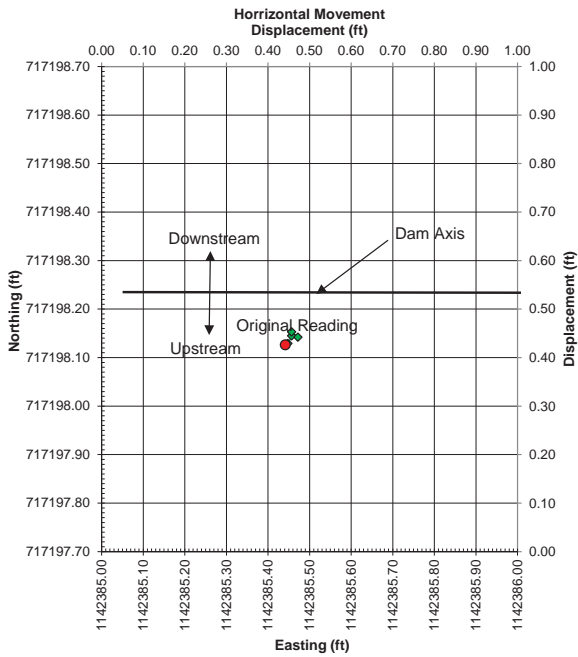
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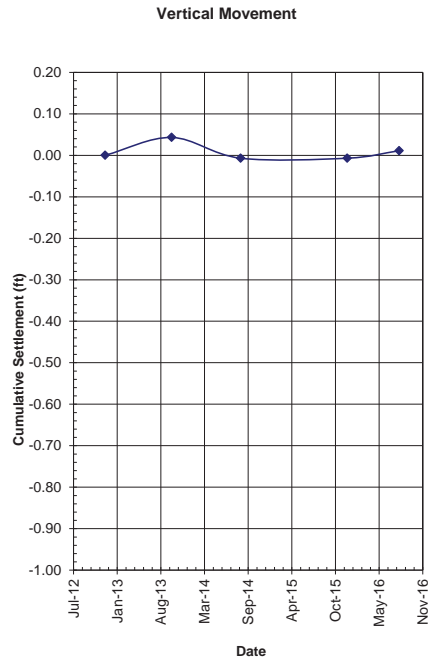
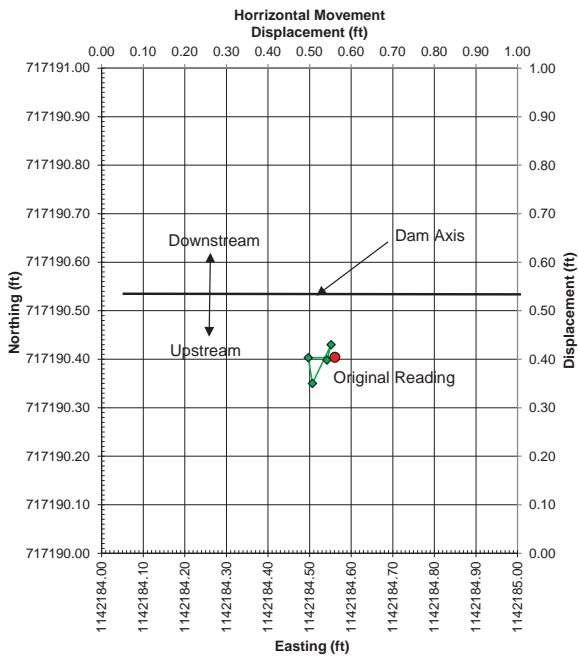
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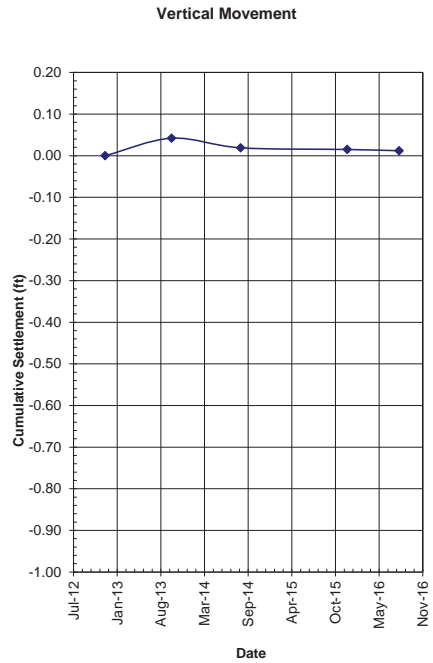
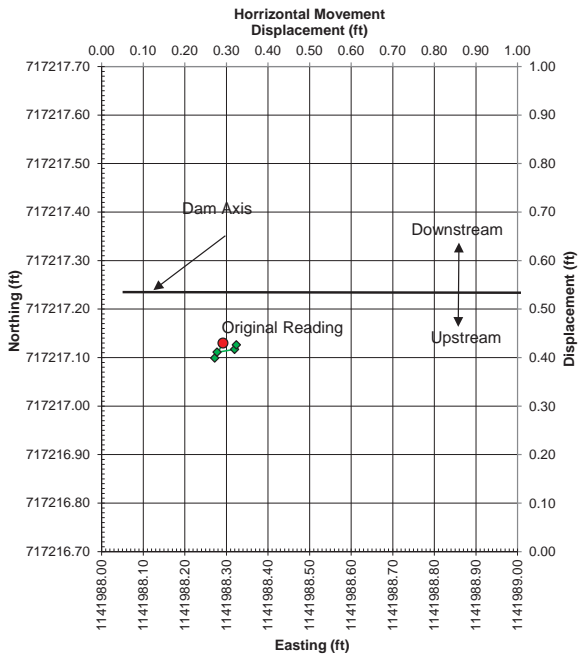
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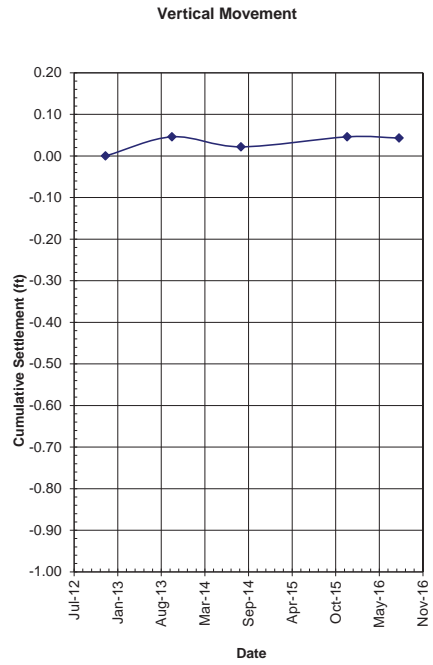
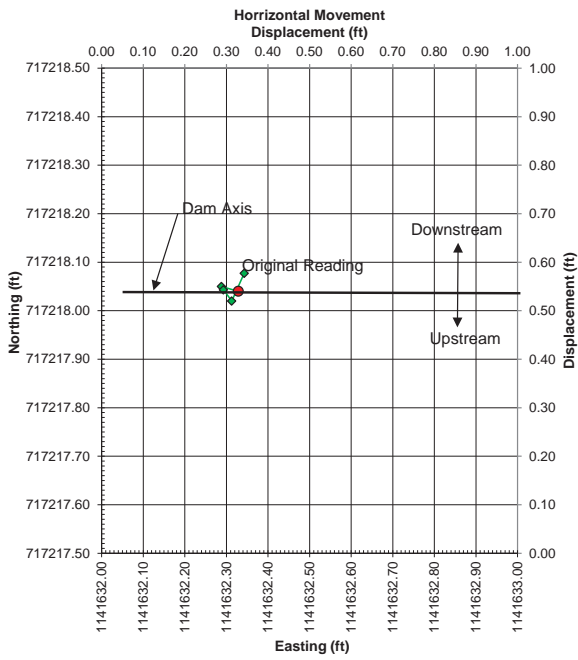
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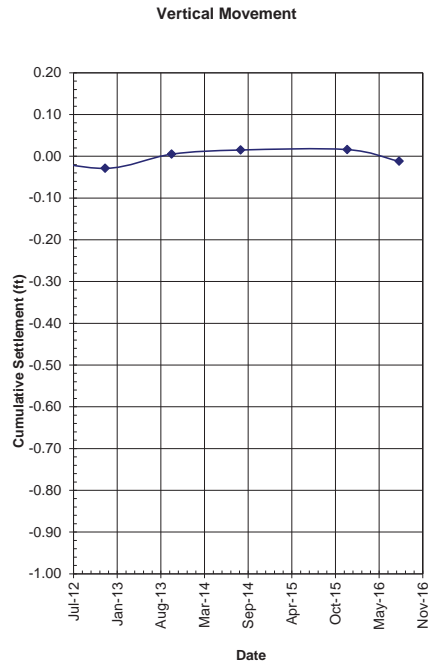
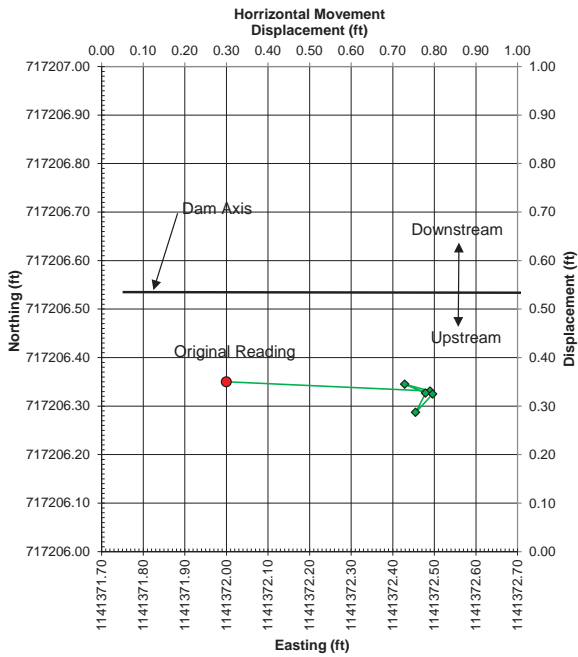
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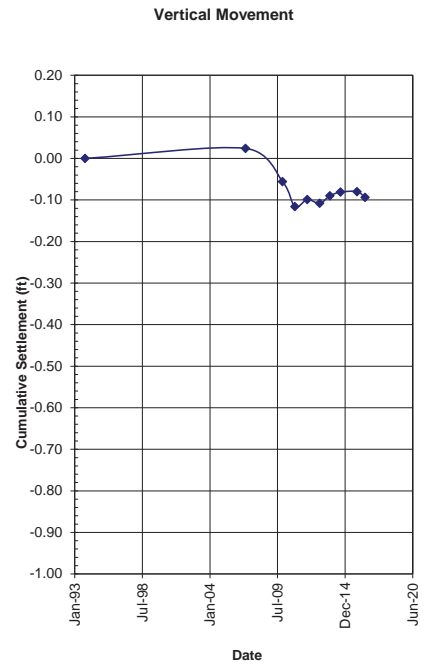
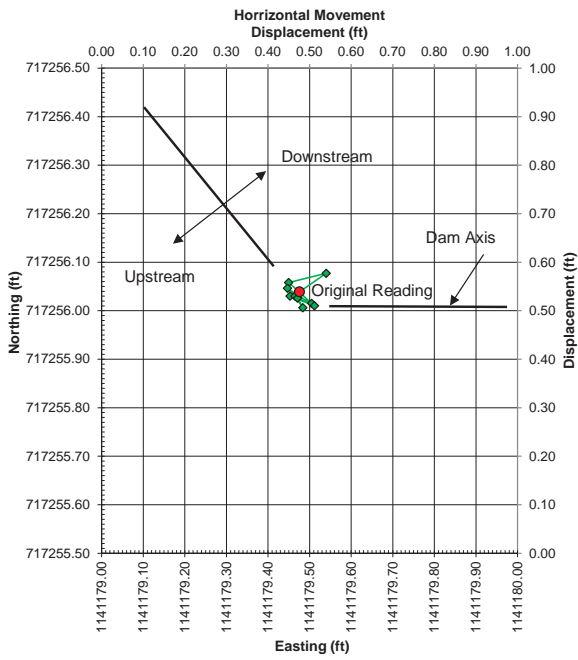
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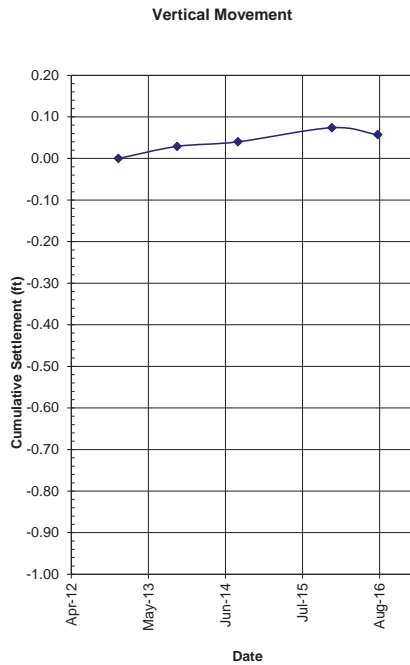
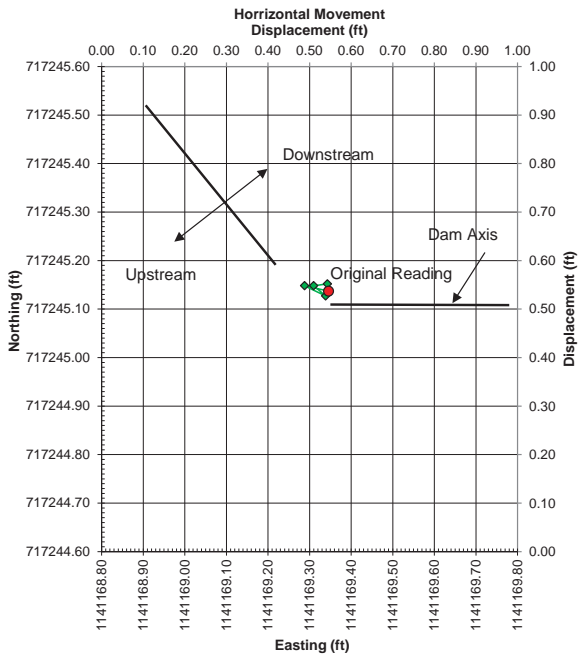
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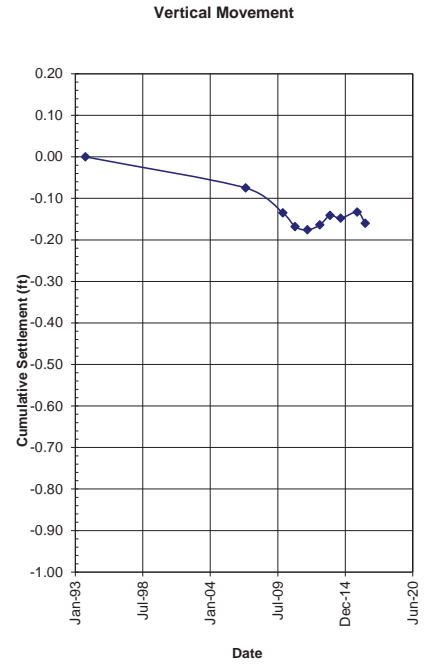
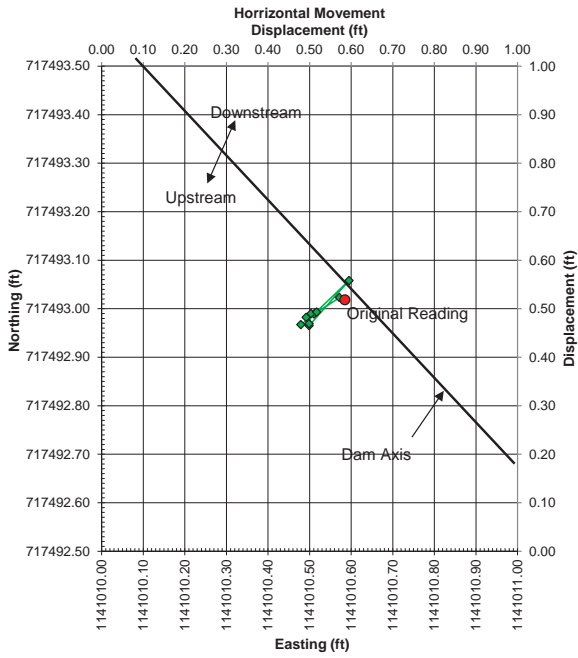
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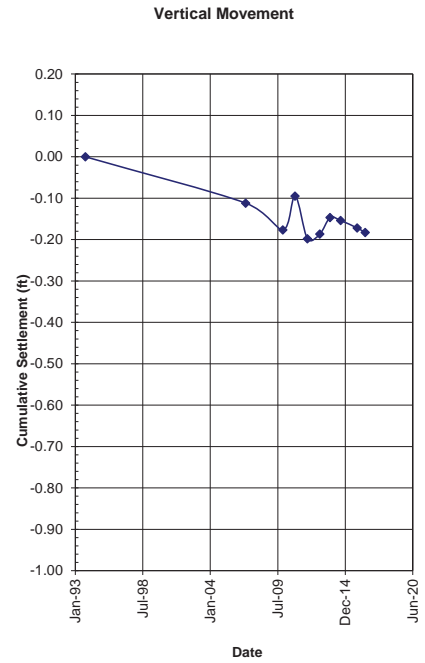
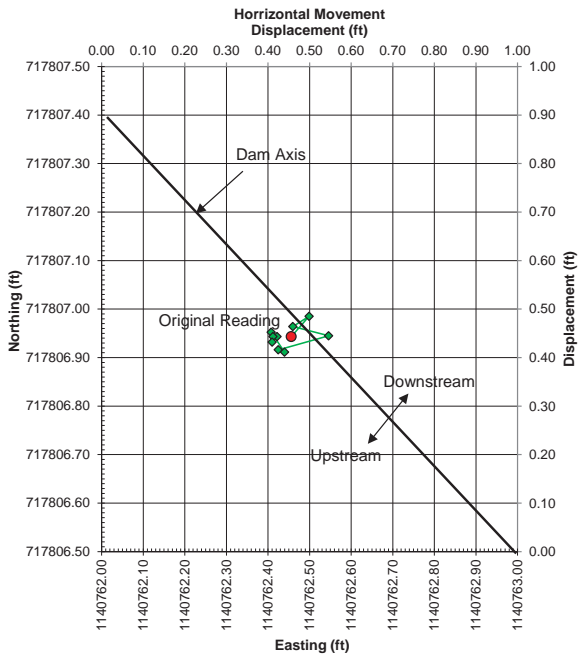
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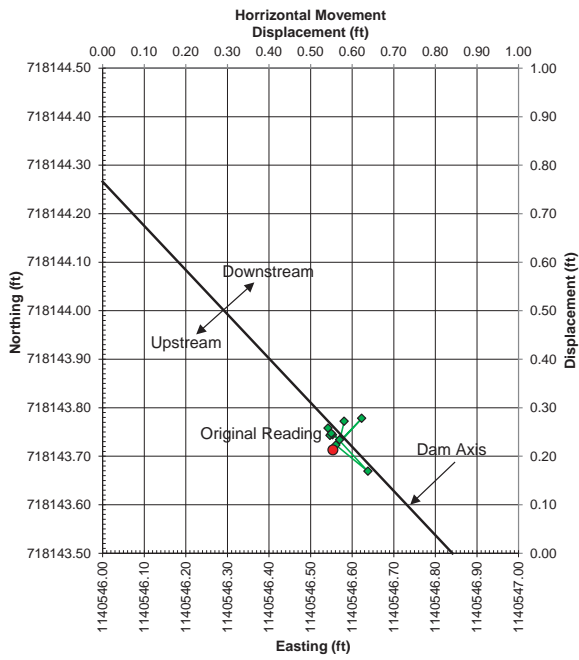
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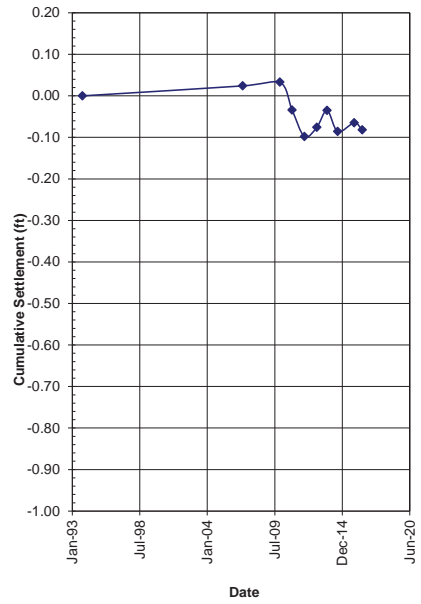
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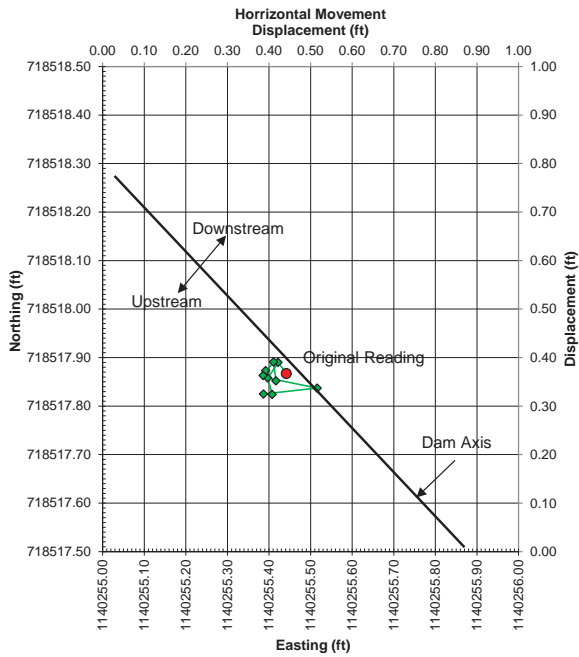
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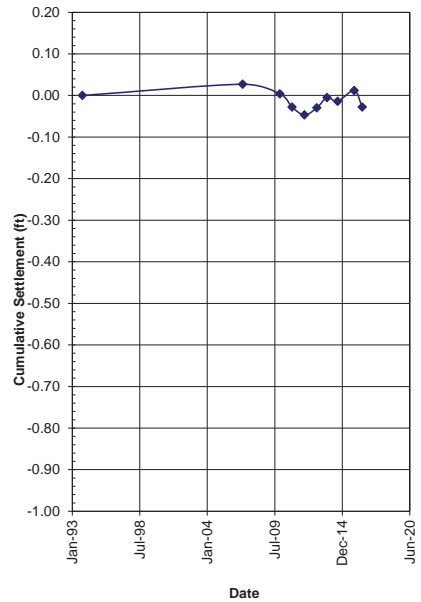
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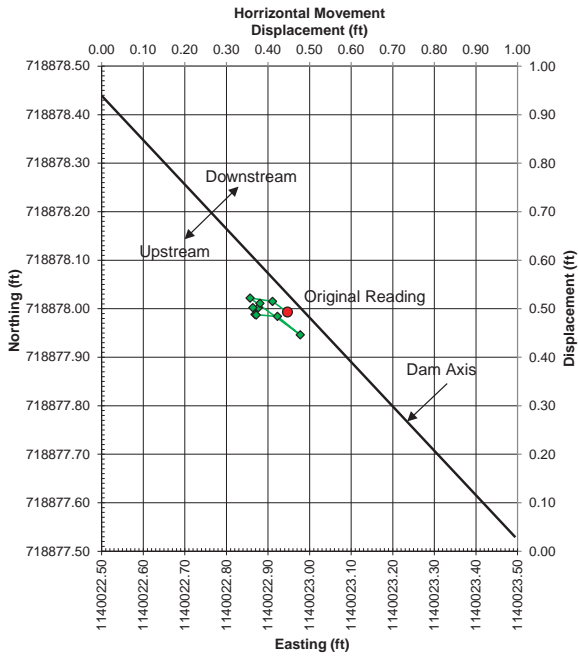
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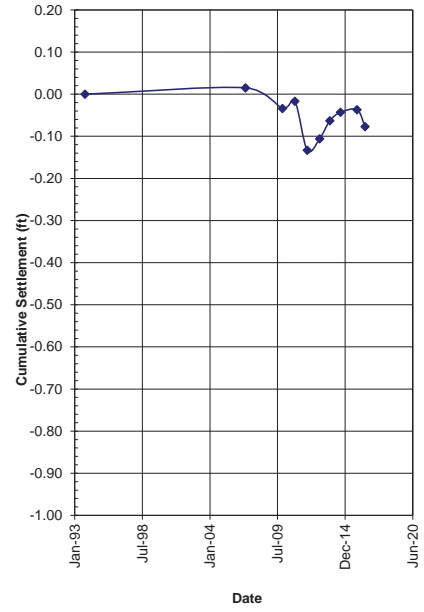
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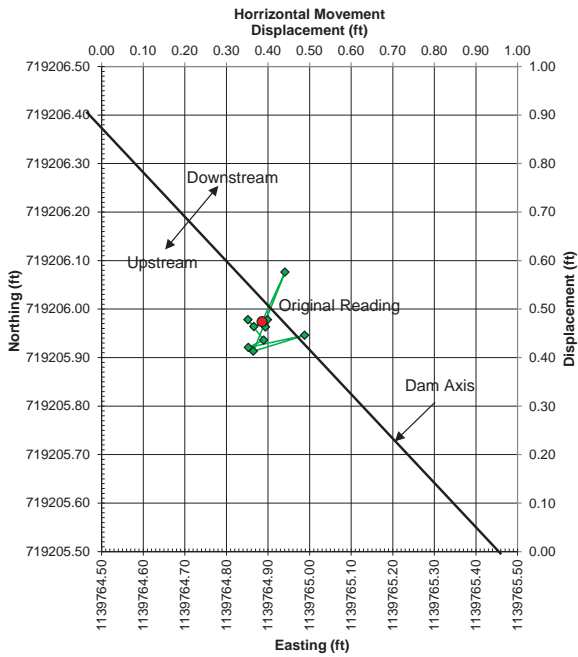
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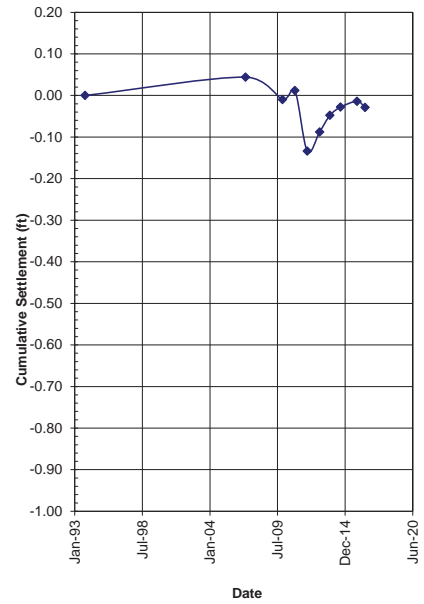
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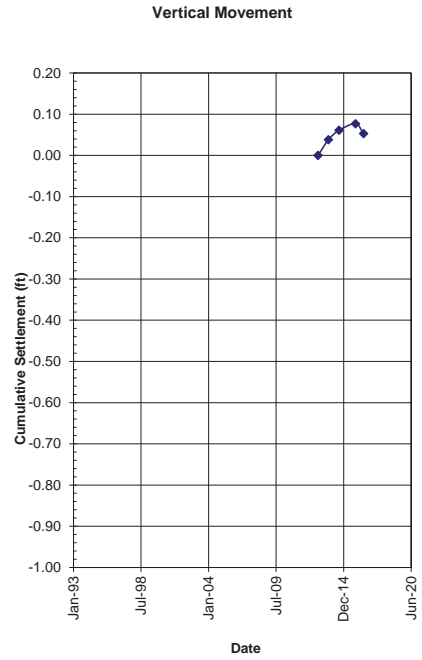
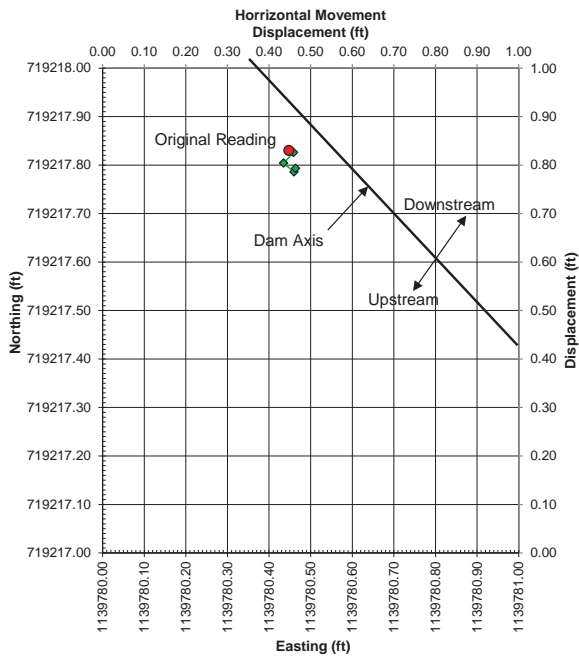
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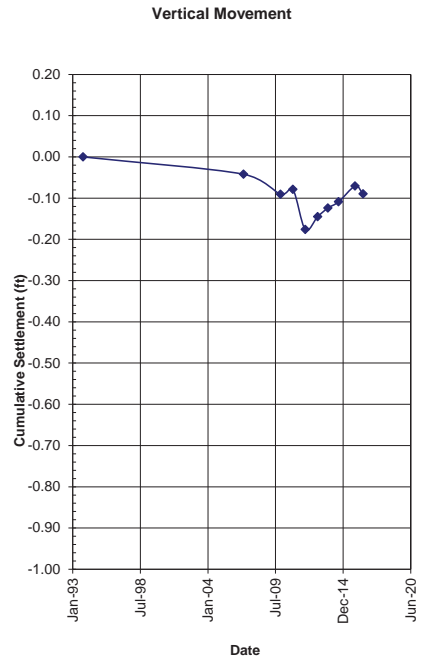
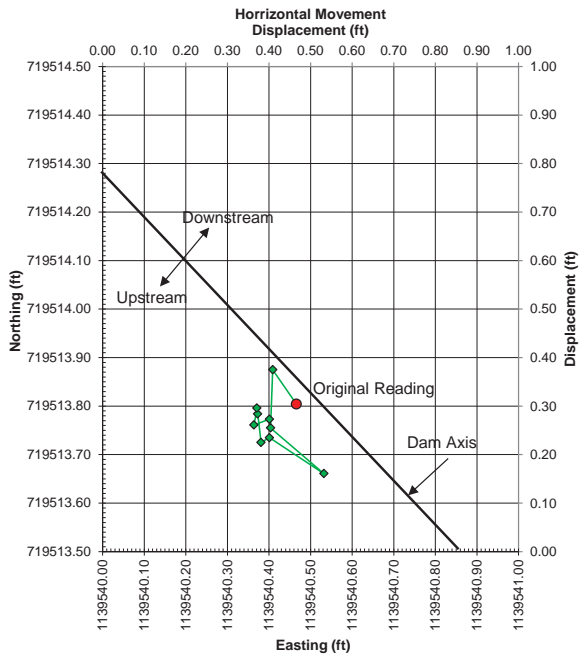
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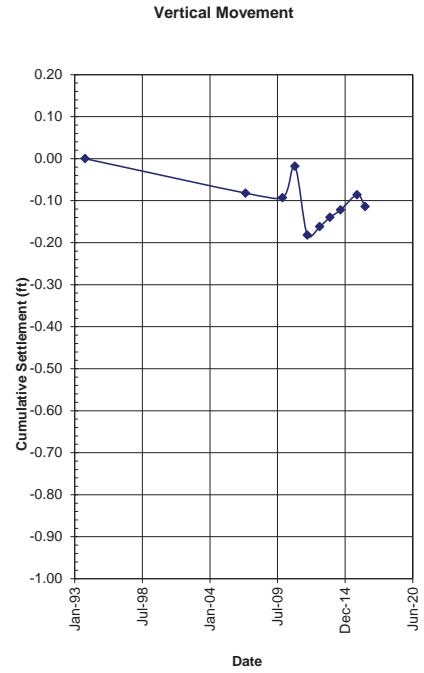
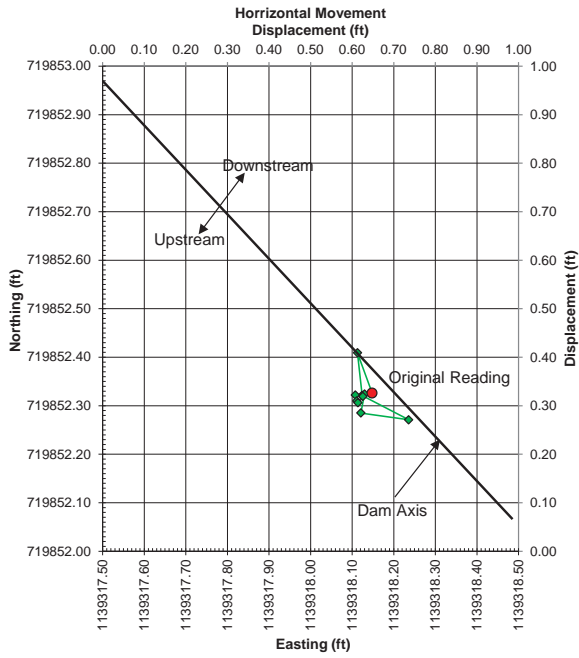
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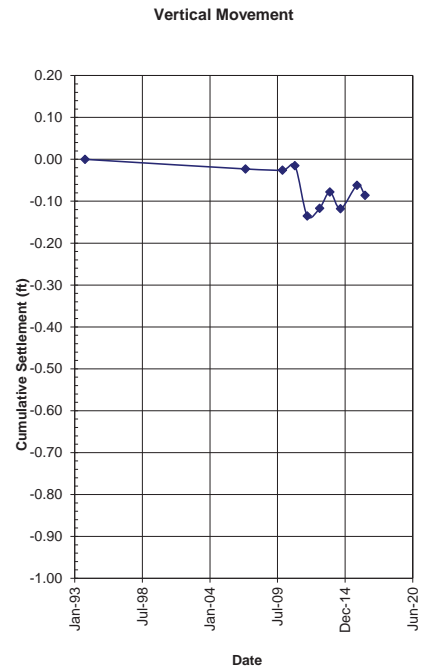
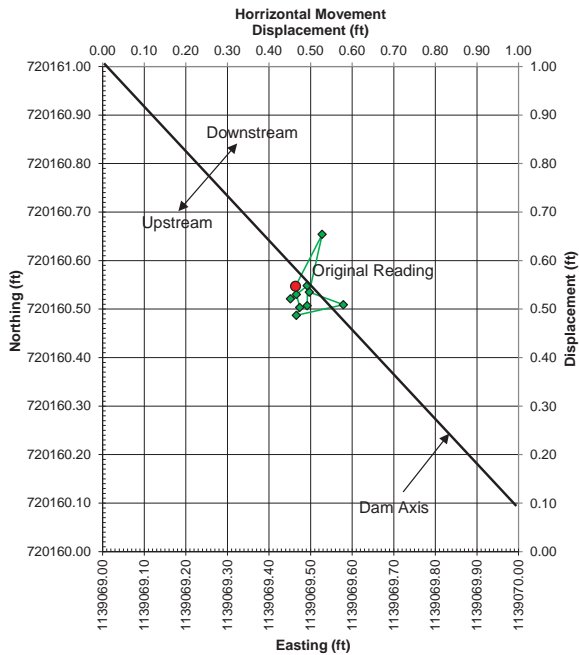
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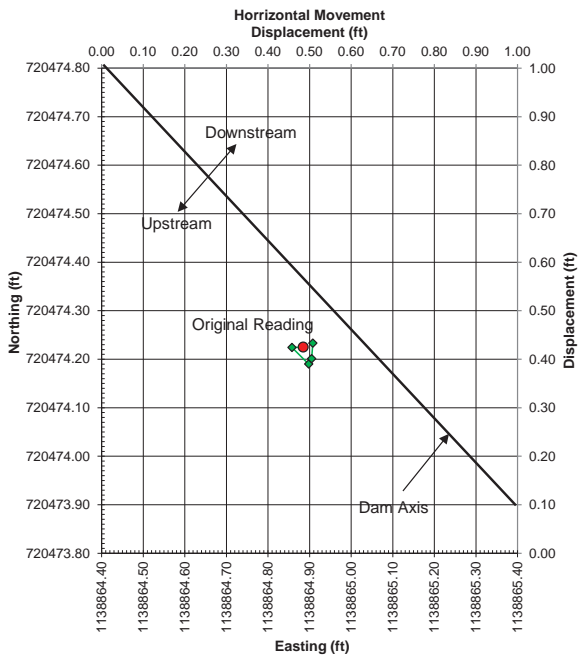
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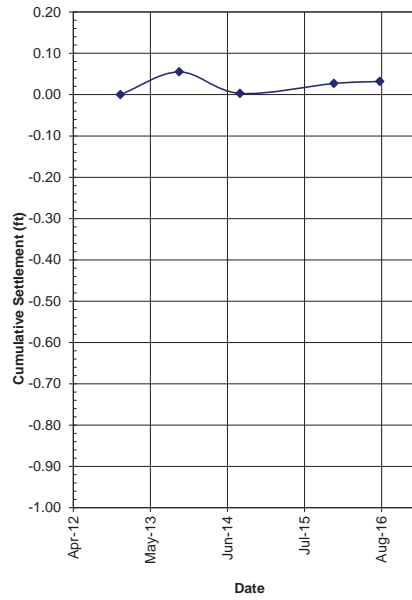
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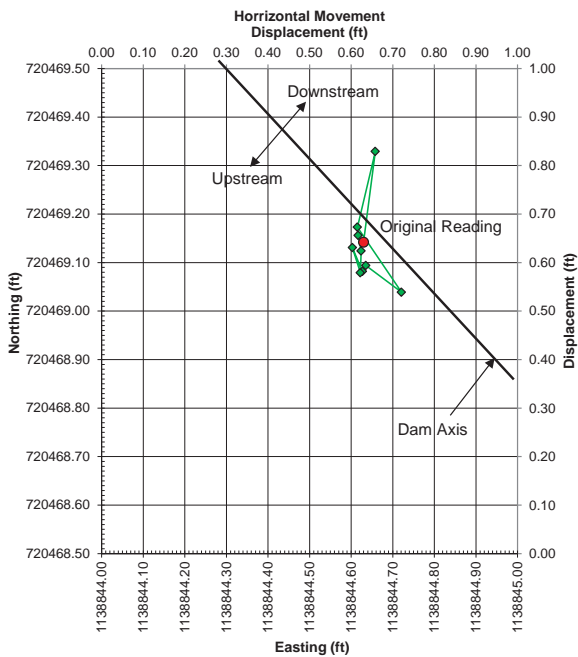
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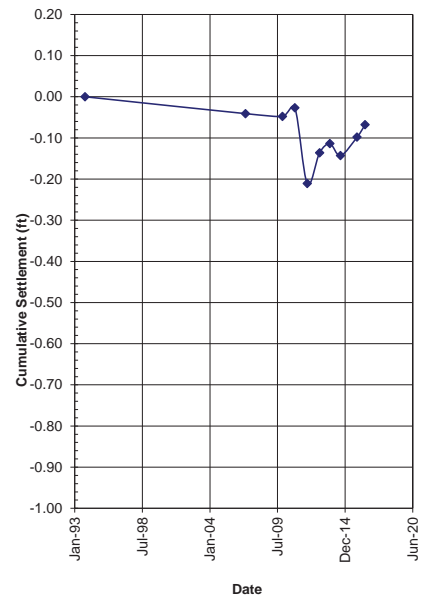
Vertical Movement



