2008 PUMPBACK WELL SYSTEM
OPERATIONS AND MAINTENANCE REPORT
YERINGTON MINE SITE

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Attachment A 2008 Pumpback Well System Operations and Maintenance Data (on compact disk)
A-1 Yerington Monthly Total Precipitation
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1.0 INTRODUCTION

This report summarizes 2008 operations and maintenance activities and associated performance data for the pumpback well system at the inactive Anaconda/Yerington Mine Site (Site), located four miles northwest of Yerington in Lyon County, Nevada pursuant to the Administrative Order (AO) for Remedial Investigation and Feasibility Study, U.S. EPA Docket No. 9-2007-0005, March 5, 2007.

This section includes a map of Site features (Figure 1-1) and background information pertaining to the technical objectives, a chronology of the pumpback well system events, major operational components, and a summary of 2008 operations and maintenance. Section 2 identifies the major functions of the pumpback well system program and describes system design components, operating parameters and procedures, and the preventative maintenance program. Section 3 summarizes the 2008 pumpback well system operation and preventive maintenance activities, and performance monitoring data. Section 4 provides a summary of operations and preventive maintenance activities planned for 2009.

Attachment A is a compact disk that contains a database compilation of 2008 operations and maintenance monitoring records, including evaporation pond design storage capacity specifications, evaporation pond daily water surface level and storage volume, and pumpback well daily production and pumping level.

1.1 Background Information

The original pumpback well system program, consisting of five production wells and an evaporation pond, was activated in 1986 by Anaconda Minerals Company to form a well barrier system to intercept and extract affected shallow groundwater near the northern perimeter of the Site pursuant to the October 1, 1985 Nevada Department of Environmental Protection (NDEP) Administrative Order (AO), Attachment 1, Technical Program. The objectives of the well barrier system as in the Technical Program document are: *" 1) Stabilize the apparent contaminant plume seeping from the tailings ponds, preventing the iron-rich groundwater from inflowing into the irrigation ditch, an attendant effect of the pump barrier operation, and 2) Subsequent clean-up of the section of the aquifer affected by the seepage."*

A variety of administrative changes and pumpback well system program modifications have occurred since 1986, including the expansion of the system from five wells to 11 wells and improvement of the evaporation pond configuration and liner system. Table 1-1 (page 1-3) provides a chronological summary of pre-1985 AO activities, implementation of the original barrier well concept in 1986, and subsequent changes and modifications implemented during the period 1987 through 2008.

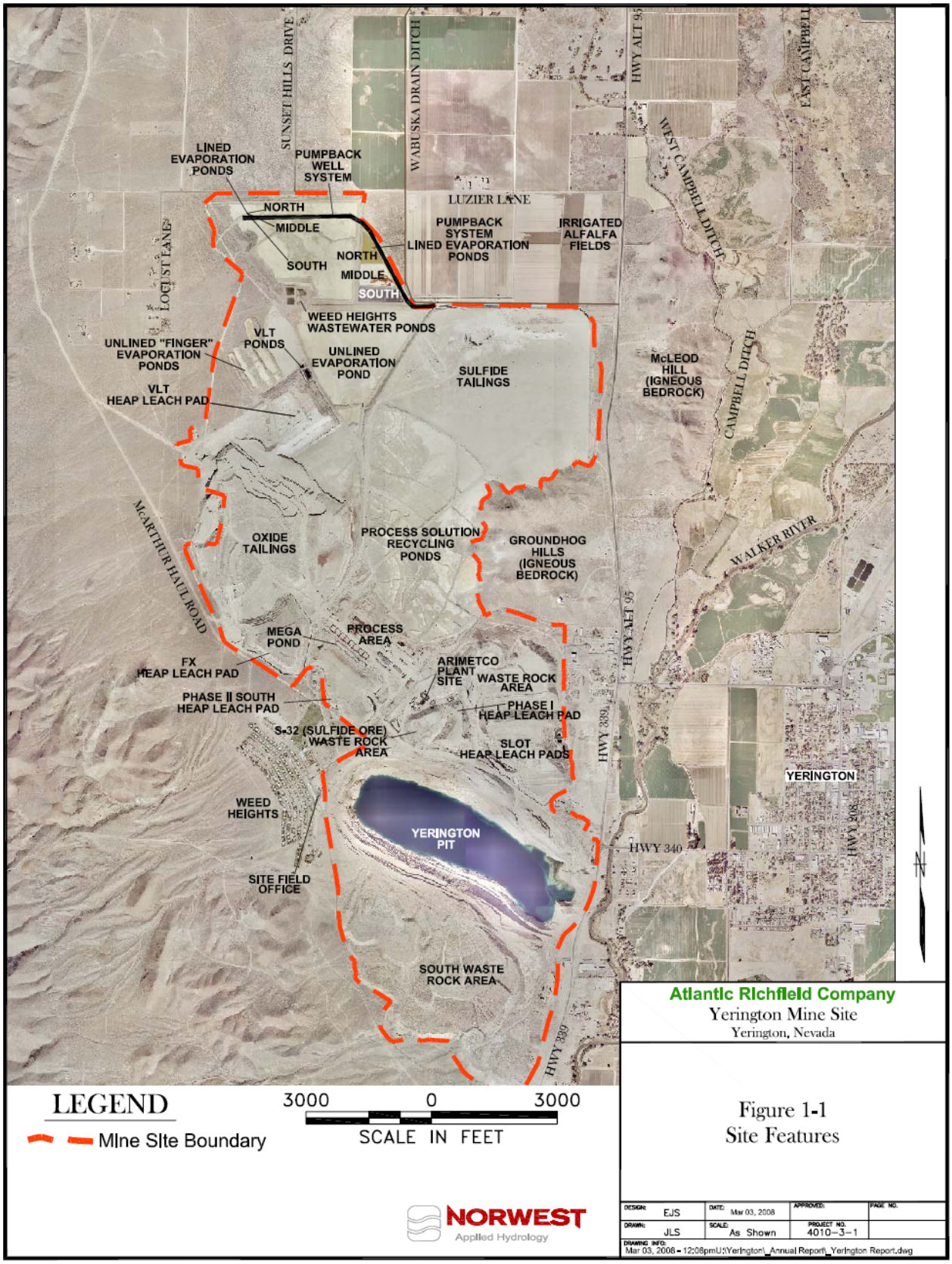
SUNSET HILLS DRIVE
WABUSKA DRAIN DITCH
HWY ALT 95
EAST CAMPBELL
WEST CAMPBELL DITCH
LINED EVAPORATION PONDS
PUMPBACK WELL SYSTEM
LUZIER LANE
NORTH
MIDDLE
SOUTH
PUMPBACK SYSTEM LINED EVAPORATION PONDS
IRRIGATED ALFALFA FIELDS
LOCUST LANE
NORTH
MIDDLE
SOUTH
WEED HEIGHTS WASTEWATER PONDS
VLT PONDS
UNLINED "FINGER" EVAPORATION PONDS
UNLINED EVAPORATION POND
SULFIDE TAILINGS
McLEOD HILL (IGNEOUS BEDROCK)
CAMPBELL DITCH
VLT HEAP LEACH PAD
MCARTHUR HAULROAD
OXIDE TAILINGS
PROCESS SOLUTION RECYCLING PONDS
GROUNDHOG HILLS (IGNEOUS BEDROCK)
WALKER RIVER
HWY ALT 95
MEGA POND
PROCESS AREA
FX HEAP LEACH PAD
ARIMETCO PLANT SITE
WASTE ROCK AREA
PHASE II SOUTH HEAP LEACH PAD
PHASE I HEAP LEACH PAD
S-32 (SULFIDE ORE) WASTE ROCK AREA
SLOT HEAP LEACH PADS
HWY 339
YERINGTON
WEED HEIGHTS
YERINGTON PIT
HWY 340
HWY 208
SITE FIELD OFFICE
SOUTH WASTE ROCK AREA
HWY 339
LEGEND
Mine Site Boundary
3000 0 3000
SCALE IN FEET
NORWEST
Applied Hydrology
Atlantic Richfield Company
Yerington Mine Site
Yerington, Nevada
Figure 1-1
Site Features
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Table 1-1
Chronology of the Pumpback Well System Program

1976 (June)	U.S. Geological Survey conducted groundwater investigations north of Site boundary.
1982 - 1984	Under 1982 NDEP order: Anaconda Minerals conducted groundwater investigation in the vicinity of the sulfide tailings ponds and process water evaporation ponds.
1985	Under NDEP 1985 AO: Pumpback system evaporation pond and wells PW-1 through PW-5 (east wellfield) installed north of unlined process water evaporation pond.
1986 (March)	Pumpback well system operation activated: utilized wells PW-2, PW-3 and PW-4.
1986 – 2000	1991-1996 PW-2, PW-3 and PW-4 operated six months per year per NDEP approval. 1997 Continuous (24/7) operation of wells PW-2, PW-3 and PW-4 per NDEP approval. PW-5 off line until April 1999 and PW-1 offline until July 2000 per NDEP approval.
1998	Regional groundwater model used to determine migration of shallow groundwater affected by seepage from asphalt lined evaporation ponds. Capture zone modeling was used to add pumpback wells. Well field expanded to 11 wells: wells PW-6 through PW-11 (north wellfield) installed along east-west dike between the north and middle asphalt lined evaporation ponds, per NDEP/BLM direction; north and east well fields operated continuously. Evaporation pond modification: Added compacted clay liner; partitioned pond into 3 cells.
1999	Idle clay-lined evaporation pond cells determined to be subject to liner desiccation during summer season when clay material is exposed to high water evaporation losses. Evaporation pond modification: Middle evaporation pond cell lined with HDPE material (over the clay liner) for protection against dike erosion and clay liner desiccation during summer dry season.
2000	July: PW-5 back on line; all 11 wells operated continuously; system inspected twice weekly.
2001	South cell of evaporation pond enlarged, compacted clay liner with synthetic liner (HDPE).
2003	Eliminated the wellhead vault (confined space) configuration for PW-1 through PW-5. Distribution piping found susceptible to clogging by mineral encrustation; pipe cleanouts added between PW-3 and PW-7; implemented header pipe preventative maintenance program for periodic pipeline cleaning using high pressure hydro-jetting technique. Well PW-5 wellhead piping modified to enable direct discharge to middle or north evaporation pond cells to reduce potential mineral encrustation of main header pipe.
2004	Well rehabilitation: Video survey showed 7 wells heavily incrusted with mineral deposits; implemented well rehabilitation program for removal of mineral deposits.
2005	Header Pipe Modification: Added 1,100 feet of 3-inch ABS header pipe with cleanouts on west side of evaporation pond; pipe flow control valves added to provide water distribution flexibility. Modified PW-4 piping to enable direct discharge to middle evaporation pond cell and reduce potential mineral encrustation of main header pipe. Effective March 31, 2005, pumpback well system program continued under Unilateral Administrative Order (UAO) for Initial Response Activities, EPA Docket No. 9-2005-0011. Operations and Maintenance Plan developed in accordance with the 2005 UAO.
2007	Effective March 5, 2007, pumpback well system program continued under Administrative Order for Remedial Investigation and Feasibility Study, U.S. EPA Docket No. 9-2007-0005. Routine inspection schedule changed from twice-weekly to once daily, five days per week.
2008	October: Implementation of mitigation plan for deterring birds from lined evaporation and pumpback ponds.