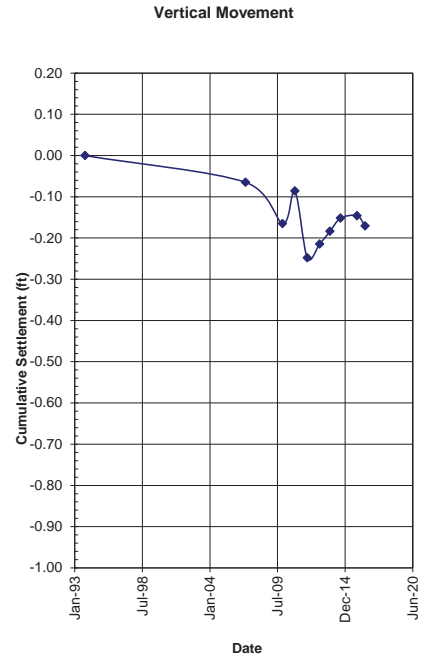
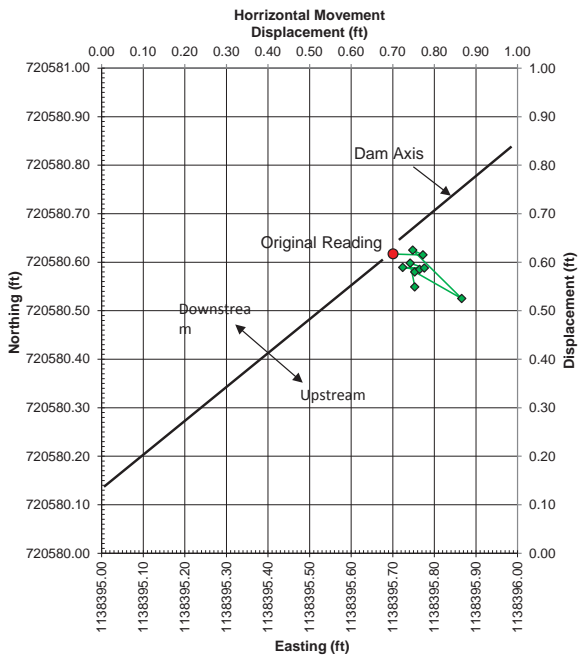
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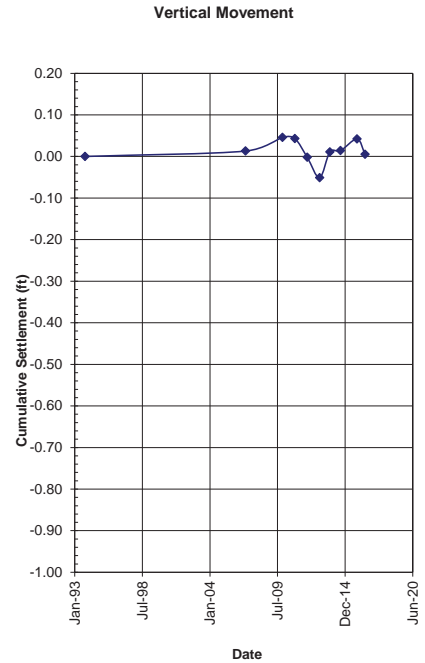
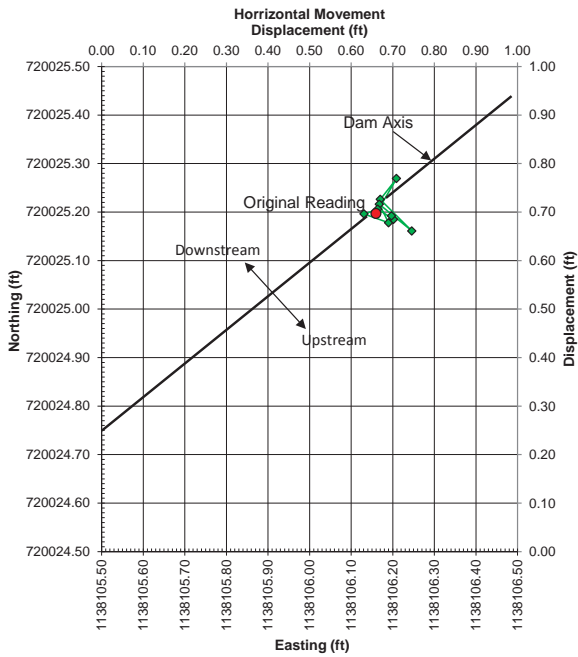
Vertical Movement