1.2 Pumpback Well System Components

Major components of the pumpback well system are listed below.

- 11 pumpback wells; east wellfield (PW-1 through PW-5); north wellfield (PW-6 through PW-11)
- 7,000 feet of distribution piping from pumpback wells to evaporation pond system
- 22-acre lined evaporation pond system
- Class A evaporation pan station

1.3 2008 Operations and Maintenance Summary

The pumpback well system continued to be operated year-round, 24 hours per day, seven days per week in accordance with the *Yerington Mine Site Pumpback Well System Interim Operations, Maintenance and Monitoring Plan, December 30, 2005* (O&M Plan), Atlantic Richfield Company (ARC) safety policies and guidelines, applicable OSHA regulations, rules and guidelines, and the *Site-Wide Health and Safety Plan, Yerington Mine Site, Revision 7, March 26, 2007.* In addition, bird dispersal and monitoring activities were implemented in October 2008 in accordance with the *Mitigation Plan for Deterring Birds from Lined Evaporation and Pumpback Ponds, August 15, 2008.*

Approximately 73.5 acre-feet (23.9 Mgal) of Shallow Zone groundwater were extracted from the 11 pumpback wells in 2008. Approximately 798 acre-feet (260 Mgal) of groundwater have been extracted from the Shallow Zone over the past 11 years (1998 through 2008). The groundwater extracted in 2008 contained approximately 1,177,000 pounds of mineral salts. The total estimated amount of mineral salts extracted since 2002 is approximately 10,158,000 pounds.

Routine pumpback well system inspections and well production and evaporation pond water level monitoring were performed once daily, five days per week, excluding holidays. Equipment preventive maintenance, repair and/or replacement work was performed as needed. Daily operations, maintenance, and performance information was recorded on field forms by Norwest Operations Technicians and maintained at the Site field office. Recordkeeping procedures also included the entry of electronic data into ARC's database and the databases maintained at the Site office and Norwest's Denver office.

Extracted groundwater was managed by pipeline conveyance to the 22-acre lined pond system for evaporation. The pond system is sized to provide a total storage capacity of 58.2 acre-feet (ac-ft) during the winter season when pond evaporation is negligible. In 2008, the maximum volume of water stored in the pond system during the winter season was about 40.8 ac-ft. The minimum volume of water stored in the pond system was about 7.7 ac-ft in late summer when pond evaporation intensity exceeded the rate of pond inflow from the pumpback wells.

2.0 DESCRIPTION OF OPERATIONS AND MAINTENANCE

2.1 Pumpback Well System Program Functions

The functions of pumpback well system operations and maintenance program include:

- Management and continuous operation of an 11 pumpback well system to maintain a shallow groundwater system capture zone within system design parameters;
- Management of the piping system used to convey extracted groundwater to the lined evaporation pond system within design parameters;
- Management of lined evaporation pond system for containment and evaporation of extracted groundwater within design parameters and deterrence of birds;
- Compilation and analysis of well system production and evaporation pond system water storage data to support appropriate management and preventive maintenance of these systems; and
- Documentation of management, operations, performance monitoring, and preventive maintenance information.

2.2 Safety

All field operations and maintenance activities were performed in accordance with applicable ARC safety policy and rules, applicable OSHA regulations, rules and guidelines, and the *Site-Wide Health and Safety Plan, Yerington Mine Site, Revision 7, March 26, 2007*.

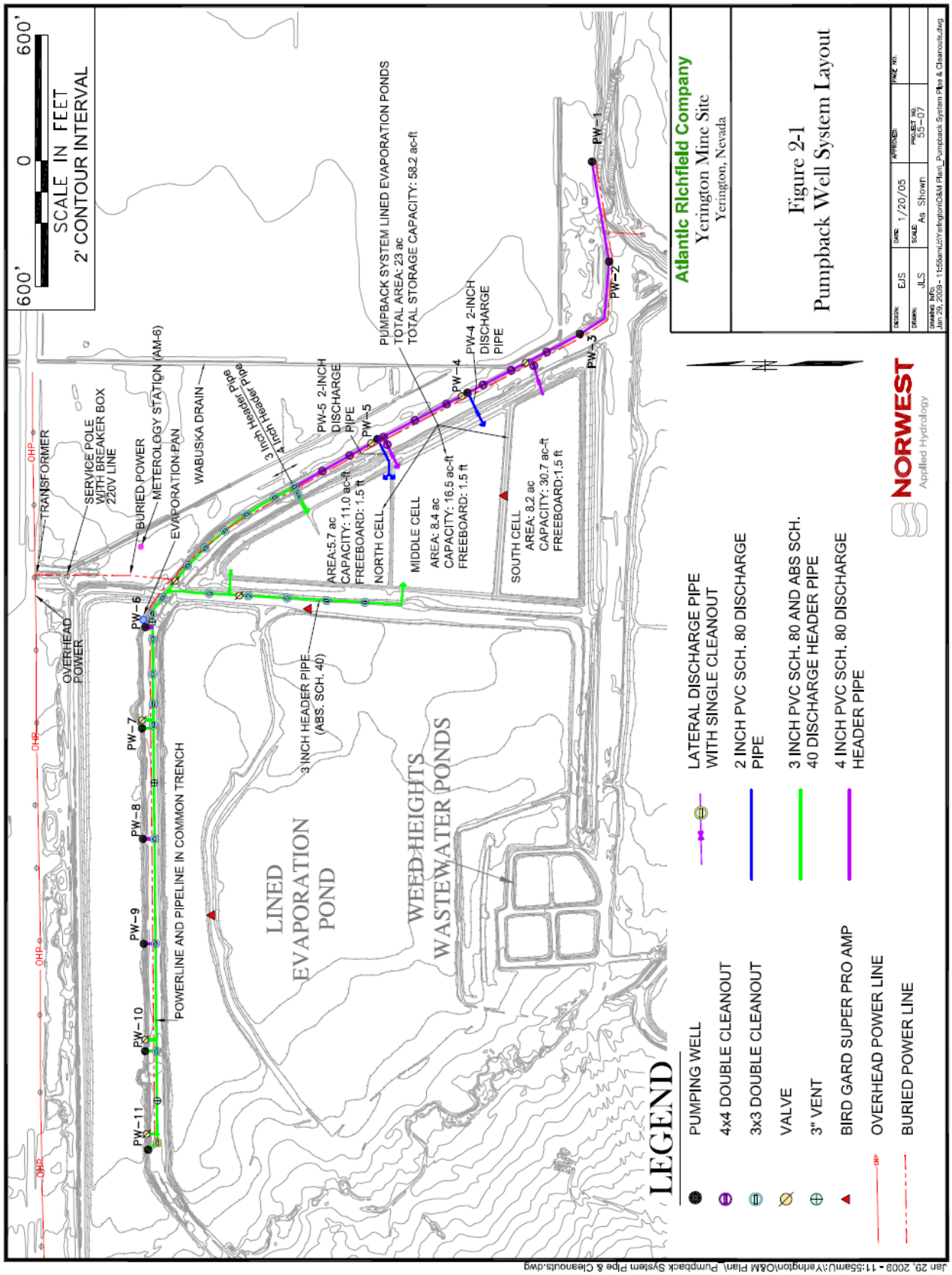
2.3 Description of Pumpback Well System Components and Operations

The layout of pumpback well system components is shown in Figure 2-1.

2.3.1 Electrical Power Service

Electric power service is provided by NV Energy (formally Sierra Pacific Power Company) via a 60 kV power line along the south side of Luzier Lane north of pumpback well PW-6. NV Energy provides the drop from the existing line to a 220V, single-phase transformer, equipped with a lightening arrestor, a service pole, meter, and master breaker box.

Electrical service to the wellfield is buried from the service pole to both the east and north wellfields. The electrical cable is buried at a depth of 2 feet below ground surface. The electrical cable to the north wellfield was installed in a common trench with the discharge header pipe at a depth of 2 feet below ground surface. An electrical control box with on/off switch is used at each wellhead and includes a low pump-amperage shutoff in case a pump runs dry (no load) and voltage overload protectors.


600'
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600'
SCALE IN FEET
2' CONTOUR INTERVAL
TRANSFORMER
SERVICE POLE WITH BREAKER BOX 220V LINE
BURIED POWER
METEROLOGY STATION (AM-6)
EVAPORATION PAN
WABUSKA DRAIN
3 inch Header Pipe
4 inch Header Pipe
PW-5 2-INCH DISCHARGE PIPE
PUMPBACK SYSTEM LINED EVAPORATION PONDS
TOTAL AREA: 23 ac
TOTAL STORAGE CAPACITY: 58.2 ac-ft
PW-4 2-INCH DISCHARGE PIPE
OVERHEAD POWER
OHP
PW-6
PW-7
PW-8
PW-9
PW-10
PW-11
PW-5
PW-4
PW-3
PW-2
PW-1
AREA:5.7 ac
CAPACITY: 11.0 ac-ft
FREEBOARD: 1.5 ft
NORTH CELL
MIDDLE CELL
AREA: 8.4 ac
CAPACITY: 16.5 ac-ft
FREEBOARD: 1.5 ft
SOUTH CELL
AREA: 8.2 ac
CAPACITY: 30.7 ac-ft
FREEBOARD:1.5 ft
3 INCH HEADER PIPE (ABS. SCH. 40)
POWERLINE AND PIPELINE IN COMMON TRENCH
LINED EVAPORATION POND
WEED HEIGHTS WASTEWATER PONDS
LEGEND
PUMPING WELL
4x4 DOUBLE CLEANOUT
3x3 DOUBLE CLEANOUT
VALVE
3" VENT
BIRD GARD SUPER PRO AMP
OVERHEAD POWER LINE
BURIED POWER LINE
LATERAL DISCHARGE PIPE WITH SINGLE CLEANOUT
2 INCH PVC SCH. 80 DISCHARGE PIPE
3 INCH PVC SCH. 80 AND ABS SCH. 40 DISCHARGE HEADER PIPE
4 INCH PVC SCH. 80 DISCHARGE HEADER PIPE
NORWEST
Applied Hydrology
Atlantic Richfield Company
Yerington Mine Site
Yerington, Nevada
Figure 2-1
Pumpback Well System Layout
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2.3.2 Pumpback Wells

Pumpback well design details and 2008 extraction rates are listed in Table 2-1.

Table 2-1
Pumpback Well Design Specifications and Production Capacity

Pumpback Well	Top of Sounding Tube Elevation ft	Total Depth fbgs[1]	Screened Interval fbgs	Depth to Bottom of Shallow Zone fbgs	Bottom of Shallow Zone Elevation ft	Cased Diameter in	2008 Mean Extraction Rate gpm
PW-1	4358.92	48.5	25.5 to 48	48.5	4310	6	14.9
PW-2	4366.44	53	27.5 to 52	53	4310	6	8.8
PW-3	4370.54	58.5	37.4 to 57.9	58.5	4309	6	4.4
PW-4	4365.27	56	34.5 to 55	56	4309	6	3.5
PW-5	4367.09	55	34 to 54.5	55	4309	6	5.6
PW-6	4367.09	48	28 to 48	47	4320	4	2.8
PW-7	4364.86	49	26 to 46	48	4316	4	2.8
PW-8	4365.40	52.5	29.5 to 49.5	51	4313	4	0.3
PW-9	4365.60	52	29 to 49	51	4314	4	1.5
PW-10	4364.77	50	27 to 47	43	4321	4	0.6
PW-11	4367.75	52	29 to 49	52	4315	4	0.6

1 fbgs - feet below ground surface; ground surface is the crest of man-made access dikes, which ranges from 15 to 18 feet above natural ground surface.

Well completion logs for the pumpback wells are included in the *Yerington Mine Site Pumpback Well System 2005 Operations and Monitoring Summary and 2006 Monitoring Data Supplement, August 31, 2006.*

2.3.3 Pump and Wellhead Descriptions

Pumpback wells are equipped with stainless steel Grundfos Model 10S submersible pumps and ½ HP, 220V single-phase, submersible motors. A gate valve on each wellhead discharge pipe is used to adjust pump discharge rates to match individual well production capacity. Pumps are protected against over pumping with a low pump-amperage shutoff in each pump electrical control box. Voltage surge and overload protectors are also included in each pump control box.

Pumps are suspended in wells on 1-inch or 1.25-inch diameter polyethylene pipe connected to a brass pitless adapter set at a minimum of 12 inches below grade. The pitless adapter provides a quick-disconnect of the pipe at the wellhead for servicing of pumps and frost-free operation. The discharge pipe at each wellhead is buried at least 12 inches below grade and routed through a valve and meter box to a header pipe for transfer of extracted groundwater to the lined evaporation pond system.

2.3.4 Wellfield Water Conveyance Piping

Wellfield water conveyance piping is buried in a trench along the line of wells, as shown in Figure 2-1. The total combined length of both the 3-inch (north wellfield) and 4-inch (east wellfield) Schedule 80 PVC main header pipes and Schedule 80 PVC Schedule 80 laterals is approximately 7,000 feet.

Approximately 5,900 feet of 3-inch and 4-inch Schedule 80 PVC main header pipe is used to convey water from PW-1, PW-2 and PW-3 to the north, middle and south evaporation pond cells Three 4-inch Schedule 80 PVC laterals from the 4-inch header pipe are fitted with chemical resistant flow control valves and are used to direct water from the wells to the evaporation pond cells.

In addition, a 1,000-foot, 3-inch Schedule 80 PVC branch header pipe is used to direct water from wells PW-6 through PW-11 to the west side of the evaporation pond. Two 3-inch Schedule 80 PVC laterals from the 3-inch branch header pipe are fitted with chemical resistant flow control valves and are used to direct water to the west side of the north and middle evaporation pond cells.

Ground water extracted from wells PW-4 and PW-5 is conveyed directly into the north or middle cells via 2-inch laterals instead of the east wellfield 4-inch main header pipe. This modification was implemented in 2003, because it was determined that groundwater extracted from these two wells aggravated very severe scaling in the main header pipe between wells PW-4 and PW-6.

2.3.5 Evaporation Pond System

Extracted groundwater is conveyed from the pumpback well system wells to a 22-acre lined pond system for containment and evaporation. Evaporation pond design specifications are summarized in Table 2-2. The evaporation pond system comprises three cells, north, middle and south, separated by earthen berms. The storage capacity curves for each cell are shown in Figure 2-2, and computation data for the curves are included in Attachment A.

All evaporation pond cells are underlain by a compacted clay liner. In addition, the clay liner and berms in the middle and south cells are covered by an engineered high-density polyethylene (HDPE) synthetic liner system, which prevents clay liner desiccation. The north cell is not lined with HDPE; therefore, a pool of water must be maintained year-round in this cell to prevent clay liner desiccation.

The storage capacity curve for each evaporation pond cell is shown in Figure 2-2. Storage capacity curve calculation data are included in Attachment A. The pond system is sized to provide a storage capacity of 58.2 acre-ft during the winter season when pond evaporation losses are negligible. The design freeboard level provides allowance for potential pond cell berm side slope wave run up generated by high wind events.

Table 2-2
Evaporation Pond Design Specifications Summary

Description	North Cell	Middle Cell	South Cell	Total
Liner System	12 inches of compacted clay	60-mil HDPE on 12 inches of compacted clay	60-mil HDPE on 12 inches of compacted clay	
Total Depth (ft)	3.5	3.5	5.4	
Operational High Water Level (ft)	2.0	2.0	3.9	
Operational Surface Area (acres)	5.7	8.4	8.2	22.3
Operational Freeboard (ft)	1.5	1.5	1.5	
Operational Capacity (ac-ft)	11.0	16.5	30.7	58.2
Operational Capacity (Mgal)	3.6	5.4	10.0	19.0

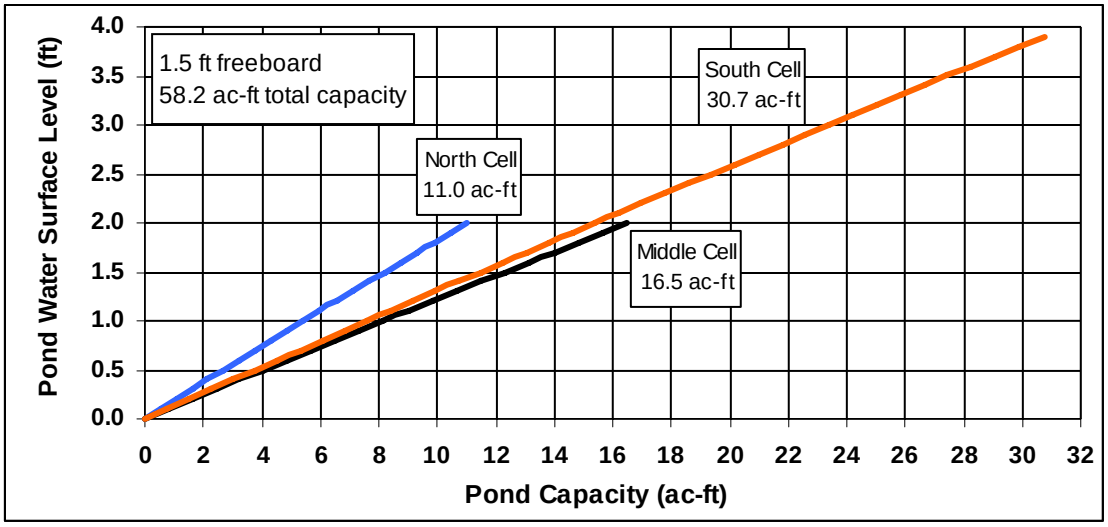

Figure 2-2 Evaporation Pond Storage Capacity Curves

Pond staff gauges are used to measure the water surface level in each evaporation pond cell once daily, five days per week. The water management system priority is to maintain a water depth of at least one foot in the north cell to keep the clay liner wet. Wellfield production in excess of the north cell evaporation rate is diverted to the middle and south cells to maximize evaporative surface area.

All three cells normally require utilization during the fall, winter and spring when wellfield production capacity exceeds pond evaporation losses. High pond evaporation losses during the summer season exceed wellfield production, and the pond storage volume declines proportionately. The middle and south cells are typically dry by August.

2.3.6 Evaporation Pan

A standard National Weather Service Class A type stainless steel evaporation pan is located adjacent to pumpback well PW-6. The evaporation pan is operated seasonally and is typically off line from December through February due to freezing conditions. Evaporation pan losses are measured and the pan refilled once daily, 5 days per week using a point gauge inside a stilling well. Evaporation pan and monthly precipitation data are used to estimate monthly pond evaporation rates during the spring, summer and fall seasons (i.e., March to November).

2.3.7 Bird Control System

An interim bird control program was implemented in October 2008 in accordance with the *Mitigation Plan for Deterring Birds from the Lined Evaporation and Pumpback Ponds, August 15, 2008* using the following active deterrent techniques:

- Predator/distress calls
- Pyrotechnics
- Soft pellet hazing (supplementary technique)

Bird Gard® digital audio bird control equipment is used to broadcast actual bird distress cries and predator sounds digitally pre-recorded on microchips to repel birds by creating an annoying or hostile environment. As shown on Figure 2-1 (red triangles), three programmable Bird Gard® Super Pro Amp systems mounted on poles were installed within the lined evaporation and pumpback ponds area in October 2008. Each unit is programmed to operate during day light hours, seven days per week. The Super Pro Amp model is the most powerful Bird Gard® unit and incorporates random broadcasting technology that keeps birds from becoming accustomed to hearing the same sounds at the same time intervals. It includes two high-output amplifiers capable of driving a specially designed 20-speaker tower with 125 decibels of output of intense sound to cover up to 30 acres, a NEMA rated control box, 10 ft. battery cable connected to a 40W solar panel, and rechargeable 12V battery.

Bird control pyrotechnics are specialized explosive devices used to disperse birds without injuring them. Screamer Siren and Bird Banger 15mm cartridges fired from a launch pistol are used by certified Operations Technicians in combination with the audio control system to discourage birds from visiting the ponds.

A single-shot bolt action airsoft rifle which shoots soft pellets may be used by trained Operations Technicians as a supplementary waterfowl hazing technique. This method is dependent on shot accuracy and intended to cause waterfowl to flee by inducing temporary, non-lethal pain without penetrating the skin.