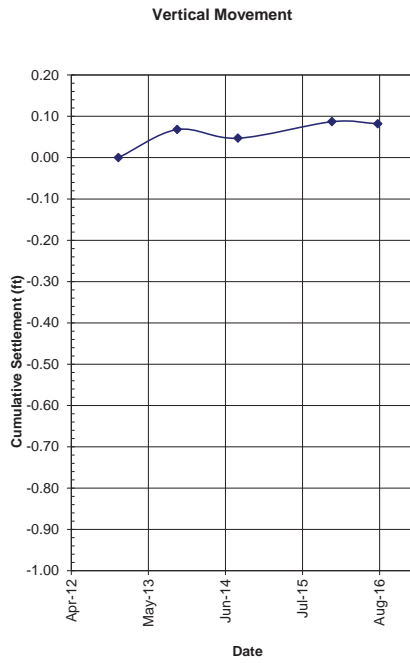
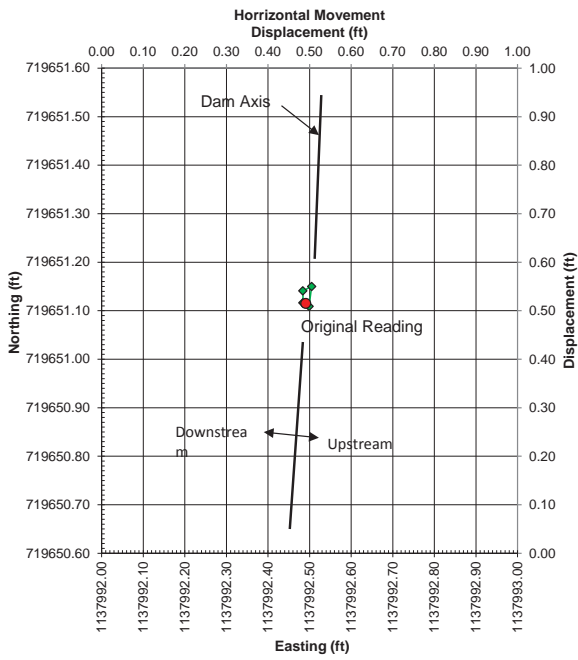
Displacement Vectors DEF-43



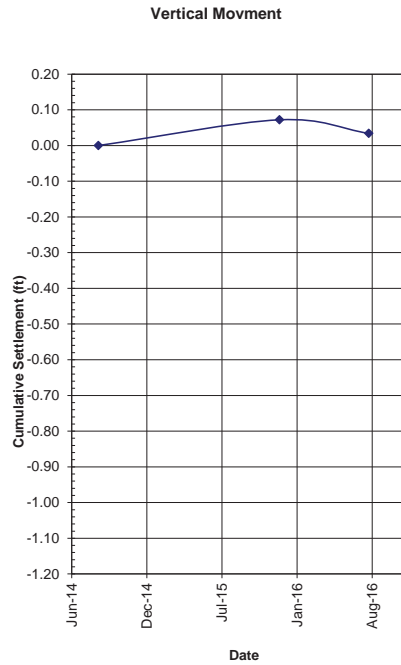
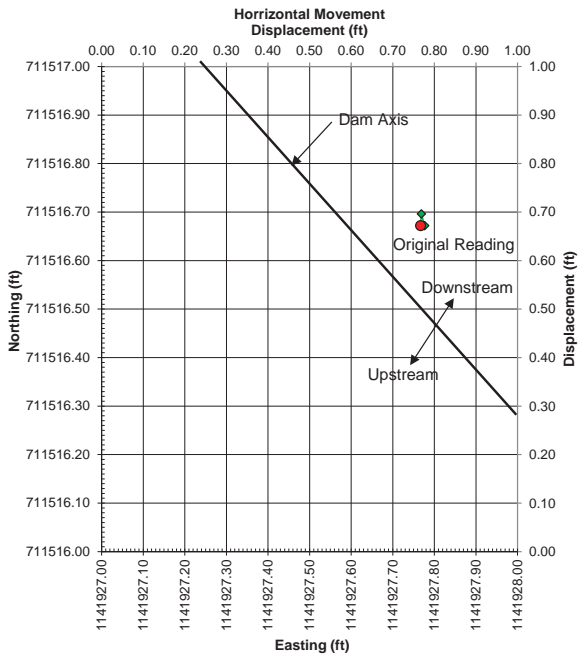
Displacement Vectors DEF-45



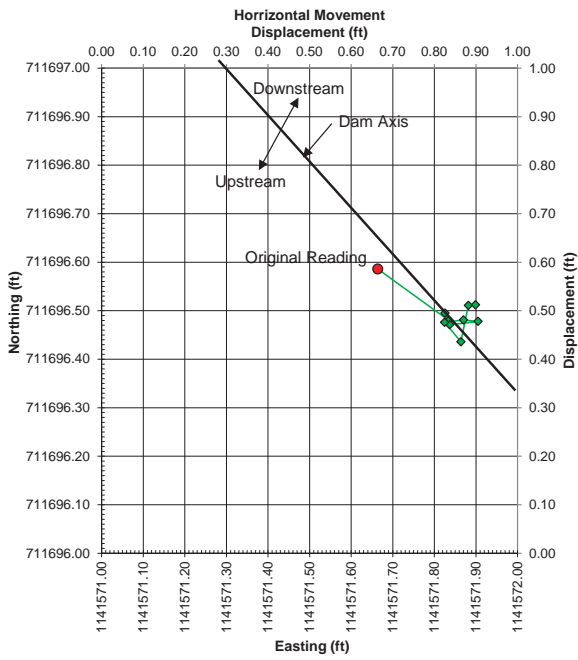
Displacement Vectors DEF-46R



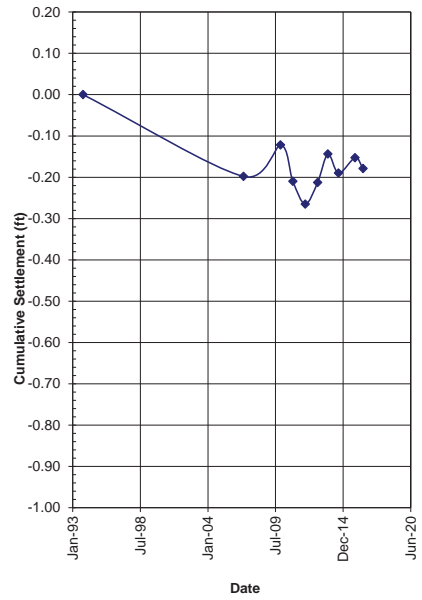
Displacement Vectors DEF-50R



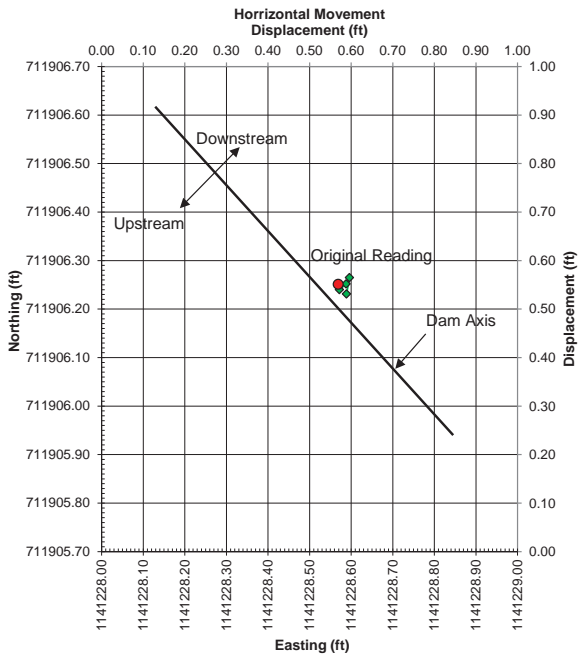
Displacement Vectors DEF-51



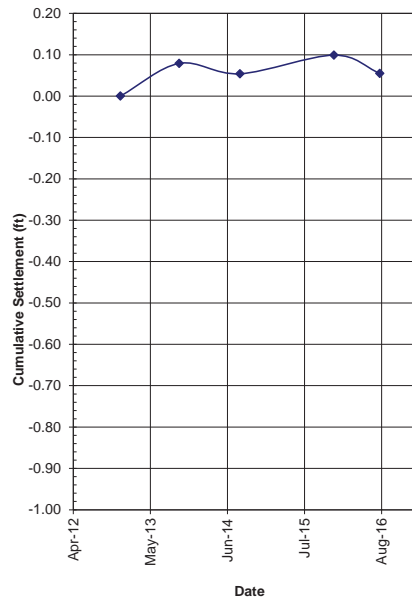
Vertical Movement



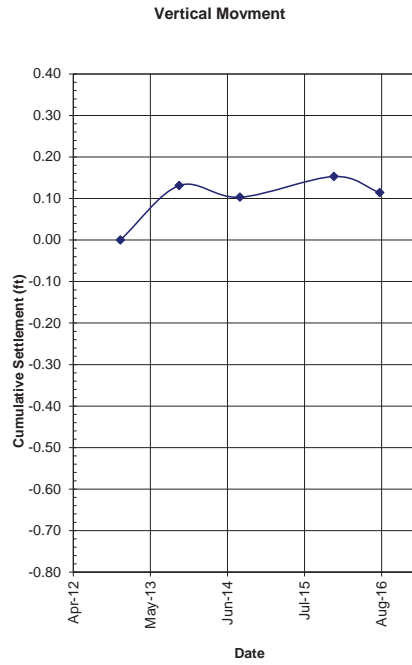
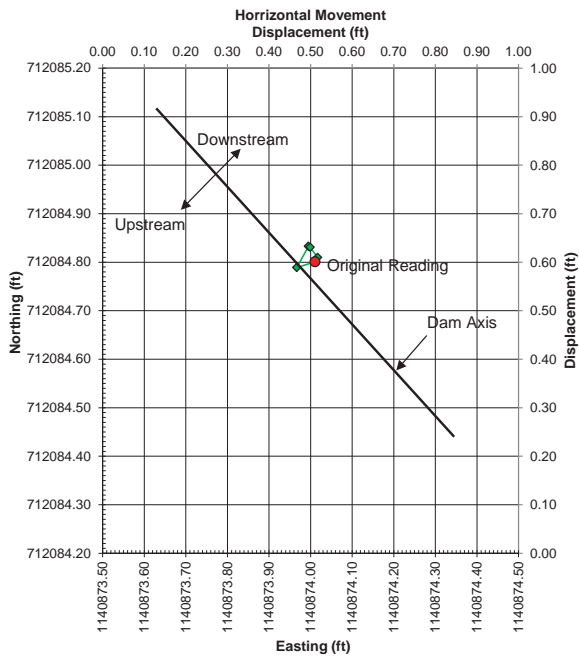
Displacement Vectors DEF-52R