2.4 Summary of Pumpback Well System Preventive Maintenance Program

Routine pumpback well system operation and maintenance inspections are performed and documented in accordance with the schedule outlined in Table 2-3 (page 2-9). Hard copies of inspection data sheets for the pumpback wells, evaporation pond cells, evaporation pan, and bird control operations are maintained at the Site field office and Norwest's Denver office. Field data are entered weekly into an electronic database (Microsoft Excel) for the pumpback wells, evaporation pond cells, evaporation pan, and bird control. Electronic copies of pumpback well system data are included in ARC's database and maintained at the Site field office and Norwest's Denver office. Bird control data summaries are submitted weekly to the U.S. Fish and Wildlife Service.

2.4.1 Pumpback Wells

All pumpback wellheads are inspected daily in accordance with routine inspection/maintenance procedures listed in Table 2-3. Total flow, gauge pressure, and water level depth in each well are monitored to track well performance on a regular basis and to schedule preventive maintenance whenever well production is outside normal operating parameters. Preventive maintenance of pumps, flow meters, associated plumbing, and electrical service is performed as needed to achieve the highest pumpback well system efficiency as possible within design parameters. Pumps, piping, valves, and meters are cleaned, repaired, or replaced periodically due to progressive buildup of mineral precipitate encrustation or wear. Spare parts and equipment are maintained on site to minimize extraction well down time.

A pumpback well preventative maintenance program was performed in July 2008 to remove incrusting inorganic deposits from screens. See Section 3.4 for a more detailed description of the 2008 pumpback well preventative maintenance program.

2.4.2 Pipelines

Distribution piping is inspected and maintained in accordance with routine inspection/ maintenance procedures listed in Table 2-3. Pipe cleanout standpipes and vent pipes are inspected for damage and repaired as needed. Pipeline cleanout locations are shown in Figure 2-1. Outfall laterals are inspected for damage and severity of scaling. Inspection of the inside of piping requires the use of video equipment to identify damage and severity of scaling.

Video inspection and follow up cleaning of the header pipe between wells PW-3 and PW-7 was performed for the first time in 2003. Inspection of the severity of header pipe scaling at specific locations where pipe cleanouts have been installed indicate that more frequent pipeline cleaning is required to maintain full pipe flow. Based on these past experiences, a semi-annual preventive maintenance schedule for entire header pipe system is deemed appropriate using the high-pressure hydro-jetting technique first used in 2007.

2.4.3 Evaporation Pond System

Daily inspections of evaporation pond components include measurement of individual cell water surface level, lateral pipe condition and outfall rate, and notation of extreme weather events, such as high wind velocity and water surface waves. The standard operating procedure for Operations Technicians is to notify the Project Manager of any observed "out-of-the-ordinary" pond system condition that may be an indicator of a potential safety, structural deterioration or hydrologic containment problem. In event of such notification, the Project Manager will arrange for an engineer's inspection to determine what action may be necessary to correct any deficiencies.

2.4.4 Evaporation Pan

The evaporation pan is inspected once daily, five days per week and cleaned periodically in accordance with routine inspection/maintenance procedures listed in Table 2-3. The pan is cleaned and stored inside one of the Process Area buildings during the winter season.

2.4.5 Bird Control Equipment

Bird Gard® Super Pro Amp units are inspected once daily, five days per week. Preventive maintenance is performed in accordance with manufacturer recommended procedures. A spare unit is maintained on site in the event an active unit or unit components need to be removed for repairs.

Table 2-3
Routine Inspection and Preventive Maintenance Schedule

Components	Items	Frequency	Assigned Personnel and Recordkeeping
Pumpback Wells	• Operate wellfield at full capacity year-round • Wellhead mechanical/electrical • Record/repair malfunctioning components • Measure/record well drawdown level • Record discharge gauge pressure • Record flow meter total, working/not working • Record meter instantaneous flow	Daily: Monday - Friday Clean, repair or replace pumps/other equipment as needed; (the last video inspection and cleanout of well screens was Jul 2008)	Routine Maintenance: Operations Technicians Field record forms and electronic database documentation Data records discussed and included in annual report
Evaporation Ponds	• Condition of berms, record damage and high-wave action conditions • Measure/record water level in each pond cell • Repair malfunctioning lateral flow control valves • Water management priorities: 1. Maintain North cell level between 1.5 and 2 ft. year-round to keep clay liner wet. 2. Adjust control valves on lateral and/or header pipes to distribute flow of water to Middle and South cells when North Cell fills to capacity 3. In the event all cells fill to maximum capacity, wellfield production may be reduced as directed by ARC with EPA approval	Daily: Monday - Friday Clean, repair or replace lateral pipe flow control valves ASAP	Routine Maintenance: Operations Technicians Field record forms and electronic database documentation Data records summarized and included in annual report
Pipelines	• Inspect header pipe cleanout standpipes for damage and cover cap • Inspect laterals at outfall to evaporation pond for buildup of encrustation • Inspect inside of well discharge pipes for buildup of mineral encrustation during well or meter box equipment preventive maintenance	Daily: Monday - Friday Well and wellhead piping Semi-Annual: Header pipe system (April and October)	Routine Maintenance: Operations Technicians Header Pipe Cleaning: Licensed contractor; high-pressure hydro-jetting at cleanout locations. Recordkeeping and reporting as above
Evaporation Pan	• Measure/record water level in pan; refill to 0.60' • Clean out foreign matter; drain for winter storage	Daily: Monday - Friday Out of service during winter months Dec – Feb	Routine Maintenance: Operations Technicians Recordkeeping and reporting as above
Bird Control - Bird Gard® Super Pro Amp System	• Operate Bird Gard® bird control system year-round in accordance with mitigation plan • Maintain Bird Gard SUPER PRO AMP towers in operating condition • Repair/replace components as soon as possible • Maintain automatic operation during daylight hours	Daily: 7 d/wk operation Daily: Monday – Friday, day light hours, preventive maintenance inspections and bird/deterrence activity monitoring	Routine Maintenance: Operations Technicians Daily: Field observation forms and electronic database documentation Weekly: Daily records submitted to EPA and USFWS in accordance with mitigation plan

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3.0 2008 OPERATIONS AND MAINTENANCE

3.1 Summary

The annual mean precipitation measured at the Western Research Climate Center Yerington Cooperative Network Station (Yerington) was 5.39 inches. Annual total precipitation measured at the Site in 2008 was 4.15 inches. The U.S. Drought Monitor web site (http://www.drought.unl.edu/dm/) shows the intensity of western Nevada drought conditions, including Lyon County, decreased from extreme to severe in January 2008 and then from severe to moderate conditions in April 2008 which continued through December 2008.

Approximately 73.5 acre-feet (23.9 Mgal) of Shallow Zone groundwater were extracted from the 11 pumpback wells in 2008. Approximately 798 acre-feet (260 Mgal) of groundwater have been extracted from the Shallow Zone over the past 11 years (1998 through 2008).

Groundwater extracted by the pumpback wells and stored in the evaporation ponds in 2008 contained an estimated 1,177,000 pounds of mineral salts. The total estimated amount of mineral salts stored in the evaporation ponds for the 7-year period of 2002 through 2008 is approximately 10,158,000 pounds.

The lined evaporation pond system storage capacity with 1.5 feet of allowance for freeboard is about 58.2 acre-feet. The maximum water storage volume in 2008 was about 40.8 acre-feet and occurred in February when pond evaporation was negligible.

Groundwater extraction efficiency was limited by severe scaling of pumps, meters and well piping. In particular, the frequency of flow meter and pump/motor maintenance for wells PW-4 and PW-7 was approximately every two weeks. The header pipe used to convey water from the north wellfield was cleaned to prevent clogging by mineral encrustation buildup. A video inspection of the well casings showed mineral encrustation, and selected well screens and casings were cleaned using chemical and physical methods.

In accordance with the interim bird mitigation plan for the lined evaporation and pumpback ponds, daily wildlife observations and bird responses to mitigation measures were recorded in November and December 2008. The frequency of bird visits and bird counts were minimal during this reporting period. No bird fatalities were observed and none appeared to be injured or sick.

3.2 Precipitation and Evaporation

Monthly and annual total evaporation and precipitation measured at the Site and the Yerington stations are summarized in Table 3-1. The annual mean precipitation at Yerington was 5.39 inches for the 1914 – 2008 period of record. Annual total precipitation measured at the Site in

2008 was 4.15 inches as compared with 1.95 inches at Yerington. The Yerington station precipitation value is a partial record for 2008, because there are five months of missing data.

Daily pan evaporation was computed as the difference between observed levels. Monthly pan evaporation was computed as the difference between the sum of the daily values and any measured monthly precipitation. The rate of evaporation from small areas is greater than that from the large areas. Therefore a pan coefficient of 0.7 was applied to convert the observed monthly pan evaporation values listed in Table 3-1 to estimated monthly values for pond evaporation (source: *V. T. Chow, 1964, Handbook of Applied Hydrology, McGraw-Hill Co.*).

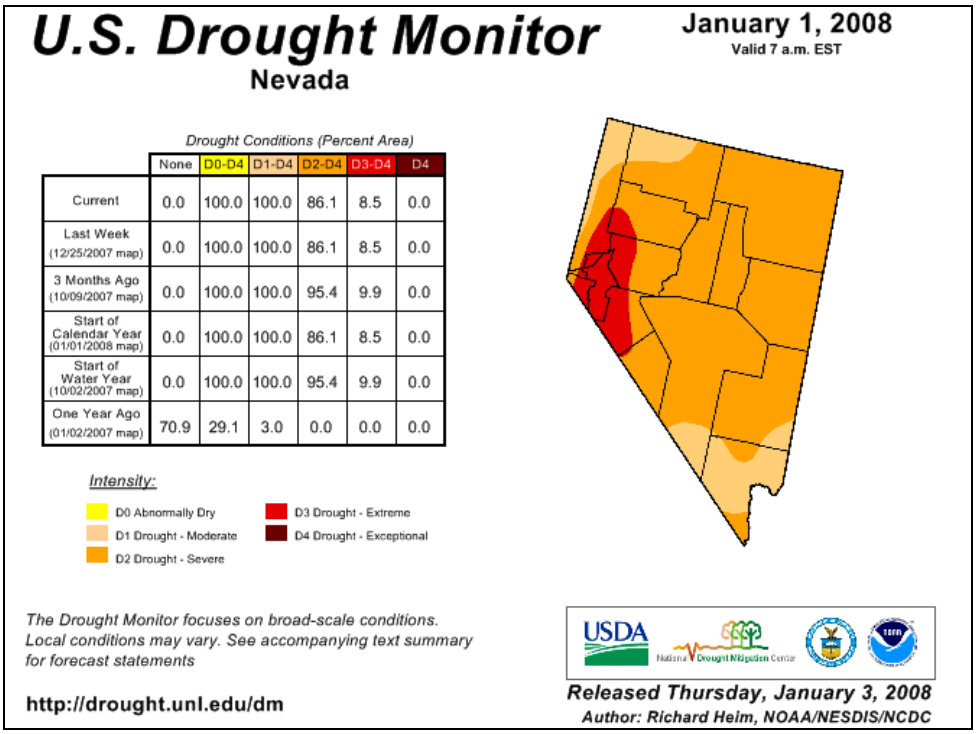
Table 3-1
2008 Monthly and Annual Evaporation and Precipitation

Month	Mine Site Net Pan Evaporation[1] Inches	Estimated Pond Evaporation Inches	Mine Site Precipitation[1] Inches	Yerington Precipitation[2] Inches	Period of Record Mean Precipitation[3] Inches
January	No data[4]	No data[4]	1.53	0.00z[5]	0.58
February	No data[4]	No data[4]	1.27	0.40	0.53
March	7.34	5.14	0.02	0.00z	0.42
April	10.92	7.64	0.00	0.00	0.40
May	10.08	7.06	0.96	1.39	0.65
June	14.78	10.35	0.02	0.00	0.47
July	15.51	10.86	0.03	0.00z	0.27
August	13.32	9.32	0.00	0.00z	0.24
September	11.40	7.98	0.00	0.00a	0.25
October	6.45	4.52	0.09	0.00a	0.34
November	2.61	1.83	0.09	0.16	0.43
December	No data[4]	No data[4]	0.14	0.00z	0.52
2008 Total	**92.41**	**64.69**	**4.15**	**1.95[6]**	**5.39[7]**
2007 Total	**99.30**	**69.51**	**3.10**	**0.27[6]**	**5.39**
2006 Total	**81.07**	**56.75**	**3.23**	**3.19**	**5.39**
2005 Total	**87.79**	**63.80**	**3.35**	**4.95**	**5.39**
2004 Total	**102.60**	**73.65**	**3.15**	**4.30**	**5.39**
2003 Total	**75.53**	**53.48**	**3.09**	**3.48**	**5.40**
2002 Total	**94.25**	**53.00**	**1.82**	**1.80**	**5.40**
2001 Total	**94.25**	**68.00**	**--**	**2.89**	**5.46**

1 Site pan evaporation measured at well PW-6; precipitation measured at air monitoring station AM-6 east of PW-6.
2 Measured at Western Research Climate Center Yerington station and available from Center's web site: (http://www.wrcc.dri.edu/cgi-bin/cliMONtpre.pl?nv9229)
3 Yerington monthly mean precipitation for period of record, 1914 - 2008
4 Pan evaporation not measured during winter season due to freezing conditions
5 Days of missing data: a = 1 day; t = 20 days; w = 23 days; x = 24 days; z = 26 or more days missing
6 Incomplete record for Yerington COOP station due to at least 5 months of missing data
7 Individual years not used for annual statistics if any month in that year has more than 5 days missing.

The U.S. Drought Monitor web site (http://www.drought.unl.edu/dm/) showed the extreme drought conditions in Lyon County decreased to severe in January 2008 and then to the moderate intensity category in April 2008 (Figures 3-1 and 3-2). The drought conditions in Lyon County remained in the moderate intensity category for the remainder of 2008 (Figure 3-3), but the percentage of Nevada identified to have severe drought conditions increased from 12% in July 2008 to nearly 30% in December 2008.

The potential net effect of long-term precipitation deficits on Shallow Zone groundwater conditions is below normal groundwater recharge and attendant decline of groundwater storage. Consequently, the potential net effect on the pumpback well system is below normal well extraction rates and above normal pond evaporation. Most of the precipitation in 2008 occurred during the first half of the year, and the wellfield monthly mean extraction rate was the highest in September 2008 at 54.8 gpm followed by monthly decreases. The December 2008 mean extraction rate of 44.2 gpm is only slightly higher than the January 2008 mean extraction rate of 43.7 gpm. The well screen and casing maintenance in July 2008 also contributed to the increase in wellfield production during August and September.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.0	100.0	100.0	86.1	8.5	0.0
Last Week (12/25/2007 map)	0.0	100.0	100.0	86.1	8.5	0.0
3 Months Ago (10/09/2007 map)	0.0	100.0	100.0	95.4	9.9	0.0
Start of Calendar Year (01/01/2008 map)	0.0	100.0	100.0	86.1	8.5	0.0
Start of Water Year (10/02/2007 map)	0.0	100.0	100.0	95.4	9.9	0.0
One Year Ago (01/02/2007 map)	70.9	29.1	3.0	0.0	0.0	0.0

Figure 3-1 Drought Conditions January 1, 2008

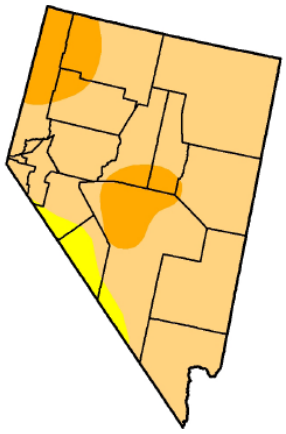
U.S. Drought Monitor

April 1, 2008
Valid 7 a.m. EST

Nevada

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.0	100.0	95.9	15.0	0.0	0.0
Last Week (03/25/2008 map)	0.0	100.0	93.7	58.7	0.0	0.0
3 Months Ago (01/08/2008 map)	0.0	100.0	100.0	80.5	0.0	0.0
Start of Calendar Year (01/01/2008 map)	0.0	100.0	100.0	86.1	8.5	0.0
Start of Water Year (10/02/2007 map)	0.0	100.0	100.0	95.4	9.9	0.0
One Year Ago (04/03/2007 map)	0.0	100.0	97.5	13.7	0.1	0.0



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://drought.unl.edu/dm

Released Thursday, April 3, 2008
Author: Rich Tinker, CPC/NOAA

Figure 3-2 Drought Conditions April 1, 2008

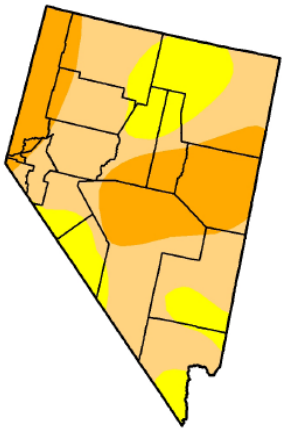
U.S. Drought Monitor

December 30, 2008
Valid 7 a.m. EST

Nevada

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.0	100.0	79.0	29.2	0.0	0.0
Last Week (12/23/2008 map)	0.0	100.0	79.0	29.2	0.0	0.0
3 Months Ago (10/07/2008 map)	0.0	100.0	74.8	20.8	0.0	0.0
Start of Calendar Year (01/01/2008 map)	0.0	100.0	100.0	86.1	8.5	0.0
Start of Water Year (10/07/2008 map)	0.0	100.0	74.8	20.8	0.0	0.0
One Year Ago (01/01/2008 map)	0.0	100.0	100.0	86.1	8.5	0.0



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://drought.unl.edu/dm

Released Wednesday, December 31, 2008
Author: Brian Fuchs, National Drought Mitigation Center

Figure 3-3 Drought Conditions December 30, 2008

3.3 Pumpback Well System Production

All pumpback wells were operated continuously in 2008 except during generally brief periods of downtime for individual well and pumpback well system preventive maintenance. A combined total of approximately 73.5 ac-ft (23.9 Mgal) of Shallow Zone groundwater was extracted from the 11 pumpback wells in 2008. An estimated total volume of 798 ac-ft (260 Mgal) of Shallow Zone groundwater was extracted during the past 11-year period, 1998 - 2008.

3.3.1 2008 Monthly Pumping Levels and Extraction Rates

Monthly pumpback well pumping levels are summarized in Table 3-2 (following page). Monthly pumpback well extraction rates and volumes are summarized in Table 3-3 (follows Table 3-2).

The pumpback well system was operated continuously during 2008 to maintain the maximum capture zone possible by pumping each well at its maximum sustainable pumping rate and lowest pumping level without breaking pump suction. Sustainable pumping rates are governed by the aquifer characteristics, which vary between pumpback well locations.

The pumping level (well drawdown) in each pumpback well was measured once daily, five days per week to track changes in well production performance as the basis for scheduling preventive maintenance or adjusting the discharge rate. For example, a rising pumping level in combination with a declining pumping rate typically indicates a mechanical pump problem, such as worn parts, motor failure or fouling of the intake screen. Well discharge control valves were used to control the pumping rate from each well and thereby control the extent of water level drawdown in each well while pumping. Increasing the pumping rate beyond well production capacity induces increased well drawdown and caused a break in pump suction, while decreasing the pumping rate reduced well drawdown.

As shown in Table 3-3, the 2008 extraction rates for the five original pumpback well system wells (east wellfield) continued to significantly exceed that of the six wells (north wellfield) added to the system in 1998. About 81 percent (59.8 ac-ft) of 2008 pumpback well system production was extracted from the east wellfield at annual mean rates ranging from 3.5 gpm to 14.9 gpm. The other 19 percent (13.7 ac-ft) was extracted from north wellfield at annual mean rates ranging from 0.3 gpm and 2.8 gpm. Well PW-1 exhibited the highest production capacity (14.9 gpm annual mean) in 2008, accounting for about 33 percent of total wellfield production.

The decline in the wellfield monthly mean extraction rate during the last three months of 2008 is indicative of effects of little precipitation on groundwater conditions. As shown in Table 3-3, the highest monthly mean pumping rate of about 54.8 gpm occurred in September 2008 following increased rainfall during the first half of the year and well screen maintenance in July 2008. The annual monthly mean rate was 45.7 gpm, about the same as the annual means experienced during the previous drought situation: 46.8 gpm in 2003; 42.3 gpm in 2004; and 46.6 gpm in 2005.