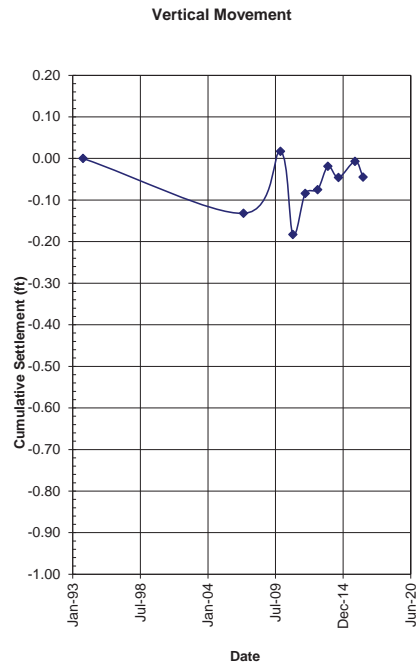
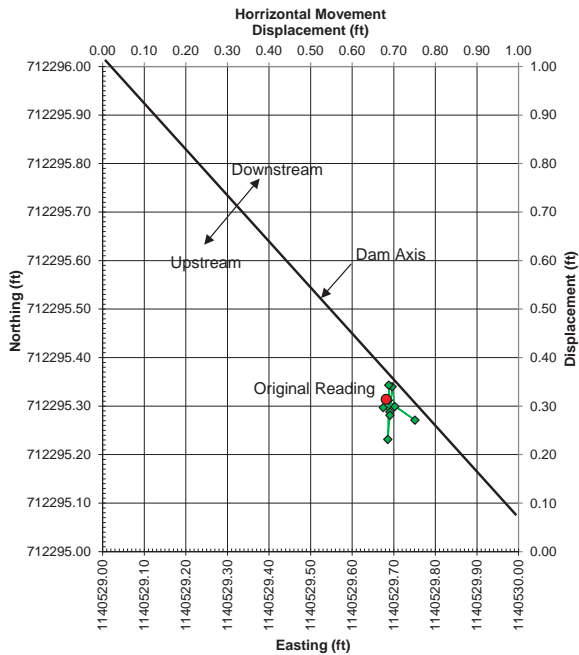
Vertical Movement



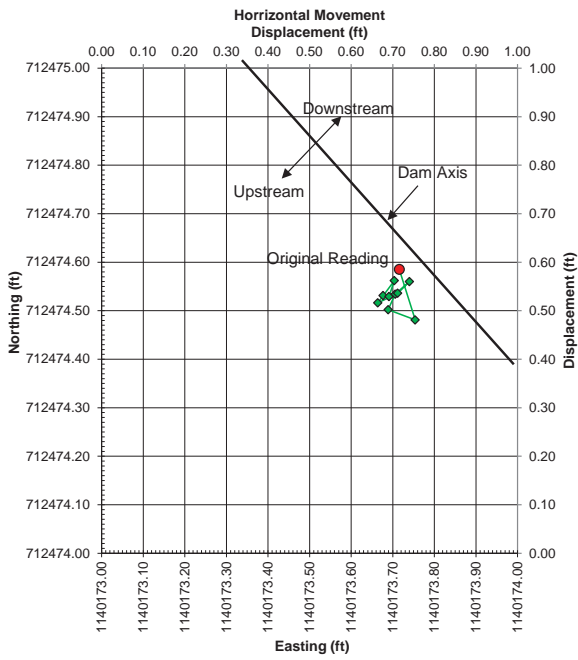
Displacement Vectors DEF-53R



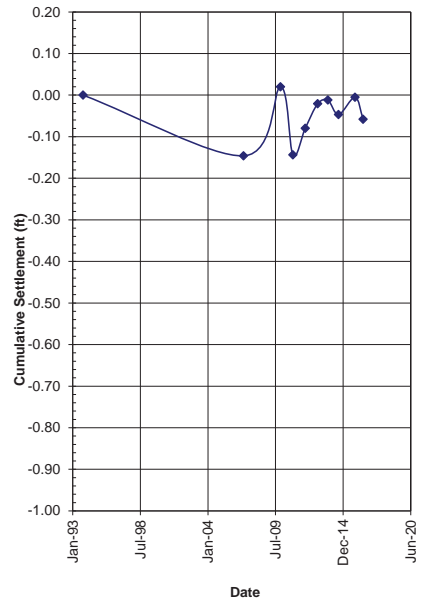
Displacement Vectors DEF-54



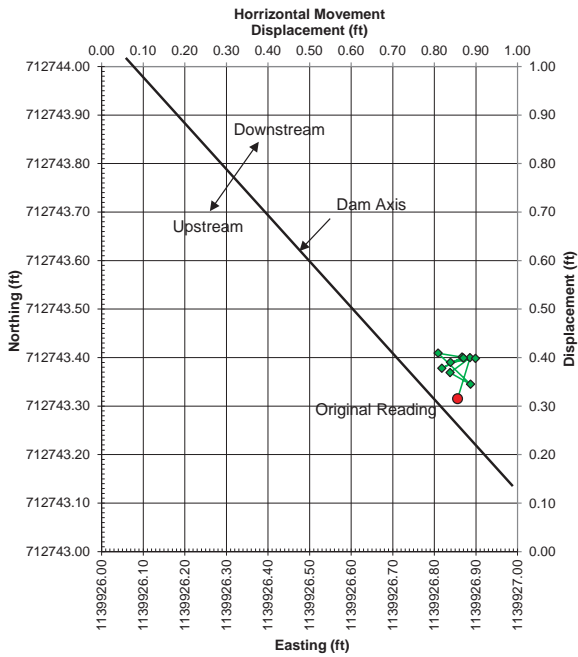
Displacement Vectors DEF-55



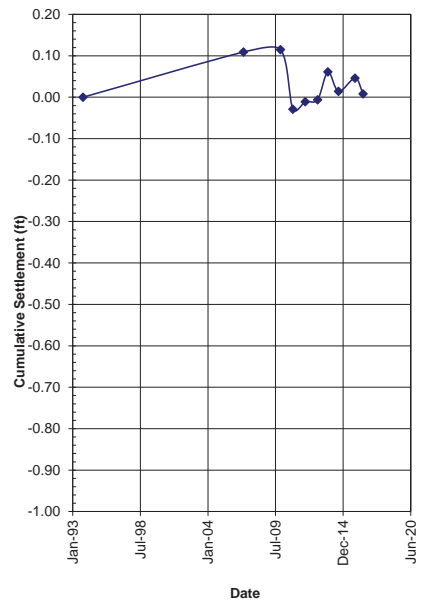
Vertical Movement



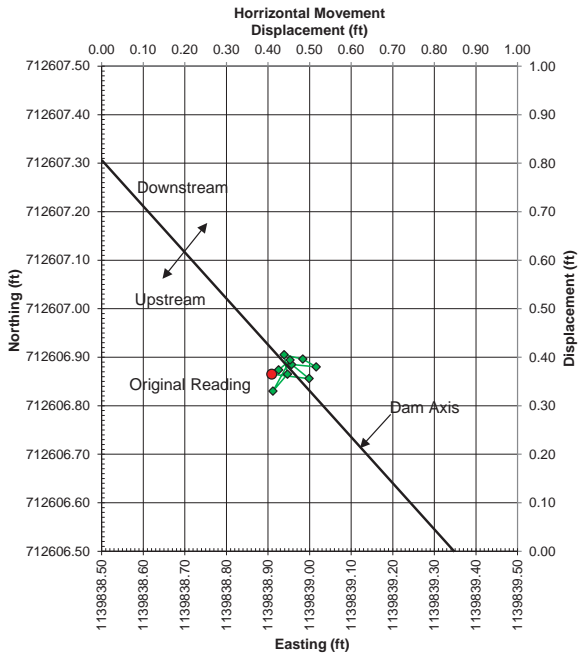
Displacement Vectors DEF-56



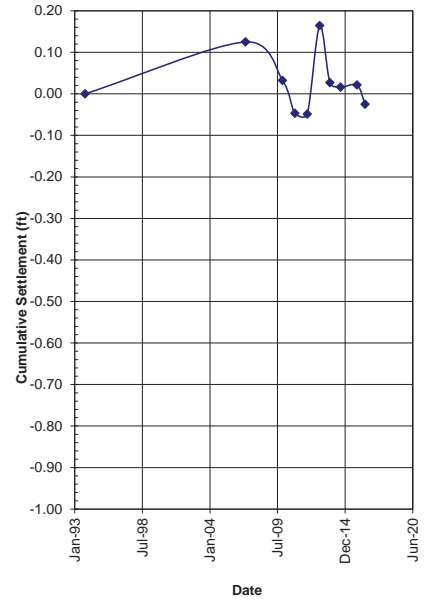
Vertical Movement



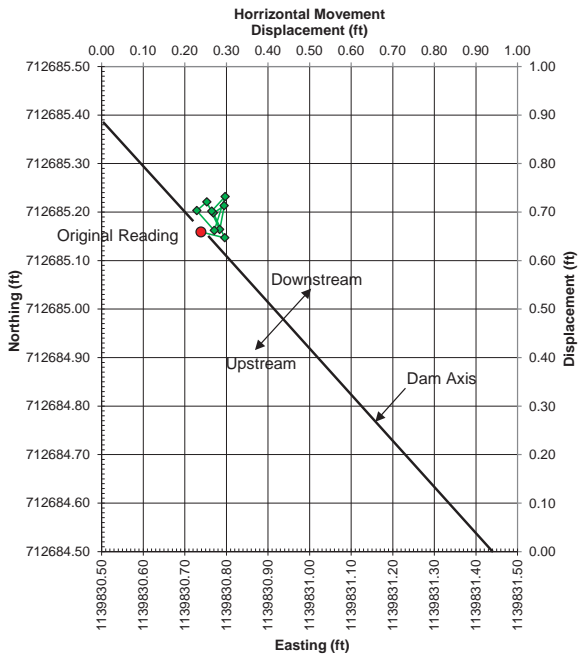
Displacement Vectors DEF-57



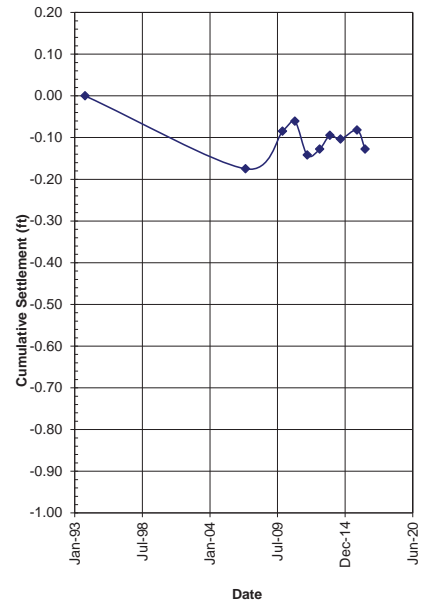
Vertical Movement



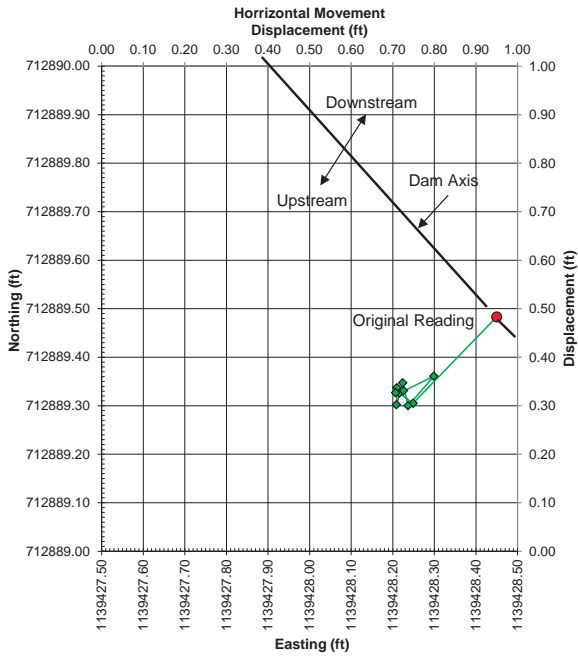
Displacement Vectors DEF-58



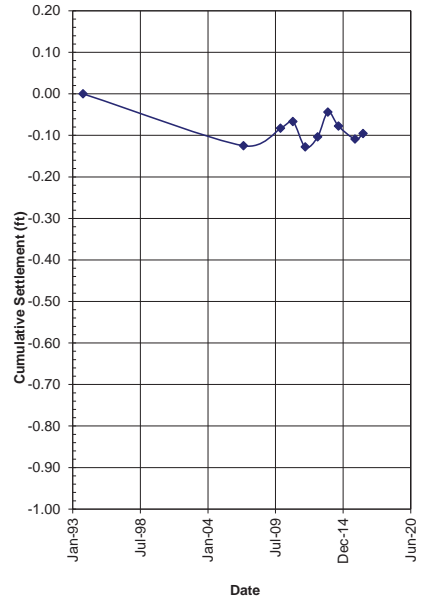
Vertical Movement



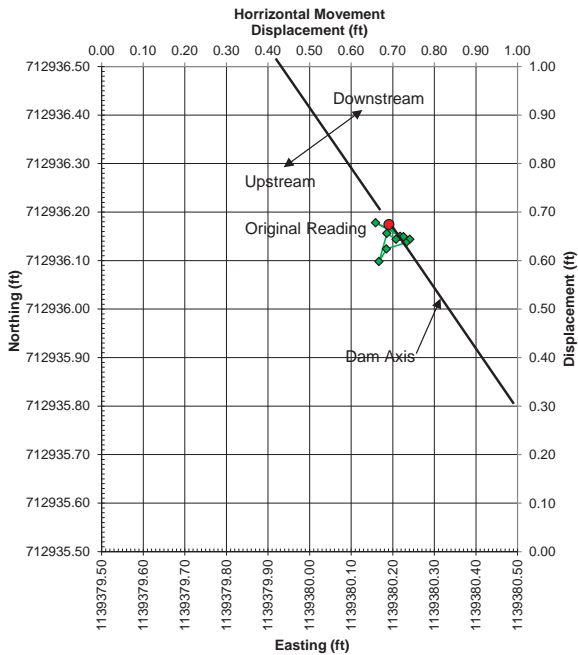
Displacement Vectors DEF-59



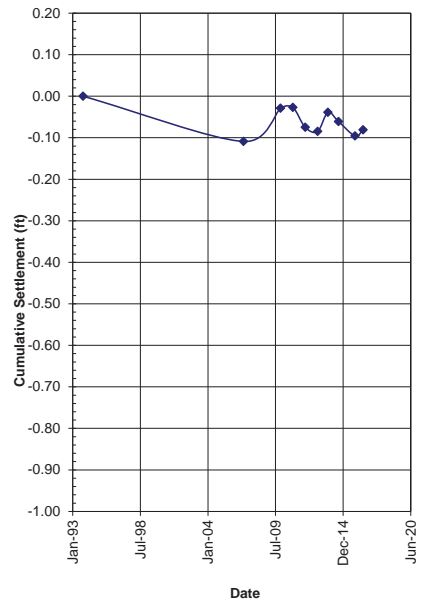
Vertical Movement



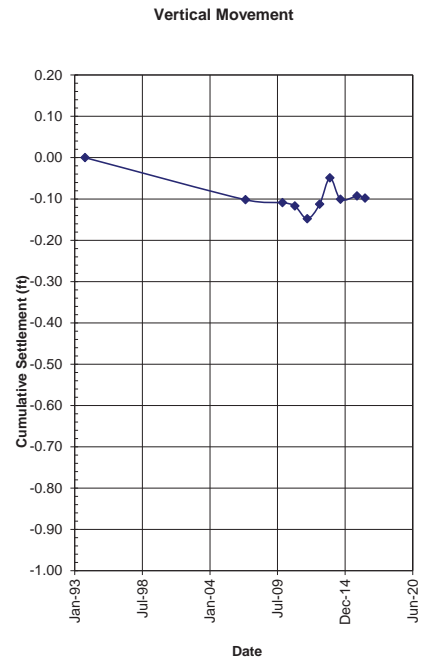
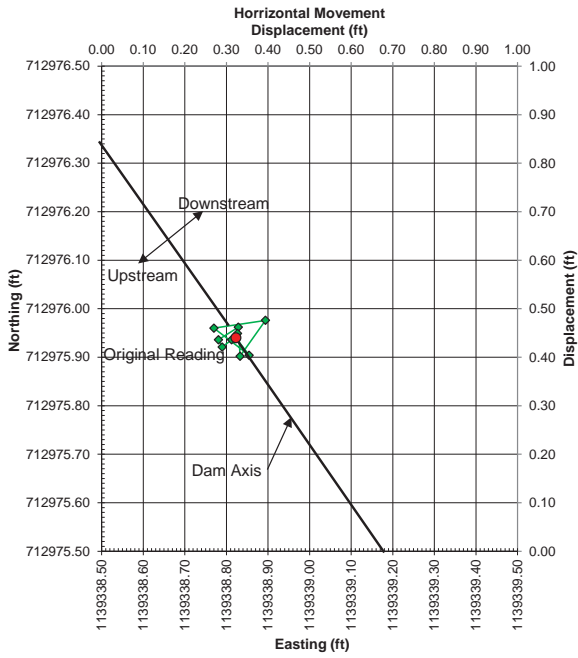
Displacement Vectors DEF-60