Table 3-2
2008 Pumpback Well Monthly Pumping Level

Date	PW-1 (4358.92 ft[1])		PW-2 (4366.44 ft)		PW-3 (4370.54 ft)		PW-4 (4365.27 ft)		PW-5 (4367.09 ft)		PW-6 (4367.09 ft)	
	Water Level fbmp[2]	Water Elevation ft	Water Level fbmp	Water Elevation ft	Water Level fbmp	Water Elevation ft	Water Level fbmp	Water Elevation ft	Water Level fbmp	Water Elevation ft	Water Level fbmp	Water Elevation ft
12/31/07	39.82	4319.10	45.59	4320.85	45.96	4324.58	39.77	4325.50	42.75	4324.34	43.82	4323.27
1/30/08	42.04	4316.88	43.33	4323.11	42.97	4327.57	42.72	4322.55	42.45	4324.64	43.84	4323.25
2/29/08	36.16	4322.76	44.88	4321.56	43.31	4327.23	42.43	4322.84	42.52	4324.57	38.22	4328.87
3/31/08	40.72	4318.20	45.33	4321.11	44.85	4325.69	37.00	4328.27	42.12	4324.97	39.52	4327.57
4/30/08	40.87	4318.05	41.46	4324.98	41.24	4329.30	41.71	4323.56	41.97	4325.12	40.77	4326.32
5/30/08	41.77	4317.15	44.76	4321.68	42.34	4328.20	38.02	4327.25	43.05	4324.04	43.76	4323.33
6/30/08	38.73	4320.19	43.63	4322.81	43.64	4326.90	37.00	4328.27	45.03	4322.06	43.21	4323.88
7/31/08	36.18	4322.74	38.66	4327.78	38.77	4331.77	41.94	4323.33	34.83	4332.26	43.21	4323.88
8/29/08	37.66	4321.26	44.17	4322.27	44.41	4326.13	42.45	4322.82	40.77	4326.32	43.29	4323.80
9/30/08	45.27	4313.65	47.69	4318.75	47.06	4323.48	42.42	4322.85	44.76	4322.33	43.24	4323.85
10/31/08	36.76	4322.16	46.31	4320.13	46.13	4324.41	46.27	4319.00	45.43	4321.66	43.31	4323.78
11/26/08	39.18	4319.74	45.75	4320.69	40.42	4330.12	46.98	4318.29	46.13	4320.96	43.27	4323.82
12/30/08	44.07	4314.85	41.00	4325.44	39.20	4331.34	41.52	4323.75	37.90	4329.19	43.11	4323.98

Date	PW-7 (4364.86 ft)		PW-8 (4365.40 ft)		PW-9 (4365.60 ft)		PW-10 (4364.77 ft)		PW-11 (4367.75 ft)	
	Water Level fbmp[1]	Water Elevation ft	Water Level fbmp	Water Elevation ft	Water Level fbmp	Water Elevation ft	Water Level fbmp	Water Elevation ft	Water Level fbmp	Water Elevation ft
12/31/07	39.26	4325.60	46.23	4319.17	43.87	4321.73	39.42	4325.35	41.51	4326.24
1/30/08	40.75	4324.11	46.25	4319.15	44.05	4321.55	40.36	4324.41	40.55	4327.20
2/29/08	39.10	4325.76	46.41	4318.99	43.03	4322.57	41.32	4323.45	40.99	4326.76
3/31/08	38.72	4326.14	46.31	4319.09	43.46	4322.14	41.56	4323.21	42.51	4325.24
4/30/08	42.78	4322.08	44.73	4320.67	42.45	4323.15	42.17	4322.60	42.80	4324.95
5/30/08	41.71	4323.15	46.42	4318.98	44.20	4321.40	45.02	4319.75	45.54	4322.21
6/30/08	39.08	4325.78	46.53	4318.87	43.75	4321.85	43.33	4321.44	43.76	4323.99
7/31/08	42.78	4322.08	46.34	4319.06	41.40	4324.20	44.59	4320.18	43.50	4324.25
8/29/08	36.28	4328.58	46.19	4319.21	45.93	4319.67	43.66	4321.11	45.81	4321.94
9/30/08	41.32	4323.54	46.44	4318.96	46.43	4319.17	43.68	4321.09	50.71	4317.04
10/31/08	42.86	4322.00	46.36	4319.04	46.39	4319.21	44.40	4320.37	50.43	4317.32
11/26/08	42.76	4322.10	43.10	4322.30	46.41	4319.19	45.00	4319.77	50.28	4317.47
12/30/08	34.00	4330.86	43.00	4322.40	46.28	4319.32	39.60	4325.17	46.90	4320.85

1 Measuring point elevation
2 fbmp = feet below measuring point

Table 3-3
2008 Monthly Pumpback Well Groundwater Extraction Summary

MONTH	PW-1[1]		PW-2		PW-3		PW-4		PW-5		PW-6	
	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm
January	681,629	15.3	367,598	8.2	163,693	3.7	159,230	3.6	167,860	3.8	103,005	2.3
February	539,476	13.9	315,765	7.6	145,134	3.5	136,578	3.3	153,622	3.7	94,234	2.3
March	668,905	15.0	327,701	7.3	156,841	3.5	146,874	3.3	155,405	3.6	106,998	2.4
April	655,554	15.2	313,239	7.3	137,188	3.2	157,469	3.8	152,197	3.5	116,299	2.7
May	697,468	15.6	343,570	7.7	141,098	3.2	21,573	0.5	181,401	4.1	132,060	3.0
June	683,576	15.8	334,086	7.7	165,052	3.8	151,816	3.7	184,829	4.3	124,864	2.9
July	709,683	15.9	371,100	8.6	151,675	3.6	172,373	4.2	190,787	4.4	123,388	2.9
August	714,823	16.0	501,614	11.2	264,577	5.9	185,191	4.2	309,738	7.0	138,079	3.1
September	679,330	15.7	496,734	11.5	298,901	6.9	178,580	4.1	379,146	8.8	133,223	3.1
October	636,905	14.3	420,409	9.4	279,022	6.3	184,557	4.1	376,983	8.5	135,676	3.0
November	570,609	13.2	418,415	9.7	212,633	4.9	172,730	4.0	349,724	8.1	126,770	2.9
December	582,464	13.0	420,806	9.4	181,694	4.1	167,778	3.8	306,580	6.9	122,423	2.7
2008 Total	**7,820,422**	**14.9**	**4,631,038**	**8.8**	**2,297,507**	**4.4**	**1,834,748**	**3.5**	**2,908,271**	**5.6**	**1,457,021**	**2.8**
Service Days	**364**		**365**		**364**		**360**		**363**		**364**	

MONTH	PW-7		PW-8		PW-9		PW-10		PW-11		2008 Totals & Means	
	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Mean Rate gpm	Pumped Volume gallons	Total Mean Rate gpm
January	168,054	3.8	17,850	0.4	69,580	1.6	28,168	0.6	22,595	0.5	**1,949,263**	**43.7**
February	146,122	3.5	16,362	0.4	63,285	1.5	30,179	0.7	22,697	0.5	**1,663,455**	**40.8**
March	175,926	3.9	17,594	0.4	70,293	1.6	34,809	0.8	21,724	0.5	**1,883,070**	**42.3**
April	139,481	3.2	16,818	0.4	63,178	1.5	25,455	0.6	28,597	0.7	**1,805,476**	**41.9**
May	147,322	3.3	15,494	0.4	72,513	1.6	29,179	0.7	32,576	0.7	**1,814,254**	**40.8**
June	128,344	3.0	13,919	0.3	69,741	1.6	27,436	0.6	27,265	0.6	**1,910,928**	**44.4**
July	119,964	2.8	11,613	0.3	62,221	1.5	24,556	0.6	22,699	0.6	**1,960,058**	**45.4**
August	88,526	2.0	8,472	0.2	65,263	1.5	27,481	0.6	19,550	0.4	**2,323,313**	**52.1**
September	74,611	1.7	7,996	0.2	65,597	1.5	27,039	0.6	22,212	0.5	**2,363,368**	**54.8**
October	103,281	2.3	8,769	0.2	68,045	1.5	25,904	0.6	23,059	0.5	**2,262,609**	**50.7**
November	88,162	2.1	8,284	0.2	63,667	1.5	22,239	0.5	23,556	0.5	**2,056,789**	**47.7**
December	52,730	1.4	8,220	0.2	64,020	1.4	24,003	0.5	25,054	0.6	**1,955,773**	**44.2**
2008 Total	**1,432,523**	**2.8**	**151,390**	**0.3**	**797,403**	**1.5**	**326,447**	**0.6**	**291,585**	**0.6**	**23,948,355**	**45.7**
Service Days	**357**		**358**		**363**		**362**		**363**			

1 Pumped volume calculated from totalizer flow meter readings as the difference between the first and last readings of each month.

3.3.2 Annual Groundwater Extraction Summary

Pumpback well annual mean extraction rates for 2000 through 2008 are summarized in Table 3-4 and annual total pumpback well system production values are summarized in Table 3-5. The 2006 annual mean extraction rate increase above the 2005 rate verified at least an initial recovery of site-wide groundwater conditions in 2006 subsequent to severe drought conditions experienced in 2003 through 2005. This was consistent with the U.S. Drought Monitor's June 2005 declaration of "complete drought recovery" in Western Nevada. However, as described in Section 3.3.1, Western Nevada experienced drought conditions again in 2008.

Wellfield annual mean pumping rates have normally been above 50 gpm. All months in 2008 except for August through October had rates below 50 gpm, consistent with the drought-like conditions experienced in 2003 through 2005.