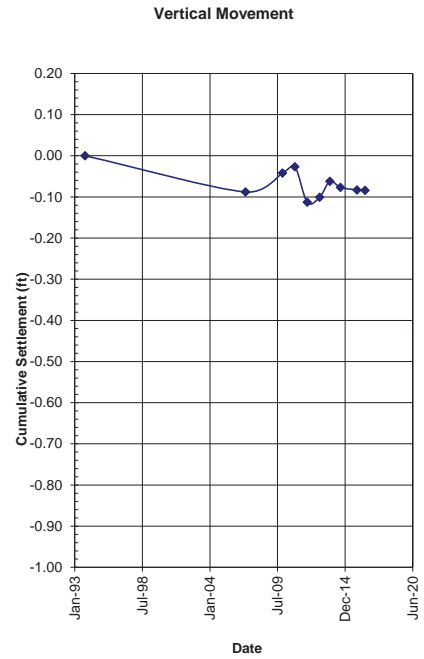
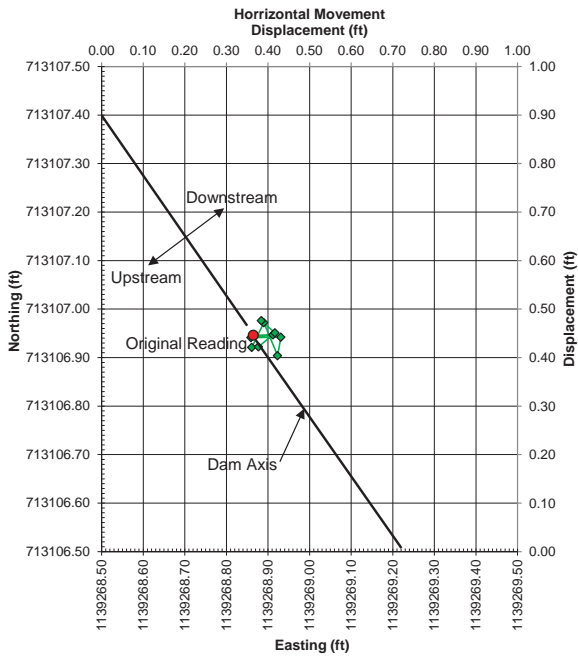
Vertical Movement



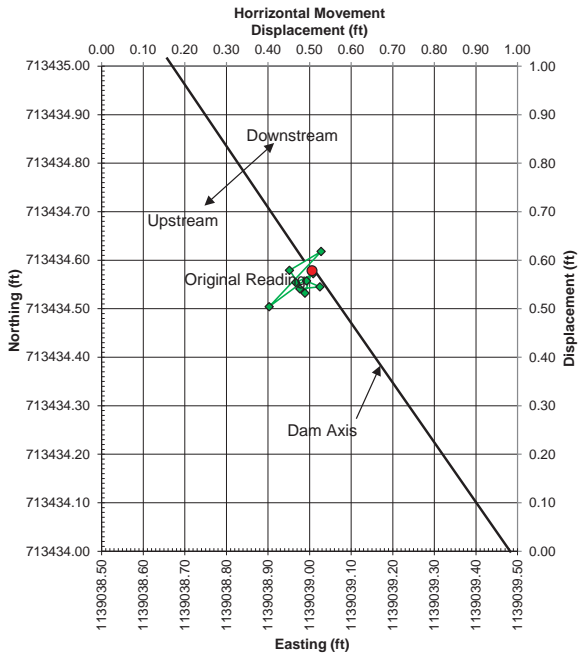
Displacement Vectors DEF-61



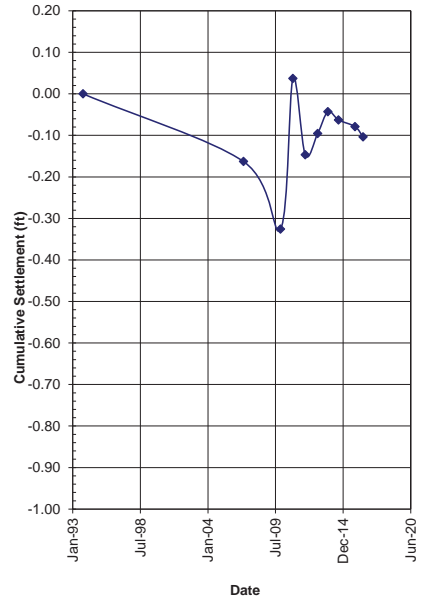
Displacement Vectors DEF-62



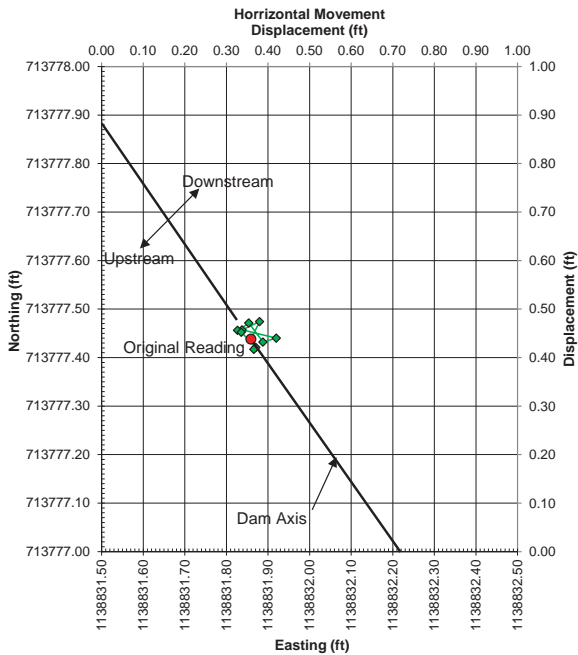
Displacement Vectors DEF-63



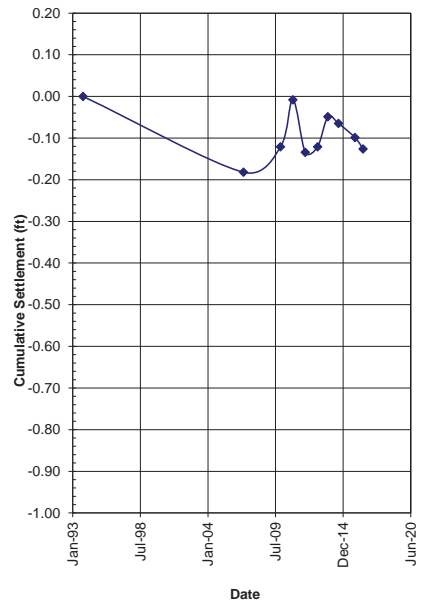
Vertical Movement



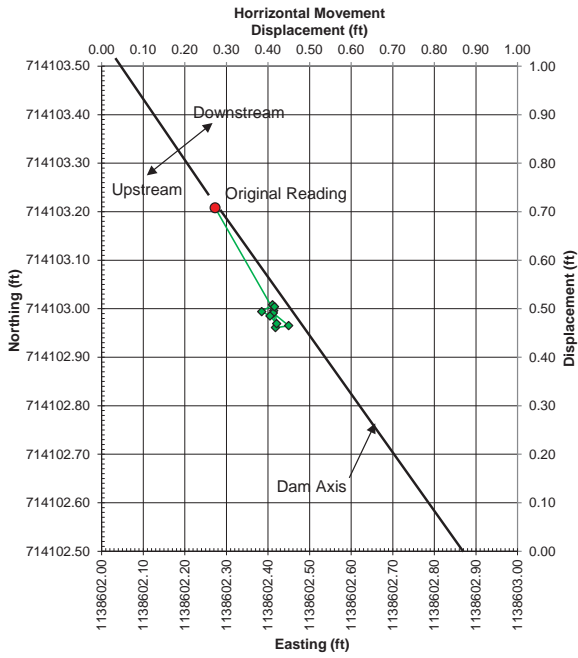
Displacement Vectors DEF-64



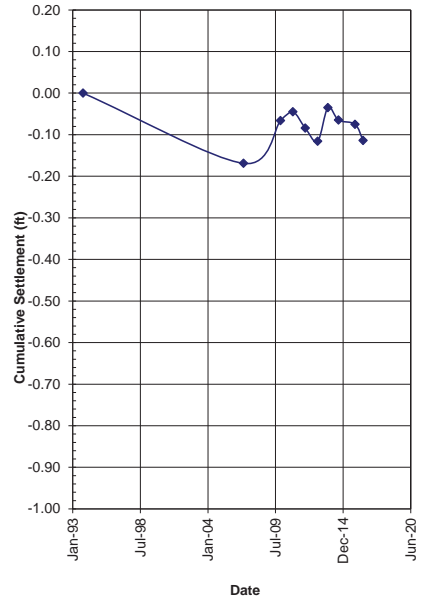
Vertical Movement



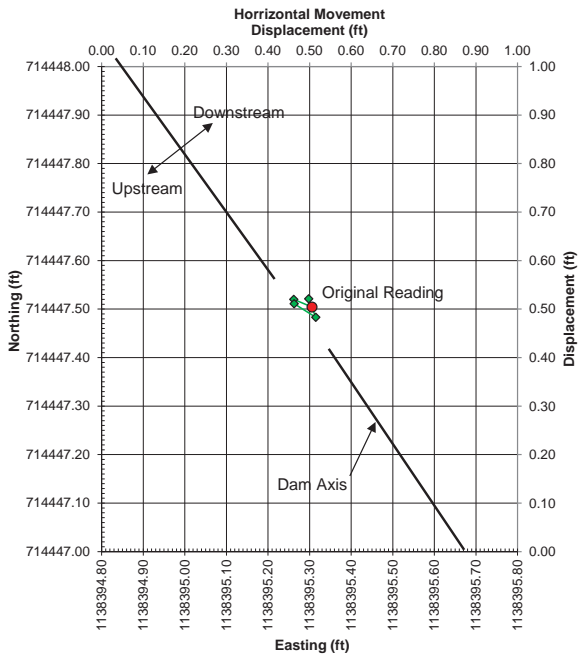
Displacement Vectors DEF-65



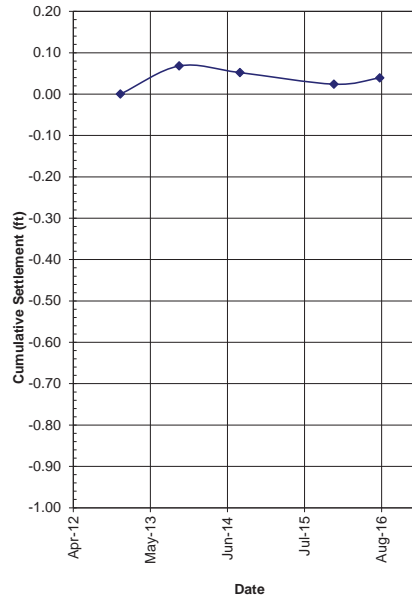
Vertical Movement



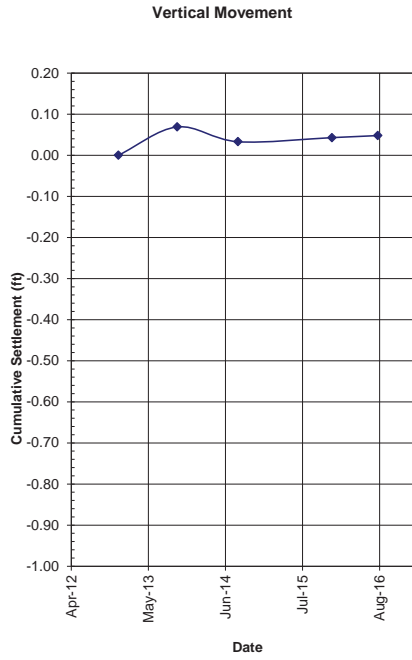
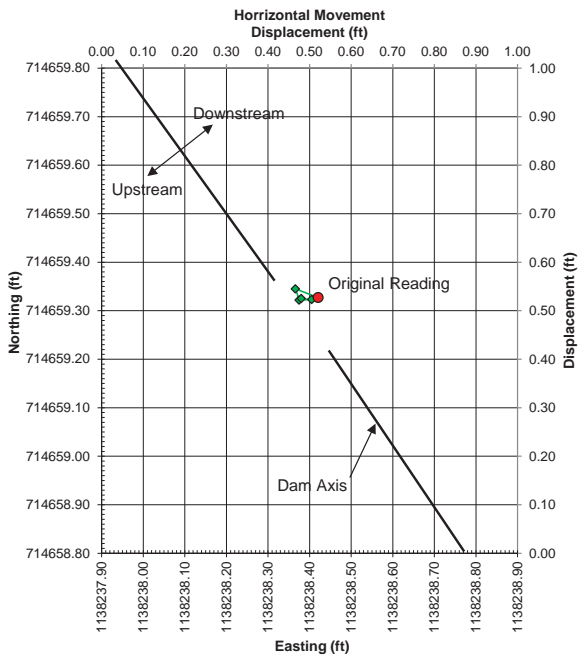
Displacement Vectors DEF-66R



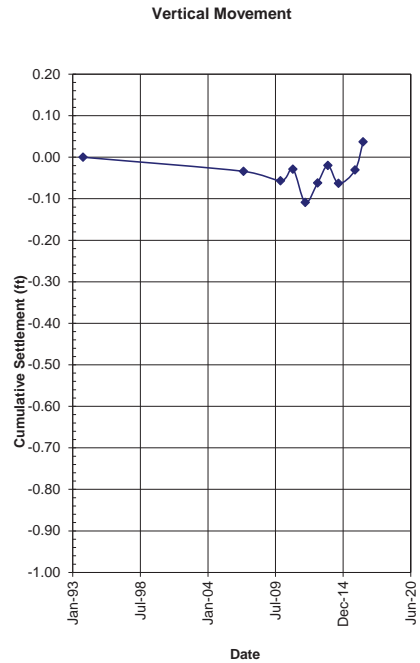
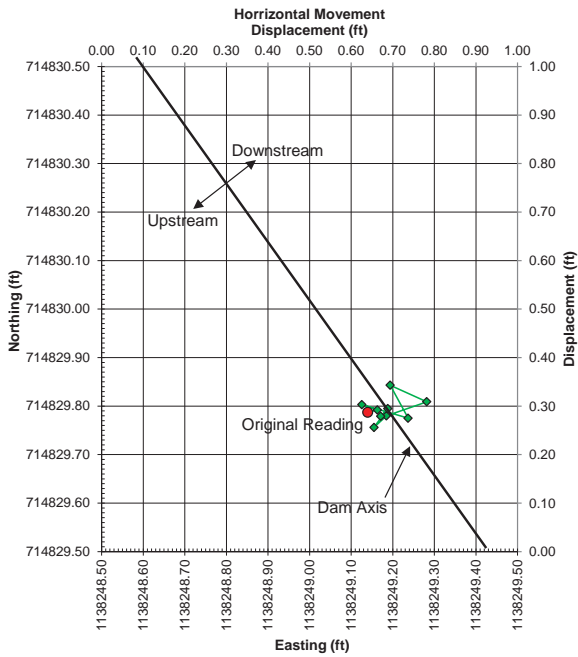
Vertical Movement



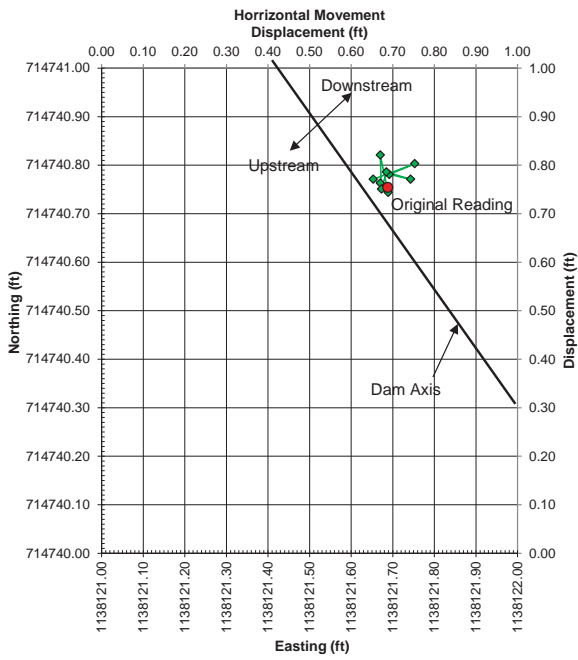
Displacement Vectors DEF-67R



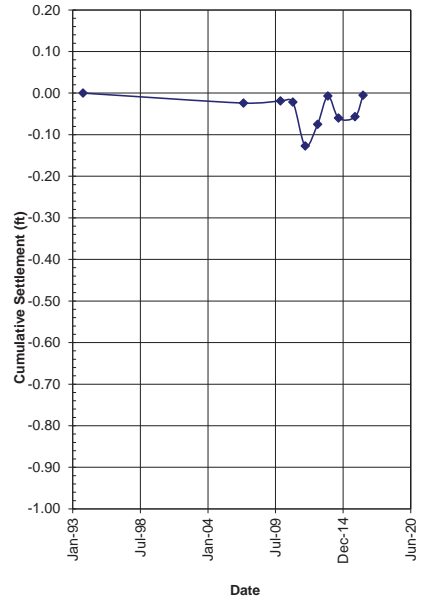
Displacement Vectors DEF-68



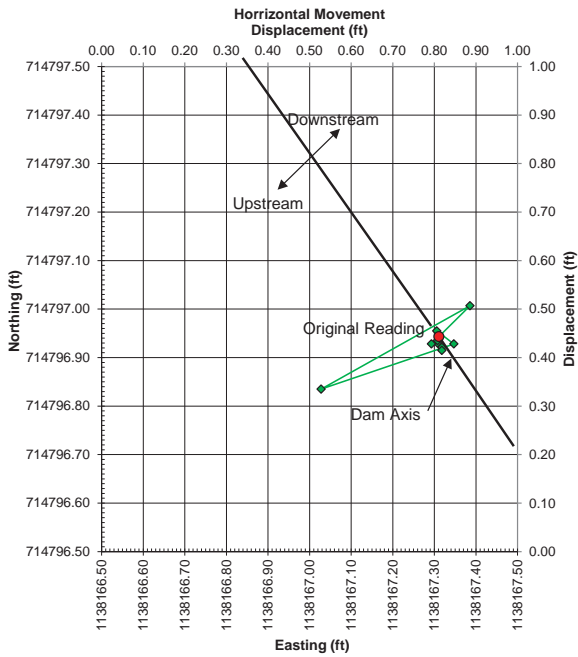
Displacement Vectors DEF-69



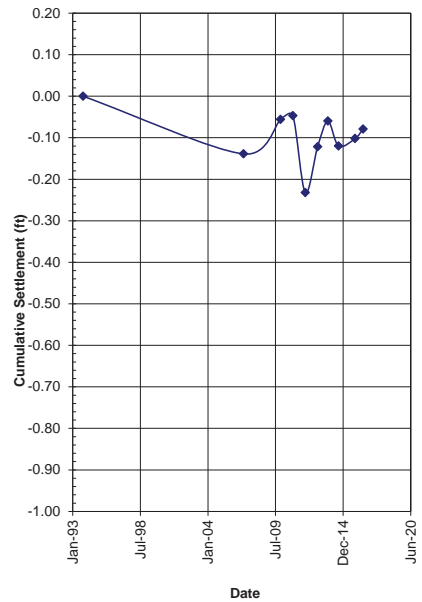
Vertical Movement



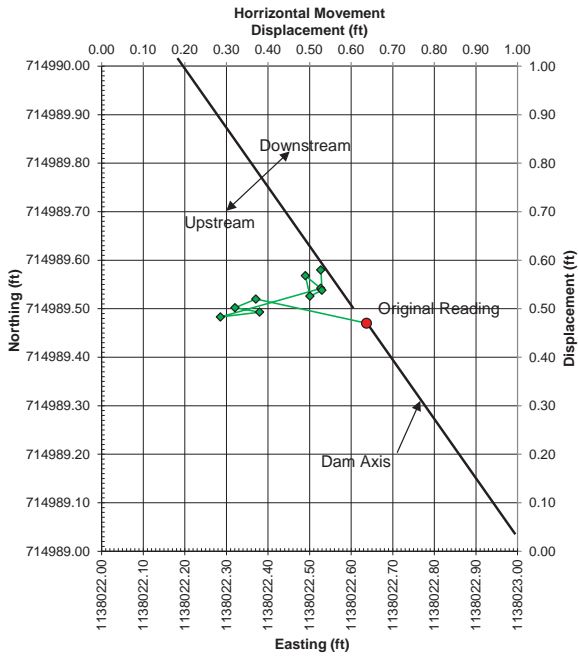
Displacement Vectors DEF-70



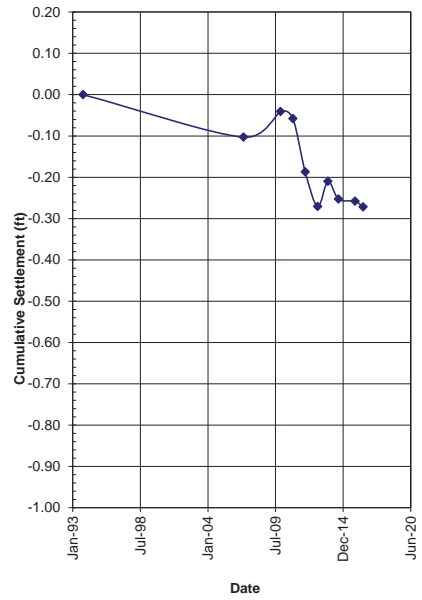
Vertical Movement



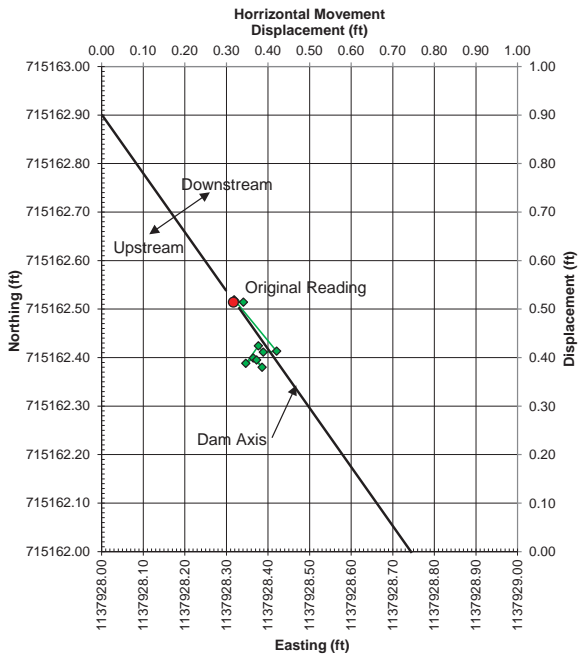
Displacement Vectors DEF-71



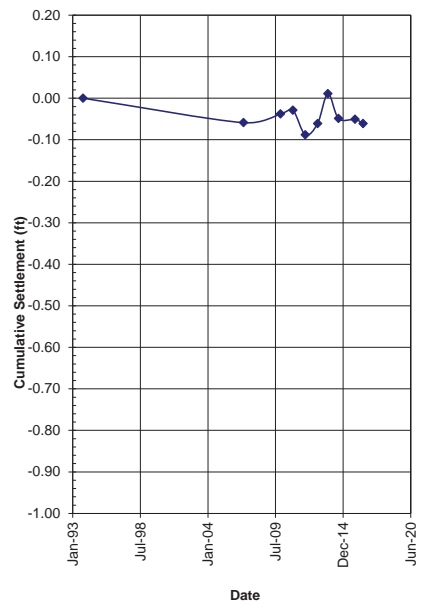
Vertical Movement



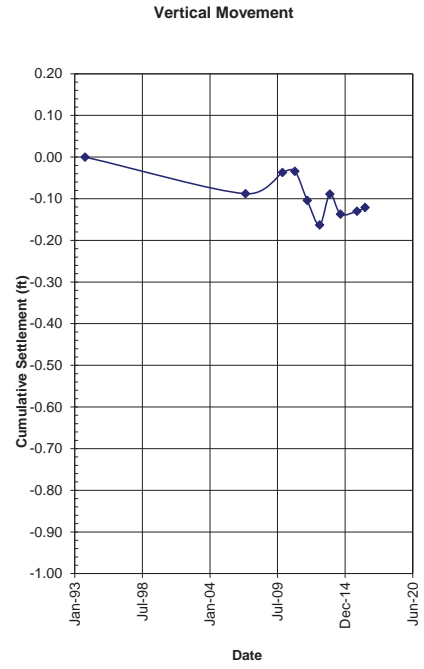
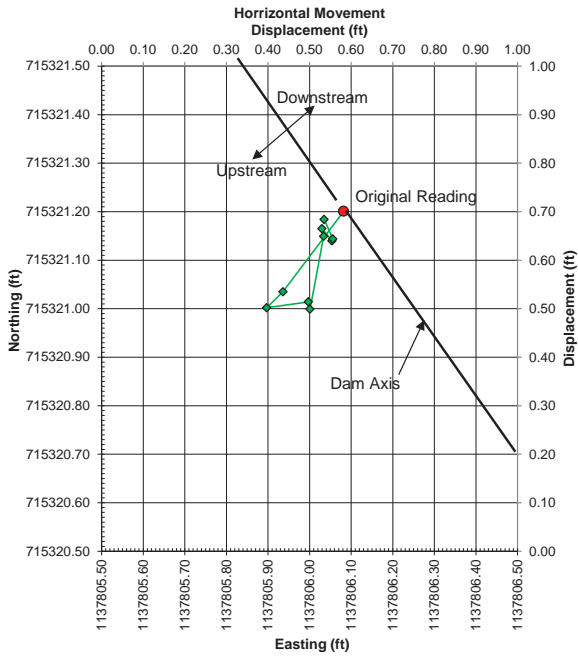
Displacement Vectors DEF-72



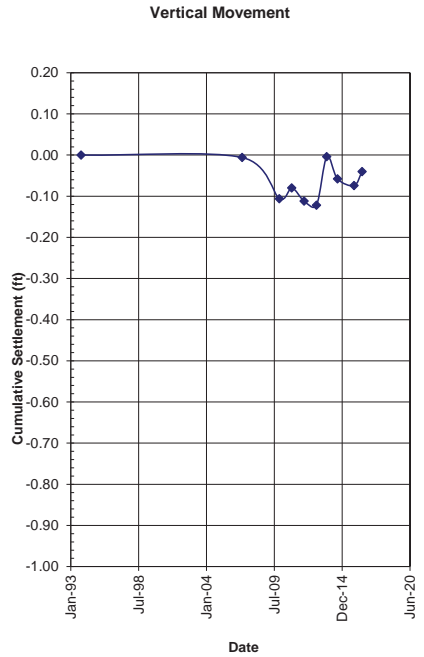
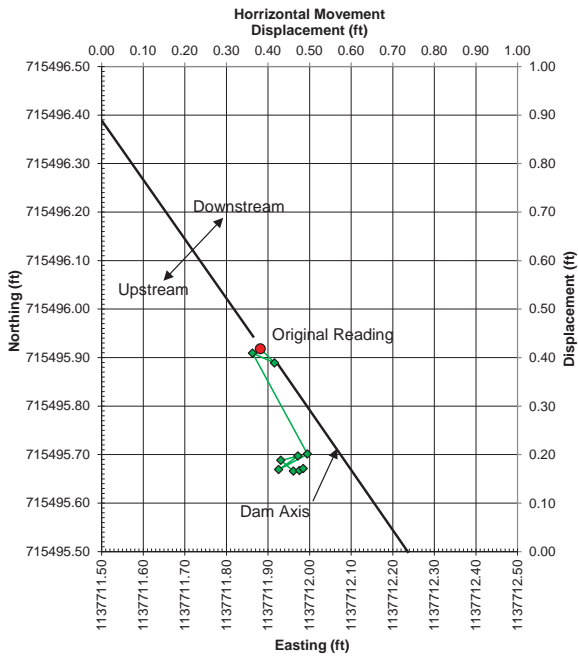
Vertical Movement



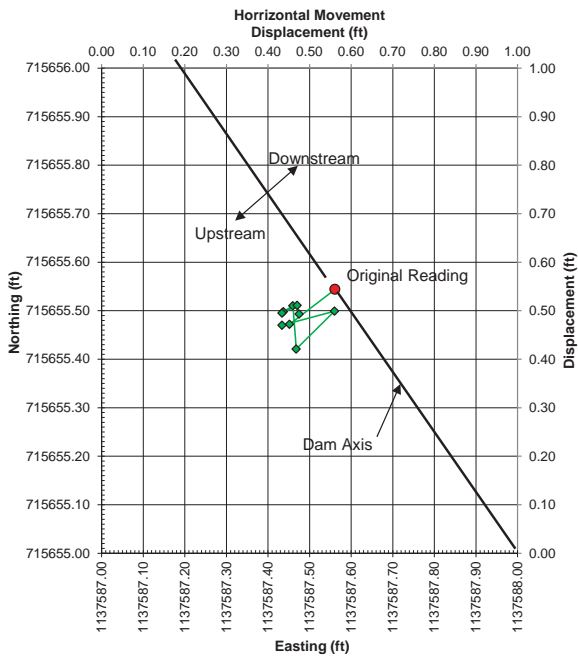
Displacement Vectors DEF-73



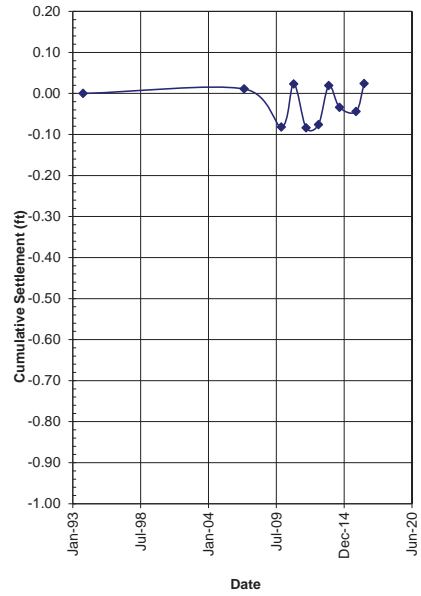
Displacement Vectors DEF-74



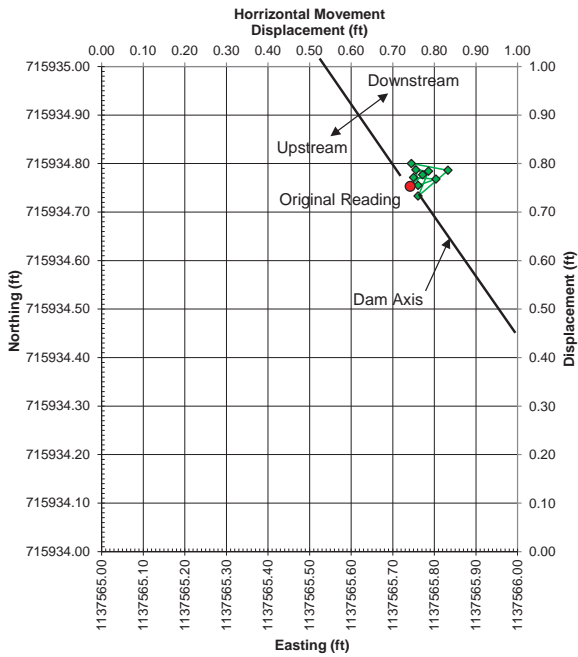
Displacement Vectors DEF-75



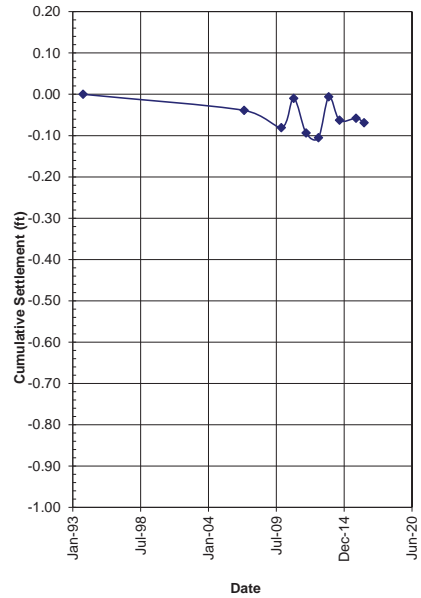
Vertical Movement



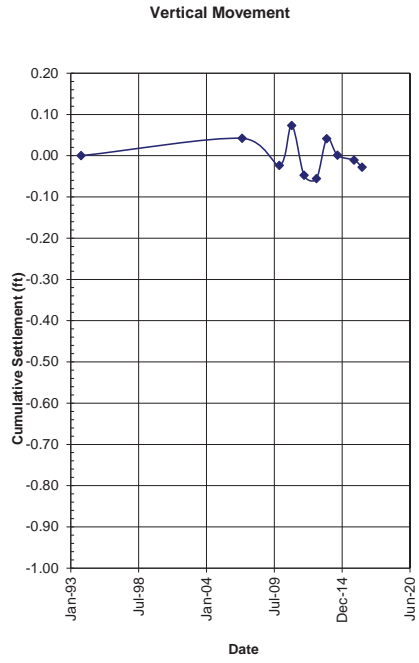
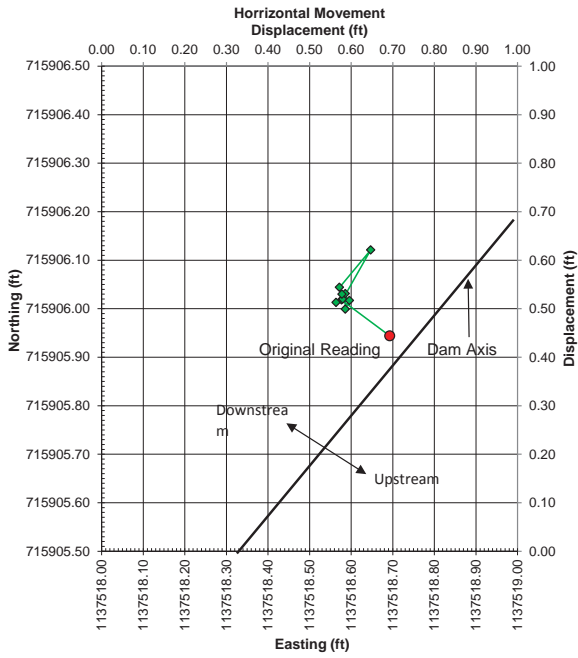
Displacement Vectors DEF-76



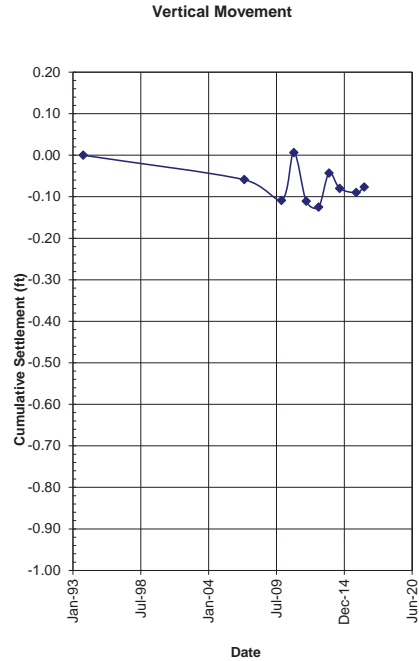
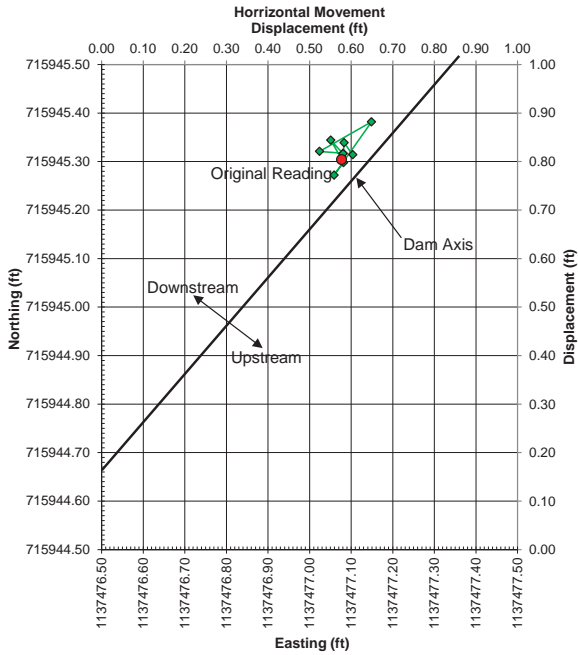
Vertical Movement