Table 3-4
Pumpback Well Annual Mean Extraction Rates (gpm)

WELL	2000	2001	2002	2003	2004	2005	2006	2007	2008
PW-1	11.9	11.6	12.0	11.5	11.4	13.3	16.7	16.5	14.9
PW-2	10.5	7.6	9.5	8.8	7.4	8.7	10.3	10.5	8.8
PW-3	9.3	6.1	4.8	5.6	5.0	5.5	6.8	5.3	4.4
PW-4	9.2	5.9	6.8	5.2	4.8	5.9	5.5	4.9	3.5
PW-5	3.9	6.6	7.0	5.4	5.5	5.5	5.7	5.3	5.6
PW-6	3.0	2.4	2.9	1.9	1.4	1.7	2.4	2.8	2.8
PW-7	2.4	3.5	2.7	2.4	1.4	1.7	3.7	4.5	2.8
PW-8	3.2	3.4	1.0	0.5	0.4	0.3	0.5	0.4	0.3
PW-9	4.0	4.0	2.8	2.9	2.7	1.4	2.1	1.8	1.5
PW-10	2.0	1.1	0.6	0.6	0.7	1.3	1.2	1.0	0.6
PW-11	6.0	5.0	3.2	2.0	1.5	1.3	1.5	1.0	0.6
TOTAL	**65.4**	**57.0**	**53.2**	**46.8**	**42.3**	**46.6**	**56.4**	**54.0**	**45.7**

Table 3-5
Annual Groundwater Extraction Summary

Year	Total Volume Extracted gallons[4]	Total Volume Extracted ac-ft	Annual Total Mean Rate gpm
2008[1]	23,948,000	73.5	45.7
2007[1]	28,388,000	87.1	54.0
2006[1]	29,692,000	91.1	56.4
2005[1]	23,913,000	73.3	46.6
2004[1]	21,430,000	65.8	42.3
2003[1]	23,621,000	72.5	46.8
2002[1]	27,100,000	83.2	53.2
2001[1]	26,100,000	80.1	57.0
2000[1]	27,200,000	83.5	65.4
1999[2]	22,700,000	69.7	51.0
1998[3]	5,980,000	18.3	17.0
TOTAL	**260,072,000**	**798**	**51.8 (1999-2008)**

1 Operating wells PW-01 through PW-11 2 Operating wells PW-02 through PW-11
3 Operating wells PW-02 and PW-03 only 4 Total gallons value rounded to nearest 1,000

3.3.3 Annual Mineral Salts Extraction Summary

Figure 3-4 charts the estimated cumulative amount of mineral salts in groundwater extracted by the pumpback wells. The total salts stored in the evaporation ponds for the 7-year period of 2002 through 2008 is approximately 10,158,000 pounds (Figure 3-4 left axis scale). The estimated amount of mineral salts removed from the Shallow Zone in 2008 was less than prior years. There have been five consecutive quarters of calculated salt mass of less than 310,000 pounds, while the overall production rate remains relatively constant (Figure 3-4 left axis scale) at approximately 24 Mgal per year. The 2008 quarterly and annual estimates of mineral salts removed from Shallow Zone groundwater extracted from each pumpback well are summarized in Table 3-6.

The following formula was used to compute estimated mineral salt values based on quarterly groundwater extraction values and quarterly groundwater total dissolved solids (TDS) concentration values for each well.

X = (V) (TDS) (Y), where

X = Pounds of salt in specified volume of extracted groundwater
V = Volume of groundwater extracted quarterly, in gallons
TDS = Total dissolved solids in quarterly pumpback well samples, in mg/L
Y = Units conversion factor of 8.345×10^{-6}; converts mg/L to pounds/gallon

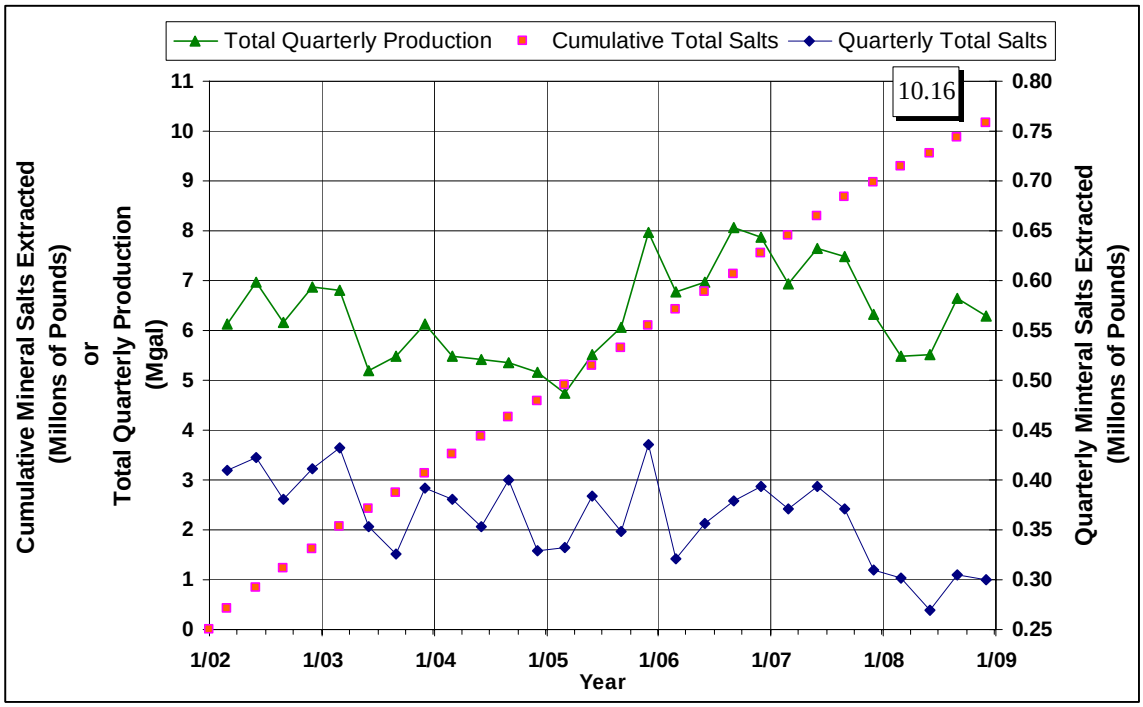


Figure 3-4 Estimated Total Mineral Salts Removed By Pumpback Wells

Table 3-6
2008 Estimated Pumpback Well Mineral Salts Extraction Summary

	PW-1			PW-2			PW-3		
QUARTER	Pumped Volume gallons	TDS mg/L	Mass lb	Pumped Volume gallons	TDS mg/L	Mass lb	Pumped Volume gallons	TDS mg/L	Mass lb
First	1,890,011	4700	74,132	1,011,065	8500	71,721	465,668	10000	38,862
Second	2,036,599	4200	71,384	990,895	7200	59,540	443,337	9400	34,778
Third	2,103,835	3900	68,474	1,369,448	6900	78,857	715,152	8700	51,924
Fourth	1,789,977	4200	62,740	1,259,630	7500	78,841	673,349	9100	51,136
ANNUAL	**7,820,422**		**276,730**	**4,631,038**		**288,958**	**2,297,507**		**176,700**

	PW-4			PW-5			PW-6		
QUARTER	Pumped Volume gallons	TDS mg/L	Mass lb	Pumped Volume gallons	TDS mg/L	Mass lb	Pumped Volume gallons	TDS mg/L	Mass lb
First	442,682	6300	23,274	476,886	4500	17,909	304,238	3100	7,871
Second	330,858	5600	15,462	518,427	3900	16,873	373,224	3000	9,344
Third	536,144	5400	24,161	879,671	2700	19,821	394,690	3100	10,211
Fourth	525,065	5400	23,662	1,033,287	2900	25,007	384,869	3200	10,278
ANNUAL	**1,834,748**		**86,560**	**2,908,271**		**79,611**	**1,457,021**		**37,704**

	PW-7			PW-8			PW-9		
QUARTER	Pumped Volume gallons	TDS mg/L	Mass lb	Pumped Volume gallons	TDS mg/L	Mass lb	Pumped Volume gallons	TDS mg/L	Mass lb
First	490,101	7300	29,858	51,806	5400	2,335	203,159	10000	16,954
Second	415,147	7000	24,252	46,231	5300	2,045	205,432	10000	17,144
Third	283,101	7600	17,956	28,080	7000	1,640	193,081	10000	16,113
Fourth	244,173	7600	15,487	25,273	5400	1,139	195,732	10000	16,335
ANNUAL	**1,432,523**		**87,552**	**151,390**		**7,159**	**797,403**		**66,546**

	PW-10			PW-11			TOTAL - ALL WELLS	
QUARTER	Pumped Volume gallons	TDS mg/L	Mass lb	Pumped Volume gallons	TDS mg/L	Mass lb	Pumped Volume gallons	Mass lb
First	93,156	17000	13,216	67,016	10000	5,593	5,495,788	301,725
Second	82,070	16000	10,958	88,439	11000	8,119	5,530,658	269,900
Third	79,076	15000	9,899	64,461	12000	6,455	6,646,739	305,511
Fourth	72,145	15000	9,031	71,669	11000	6,579	6,275,171	300,235
ANNUAL	**326,447**		**43,105**	**291,585**		**26,746**	**23,948,355**	**1,177,370**

3.3.4 2008 Evaporation Pond Utilization

Evaporation pond water surface level and pond inflow rate were recorded once daily, five days per week to track changes in levels as the basis for managing the distribution of inflow to each cell within the design specifications listed in Table 2-2, and pond water storage capacity curve, Figure 2-3.

Figure 3-5 charts the hydrographs for the 2008 daily water surface level in each evaporation pond cell, maximum design water level for each cell, and the design freeboard allowance for water surface waves and rainfall.

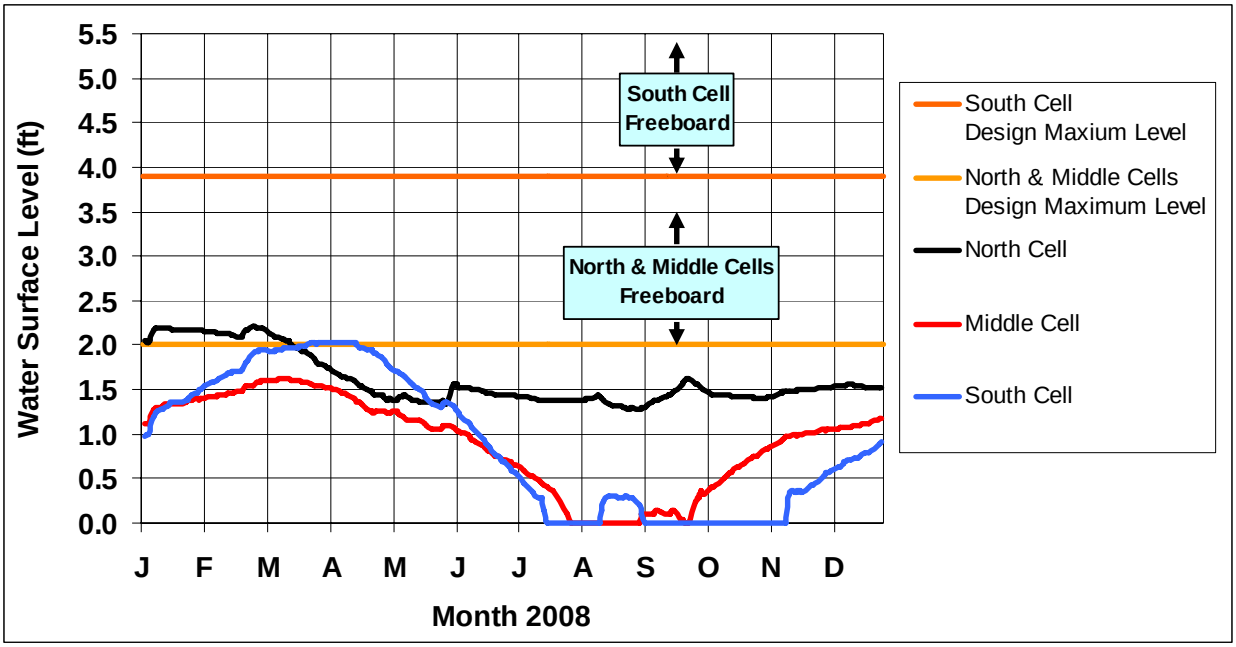


Figure 3-5 2008 Evaporation Pond Water Surface Level Hydrograph

To keep the clay liner wet, enough water was distributed to the north cell to maintain a minimum water surface level of about 1.5 feet throughout 2008. About 5 gpm of water was distributed to the north cell in January and February 2008, which resulted in a rise in the water surface level to about 0.2 feet above the maximum design level before all water was subsequently distributed to the other cells.