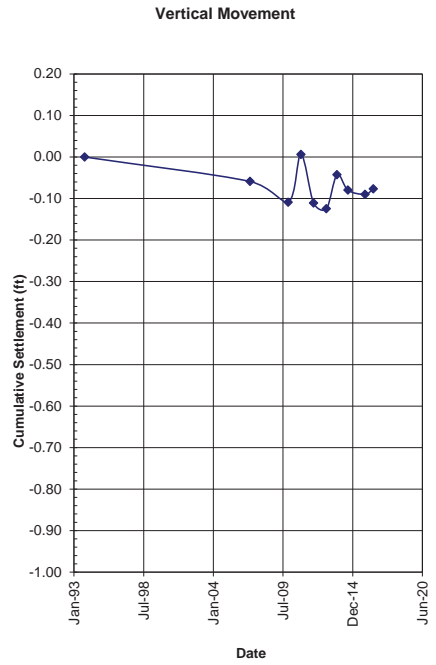
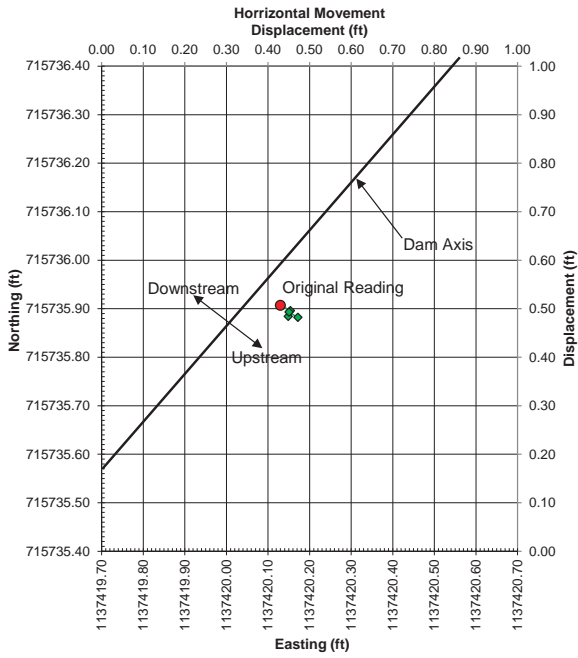
Displacement Vectors DEF-77



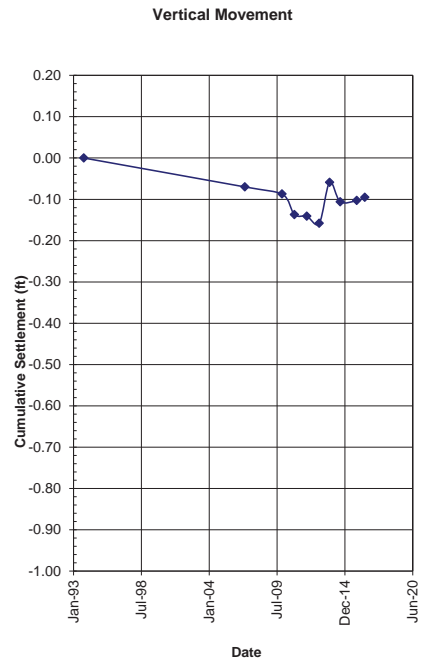
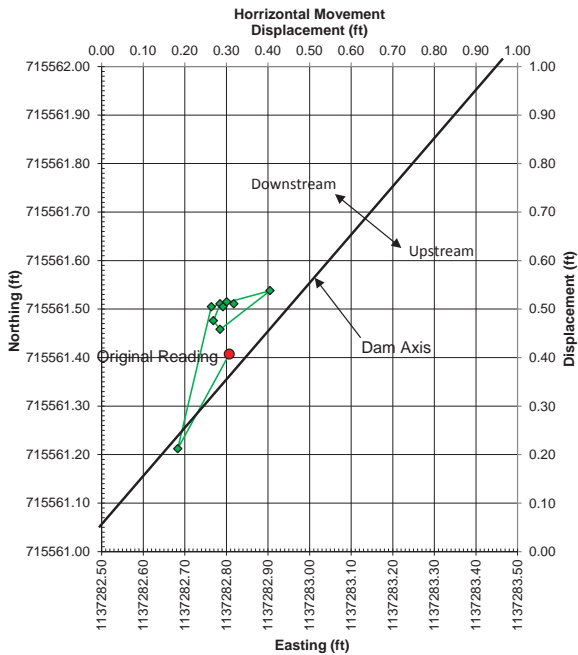
Displacement Vectors DEF-78



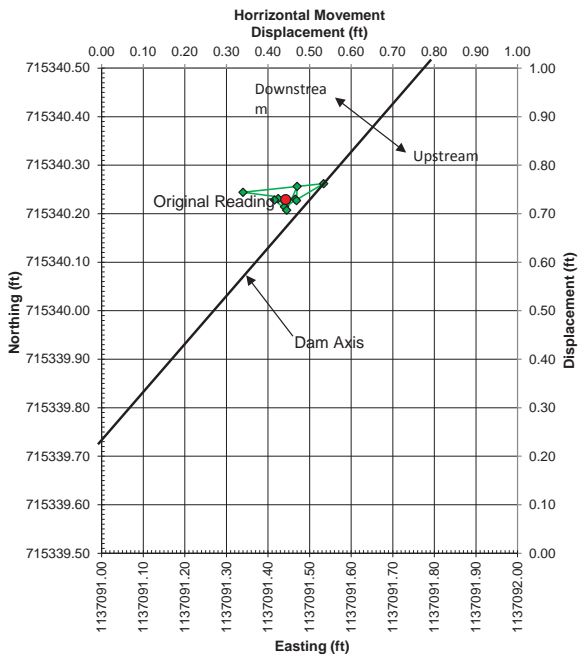
Displacement Vectors DEF-79R



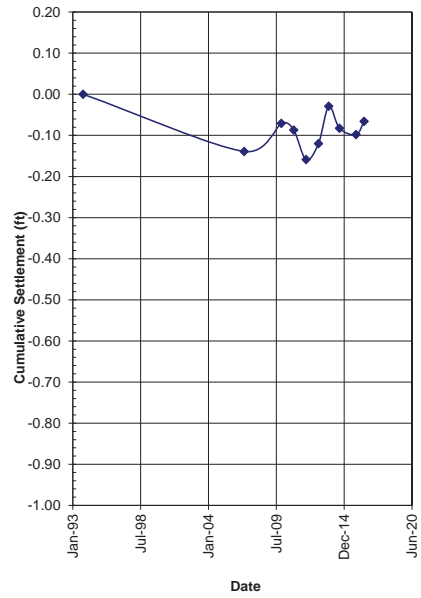
Displacement Vectors DEF-80



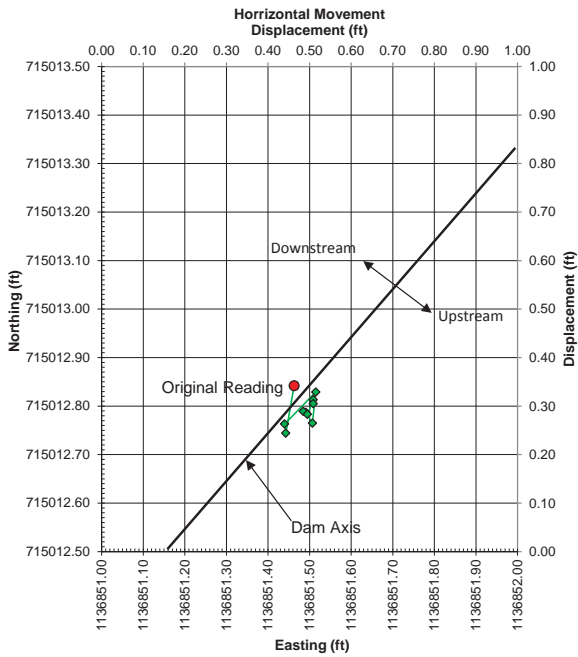
Displacement Vectors DEF-81



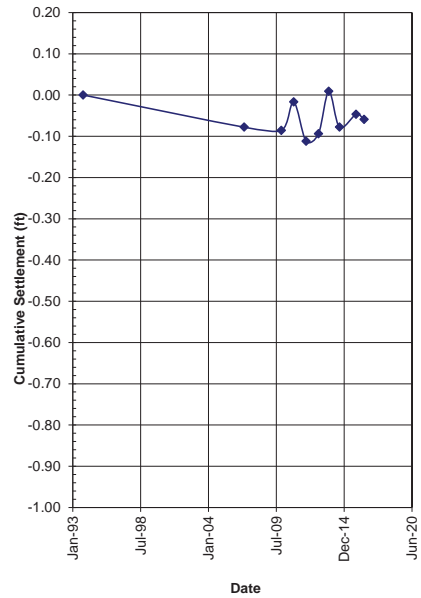
Vertical Movement



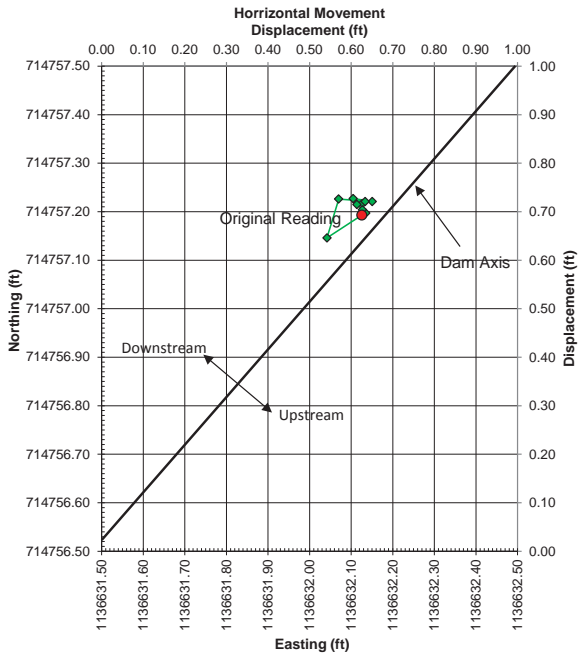
Displacement Vectors DEF-82



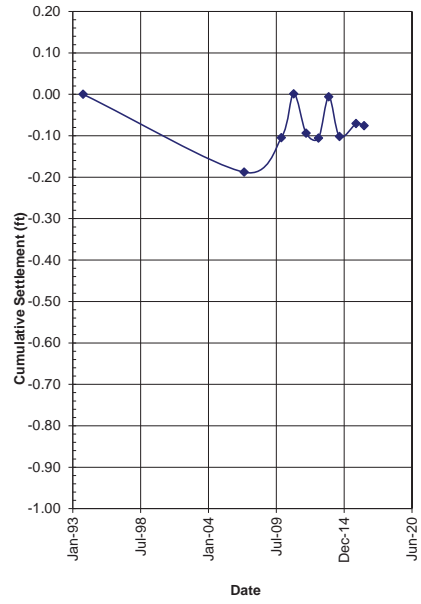
Vertical Movement



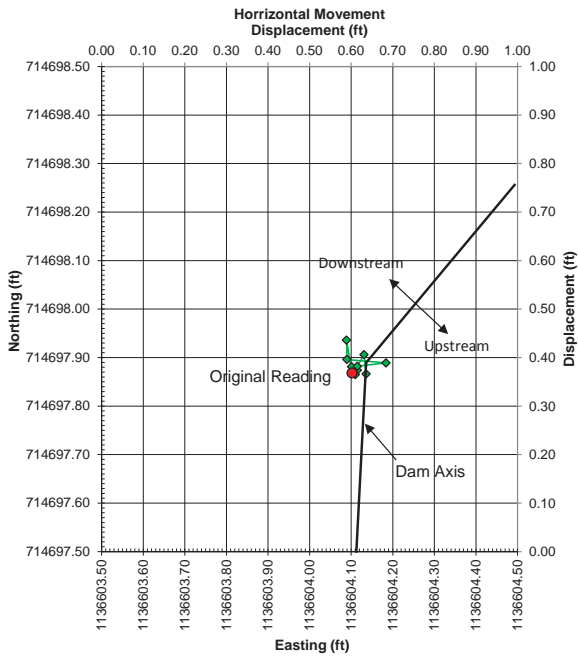
Displacement Vectors DEF-83



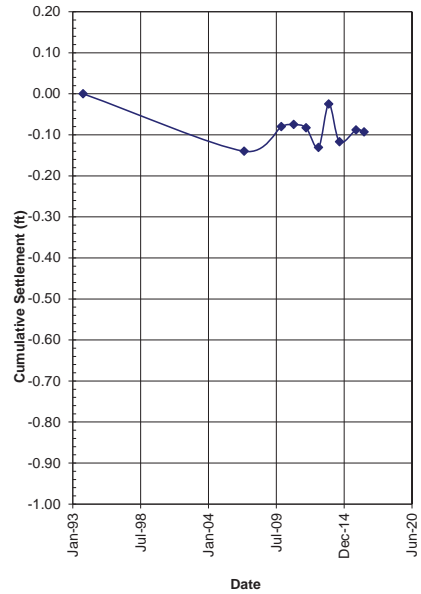
Vertical Movement



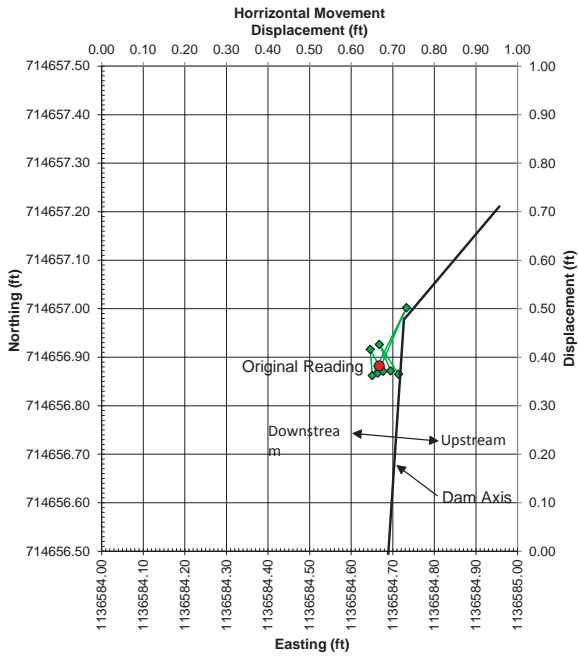
Displacement Vectors DEF-84



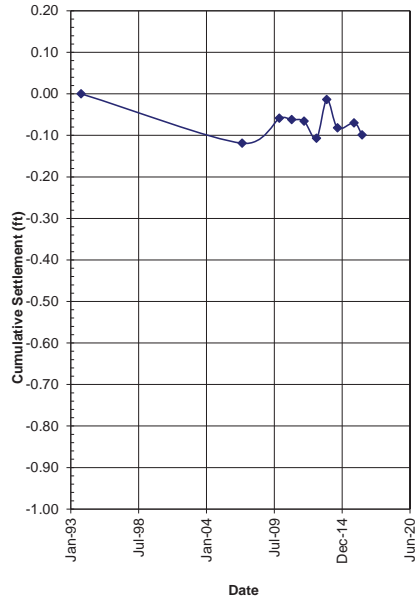
Vertical Movement



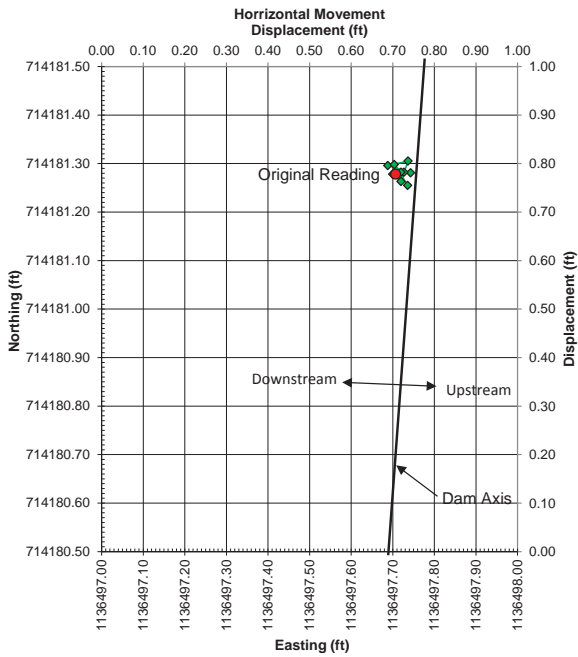
Displacement Vectors DEF-85



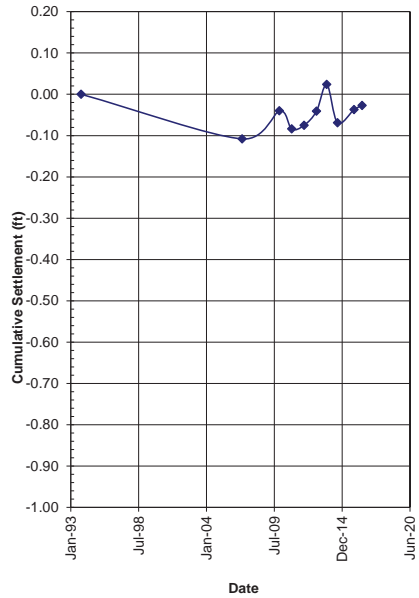
Vertical Movement



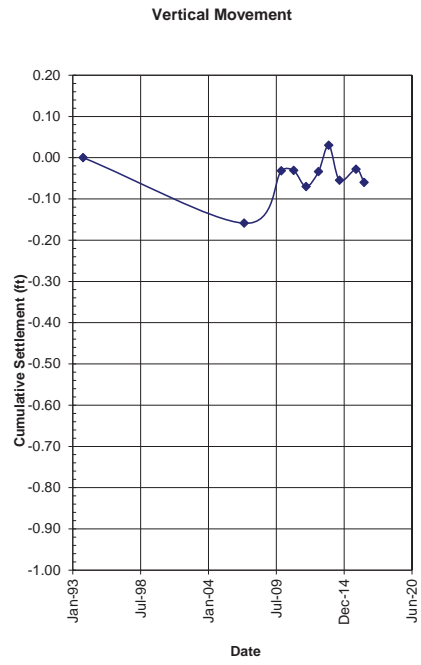
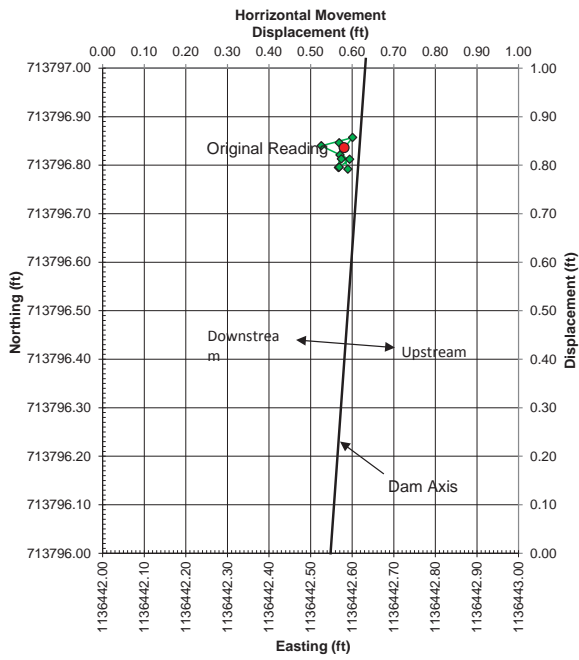
Displacement Vectors DEF-86



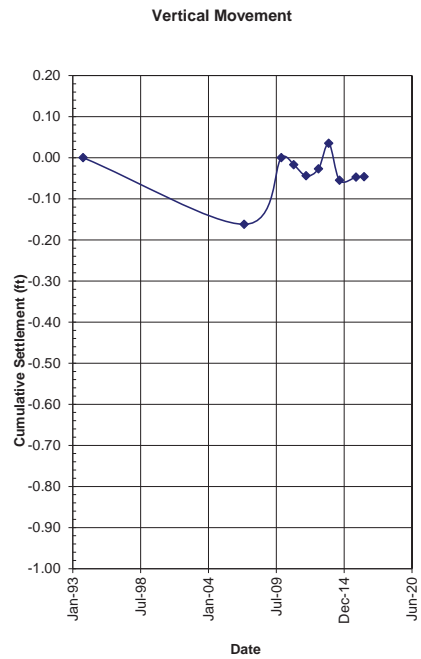
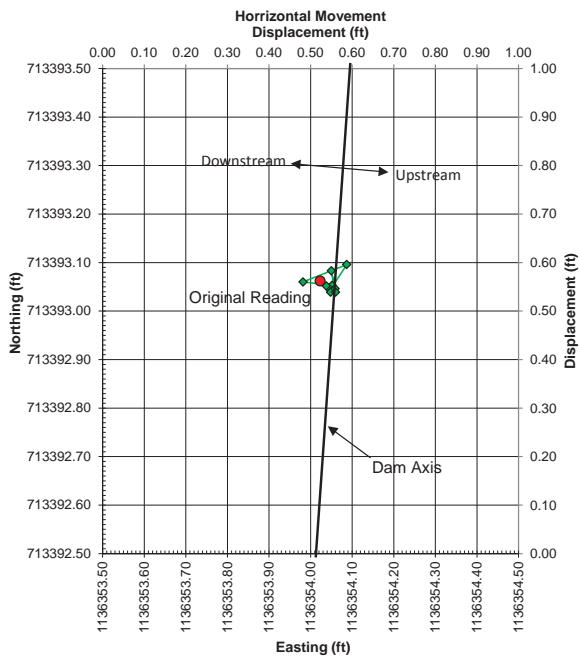
Vertical Movement



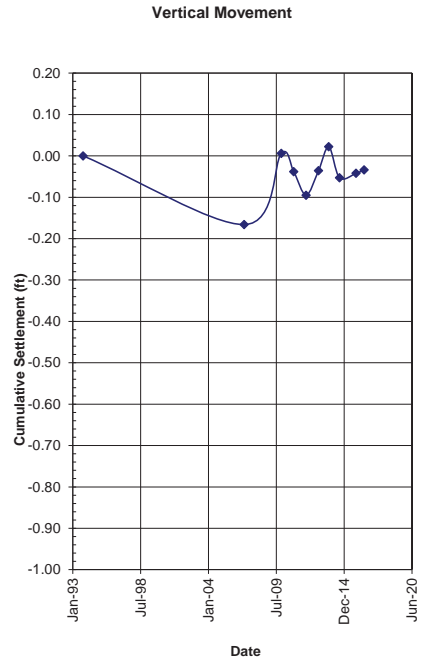
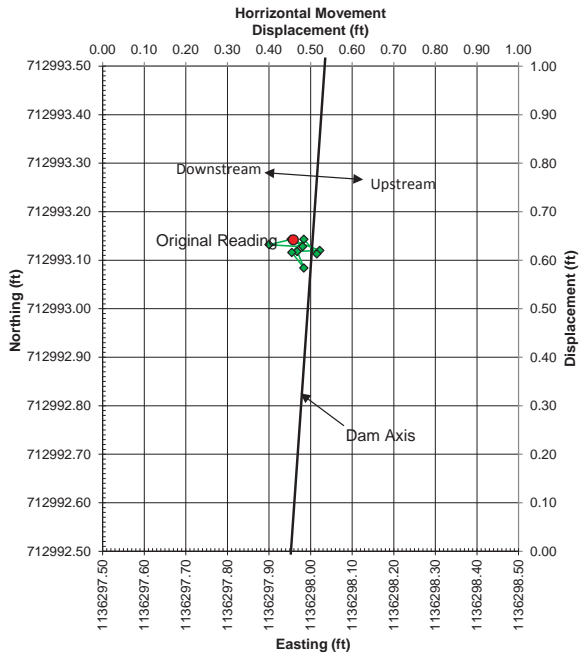
Displacement Vectors DEF-87



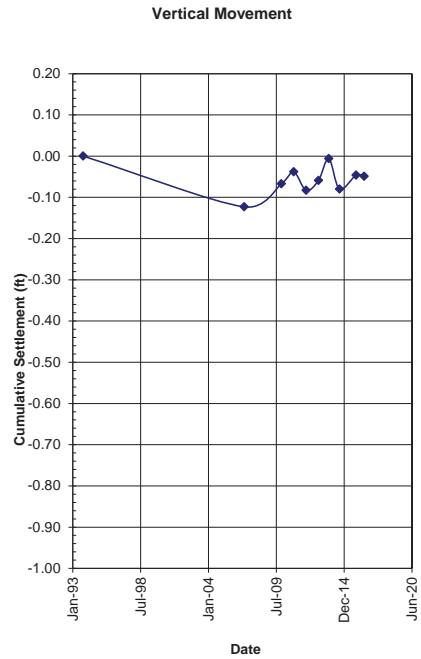
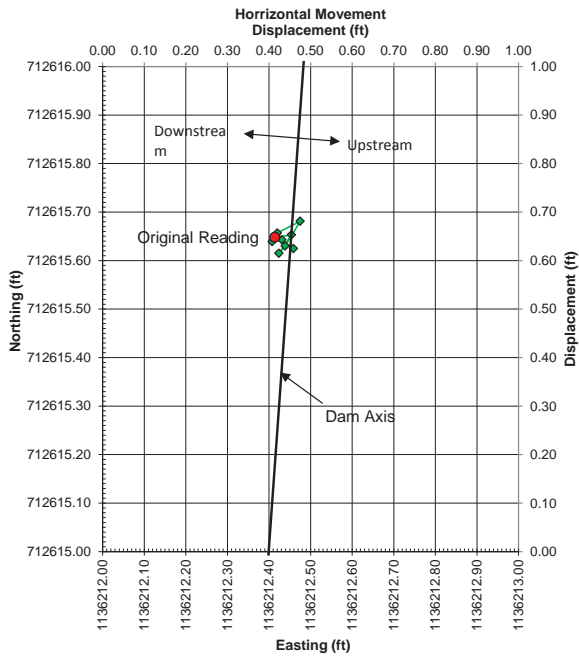
Displacement Vectors DEF-88



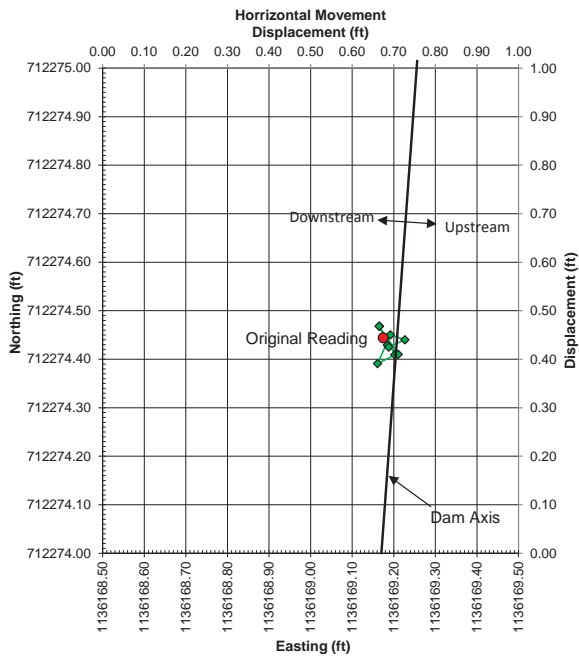
Displacement Vectors DEF-89



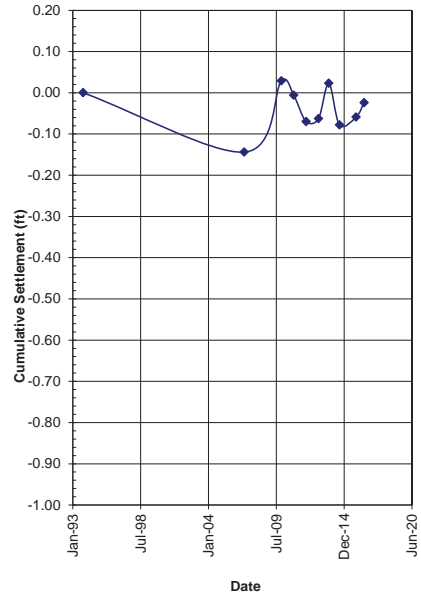
Displacement Vectors DEF-90



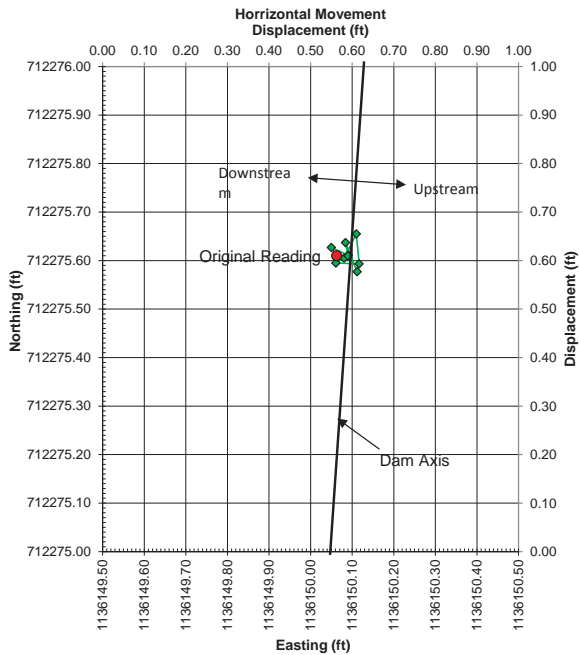
Displacement Vectors DEF-91



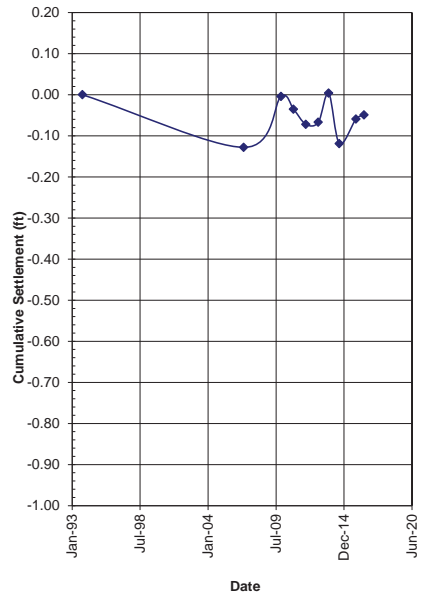
Vertical Movement



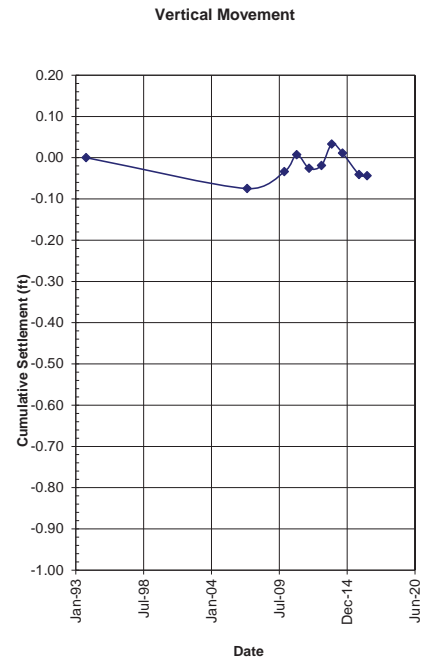
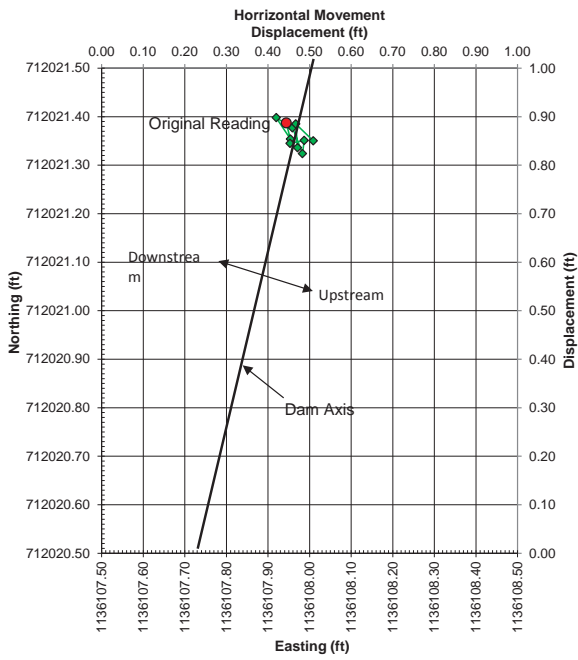
Displacement Vectors DEF-92



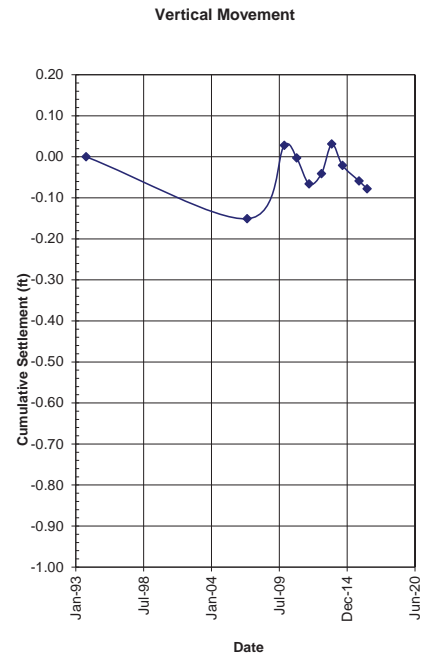
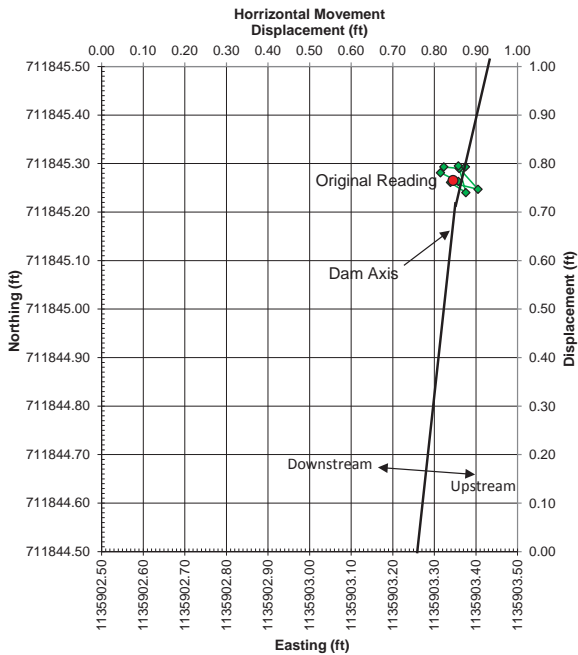
Vertical Movement



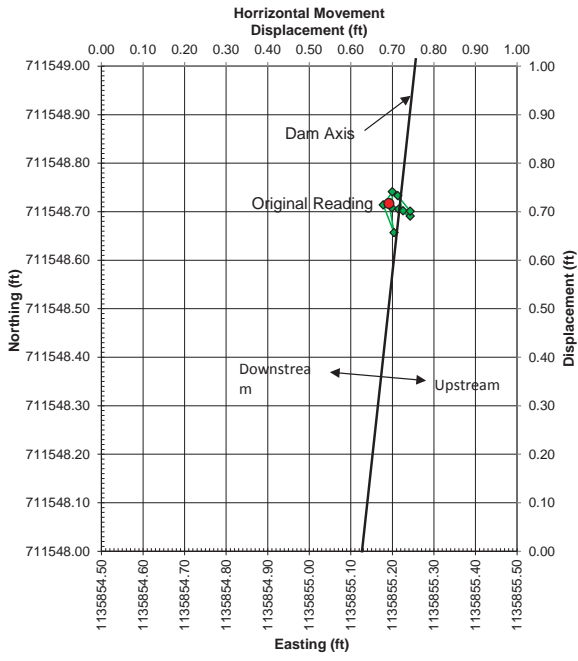
Displacement Vectors DEF-93



Displacement Vectors DEF-94



Displacement Vectors DEF-95



Vertical Movement