The middle and south cell curves in Figure 3-5 illustrate the seasonal fluctuation in water surface level in proportion to the daily amount of pond evaporation. The water surface level rose when the rate of pond inflow exceeded pond evaporation intensity, leveled off when pond inflow and evaporation intensity were equal, and declined when evaporation intensity exceeded pond inflow. The middle cell was dry for about one month and the south cell was dry for about three months in 2008. The middle and south cells were kept dry, or with very little water, until the berms and liners were inspected in September. The south cell was kept dry until two small tears in the liner were repaired in November.

Figure 3-6 on the following page displays hydrographs for the total pond water storage capacity, 2008 daily total evaporation pond water storage, and 2008 daily total storage in each of the three evaporation pond cells. The evaporation pond system is sized to provide a maximum storage capacity of 58.2 acre-ft during the winter season when pond evaporation is negligible.

Consistent with the pond cell water surface levels, the 2008 maximum total water storage volume charted in Figure 3-6 peaked at about 40.8 acre-ft in late February 2008 when pond evaporation was negligible. This amounts to about 70 percent pond utilization for 2008. The daily total storage volume declined after February 2008 to a minimum total storage volume of about 7.7 acre-ft in late July 2008. The annual minimum storage value typically occurs in late summer when evaporation intensity exceeds pond inflow. At the end of July, all of the water was distributed between the north and middle cells. The south cell dried out from mid-July to mid-August and then again from September to early November. As the pond evaporation intensity started to decline in September 2008, water was distributed to the middle and north cells and then to the south cell in November 2008 to utilize as much of the fall season pond evaporation potential as possible in advance of the winter season.

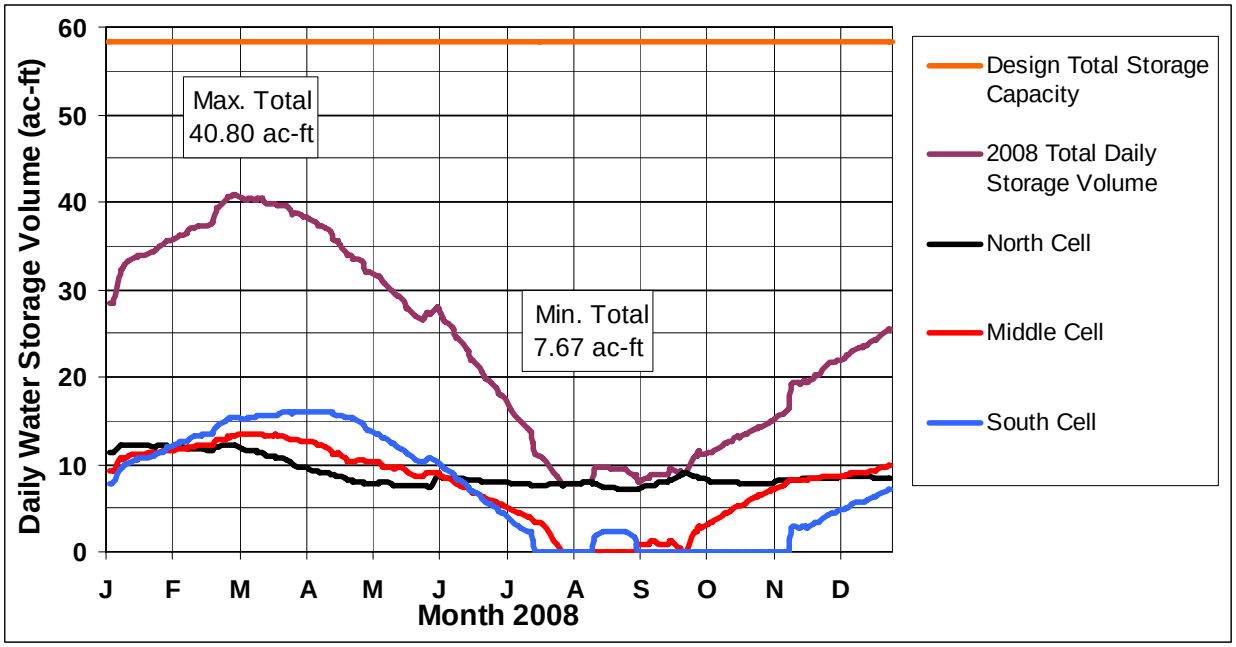


Figure 3-6 2008 Evaporation Pond Water Storage Hydrograph

3.4 2008 Pumpback Well System Preventive Maintenance

This section provides a summary of 2008 preventative maintenance activities performed to assure as reasonably as possible that all system components continued to function within design parameters and with minimal operational down time. Routine pumpback well system operation and maintenance inspections were performed and documented in accordance with the O&M Plan preventive maintenance program as described in Section 2.0. A non-routine video inspection of the well casings and screen was conducted in July 2008, and each well was subsequently cleaned using standard mechanical and chemical treatment procedures. Also, a non-routine inspection of the evaporation pond liners was conducted in September 2008.

3.4.1 Pumpback Wells

All pumpback wellheads were inspected once daily in accordance with routine inspection and maintenance procedures specified in Table 2-3. Total flow, gauge pressure and water level depth in each well were recorded to track well performance on a regular basis and to schedule preventive maintenance whenever changes in pumping water level and rate indicated well production was outside normal operating parameters. Pumps, piping, valves, and meters were cleaned, repaired, or replaced periodically due to progressive buildup of mineral precipitate encrustation or wear.

Equipment, such as pumps and meters, that required maintenance was removed and replaced with spare equipment. Equipment re-use typically only required cleaning or small parts replacement to be serviceable and minimized the frequency of new equipment purchases. A small inventory of new equipment, primarily pump parts, pumps and motors was maintained at the site laboratory to replace used equipment that was beyond repair. Small items like pressure gauges and control valves were replaced when they failed to work.

Table 3-7 provides a summary of 2008 preventive maintenance frequency for each pumpback well by type of equipment. Wells PW-4 and PW-7 required the most frequent attention, followed by PW-5 and PW-10.

Table 3-7
2008 Pumpback Well Preventive Maintenance Activity Summary

Maintenance Frequency						
Well	Pump Replaced	Meter Replaced	Gauge Replaced	Control Valve Replaced	Discharge Piping Replaced	Well Cleaned
PW-1	2	2	1	1	0	0
PW-2	1	1	0	1	0	1
PW-3	0	3	0	4	0	1
PW-4	30	28	0	0	1	1
PW-5	12	5	0	0	1	1
PW-6	0	2	0	0	0	1
PW-7	19	23	1	0	1	1
PW-8	1	2	0	0	0	1
PW-9	1	1	0	1	0	1
PW-10	5	15	1	0	0	1
PW-11	4	6	0	0	0	1

All of the pumpback wells, except PW-1, were video inspected in July 2008 for severity of incrustation. All of the 10 wells inspected were severely incrusted. Each well was cleaned in July 2008 using standard mechanical and chemical treatment procedures, including brush swabbing, surging, vacuum extraction, and air jetting in combination with chemical treatment. Only

environmentally safe, biodegradable colloid suspension (CETCO SC-200) and penetrating (CETCO DPA) agents were used for chemical treatment to aid in the breakdown and removal of mineral deposits.

3.4.2 Pipeline Distribution and Evaporation Pond Systems

The pumpback well system header pipe was cleaned in May and December 2008 to remove mineral encrustation buildup and thereby prevent buildup of backup pressure in the pipeline and at the wellheads. The cleaning was accomplished by using high-pressure hydro-jetting equipment and flushing all water in the pipeline to the evaporation pond.

A visual inspection of the embankment, liner, and appurtenant works was conducted on September 24 and 25, 2008. The primary focus of the inspection was to assess the surface condition of the pond embankments and liners and recommend maintenance required to adequately maintain the functional integrity of the evaporation pond system.

Two small tears (3" in length) were identified in the south cell HDPE liner near the discharge lateral in the center of the east embankment. The Operations Technicians were instructed not to discharge any water into the south cell until the tears were repaired. Both small tears were repaired on November 11, 2008 and the south cell was back in service on November 12, 2008.

In addition, maintenance was recommended for several areas of the evaporation pond system, such as repairing berm erosion, removing vegetation on the berms, and filling animal holes on the berms. It was not deemed necessary to immediately perform the recommended maintenance to prevent a loss of containment. Further evaluation of the recommended measures will be performed in 2009.

3.5 Bird Mitigation

The Bird Gard® amplified auditory deterrent system was installed in October 2008 and operated during daylight hours, seven days per week in November and December. Pyrotechnic devices were used infrequently and the soft pellet hazing method was not applied because of inaccuracy issues. Wildlife observations as well as bird responses to mitigation measures were recorded at least three times each day (Monday-Friday), holidays excepted; one hour after sunrise, mid-day, and one hour before sunset. These records were submitted to EPA and the U.S. Fish and Wildlife Service ("USFWS") in weekly summary reports.

The frequency of bird visits and bird counts were minimal during the last quarter of 2008. No bird fatalities were observed and none appeared to be injured or sick. Reporting of data records and evaluation of mitigation measures is beyond the scope of this report. In accordance with the mitigation plan, quarterly progress reports will be provided under separate cover to EPA and USFWS as a part of the ongoing evaluation of the three bird mitigation measures.

4.0 2009 OPERATIONS AND MAINTENANCE PLAN

The pumpback well system will continue to be operated and maintained for year-round service, 24 hours per day, seven days per week. The 2005 operations and maintenance plan will be updated to incorporate bird mitigation plan activities. Implementation of non-routine preventative maintenance of the pumpback well evaporation pond system, such as repairing berm erosion, removing vegetation on the berms, and filling animal holes on the berms will also be evaluated in 2009 as deemed necessary to maintain containment.

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ATTACHMENT A
2008 Pumpback Well System Operations and Maintenance Data Files
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