LMS/SAL/S05212

Post-Closure Inspection, Sampling, and Maintenance Report for the Salmon, Mississippi, Site

Calender Year 2008

March 2009

U.S. DEPARTMENT OF ENERGY | Office of Legacy Management

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Abbreviations

AEC	U.S. Atomic Energy Commission
COC	contaminant of concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	feet/foot
GEMS	Geospatial Environmental Mapping System
LM	Office of Legacy Management
MCL	maximum contaminant level
pCi/L	picocurie(s) per liter (1×10^{-12} Ci/L)
TRG	target remediation goal
VOC	volatile organic compound

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1.0 Introduction

This report summarizes the annual inspection, sampling, and maintenance activities performed on and near the Salmon, Mississippi, Site in calendar year 2008. The *Draft Long-Term Surveillance and Maintenance Plan for the Salmon Site, Lamar County, Mississippi* (DOE 2007) specifies the submittal of an annual report of site activities and the results of sample analyses. This report is submitted to comply with that requirement.

The Tatum Salt Dome was used by the U.S. Atomic Energy Commission (AEC) for underground nuclear testing during the Cold War. The land surface above the salt dome, the Salmon Site, is located in Lamar County, Mississippi, approximately 12 miles west of Purvis (Figure 1). The U.S. Department of Energy (DOE), the successor to AEC, is responsible for the long-term surveillance and maintenance of the site. The DOE Office of Legacy Management (LM) was assigned this responsibility effective October 1, 2006.

Between 1964 and 1970, two underground nuclear tests and two chemical explosive tests were conducted in the salt dome. The first nuclear test, Salmon, created a cavity 2,710 feet (ft) below ground surface; all subsequent tests were conducted within this cavity. Radioactive products from the tests were contained within the salt dome, and no radioactivity was released during the tests. After each test, boreholes were drilled into the cavity for post-shot measurements, resulting in the release of some contamination.

The site was decommissioned in 1972. During the site cleanup, boreholes were drilled in the southwest corner of the site, and contaminated material was injected through one of the boreholes into Aquifer 5, which is a deep, briny aquifer. Contaminated material was also injected into the test cavity. Residual volatile organic compounds (VOCs) and metals from two drilling mud pits could not be removed effectively and safely. Both mud pits are below the shallow water table under concrete or covered with clean fill. One mud pit is located at surface ground zero; the other is located nearby (178 ft, E73.5°S). Laboratory analyses of surface and groundwater samples collected annually since 1972 by DOE show that this contamination is attenuating naturally as expected. Current surface water sample points and monitor well locations are shown in Figure 2.

Contamination remaining at the site is due to drill-back operations and consists of radioactive materials (tritium), VOCs, and metals. The potential sources of contamination of the surface water and groundwater at the site are:

- The two drilling mud pits.
- The explosion cavity and the boreholes drilled into the cavity.
- The wastes injected into Aquifer 5 and the boreholes used to inject the wastes.

All test boreholes were sealed and abandoned in accordance with the requirements of the State of Mississippi.

The contaminants of concern (COCs) for the site are tritium, arsenic, chromium, and trichloroethene and one of its degradation products, *cis*-1,2-dichlorethene. Historically, some concentrations of COCs have exceeded either the drinking water maximum contaminant level (MCL) (EPA 2004) or the Mississippi target remediation goal (TRG) (MDEQ 2006).

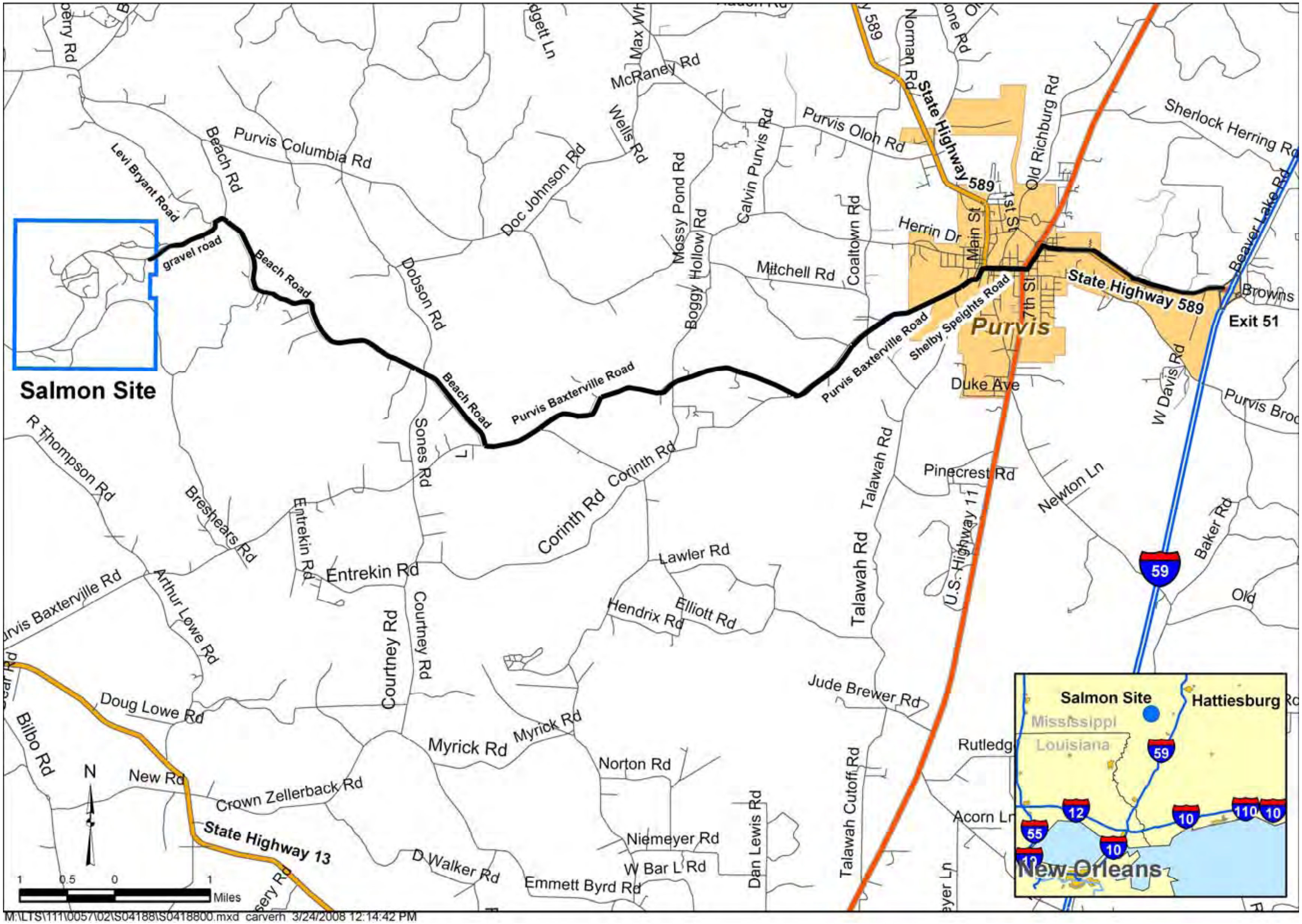

Figure 1. Regional Location Map for the Salmon, Mississippi, Site

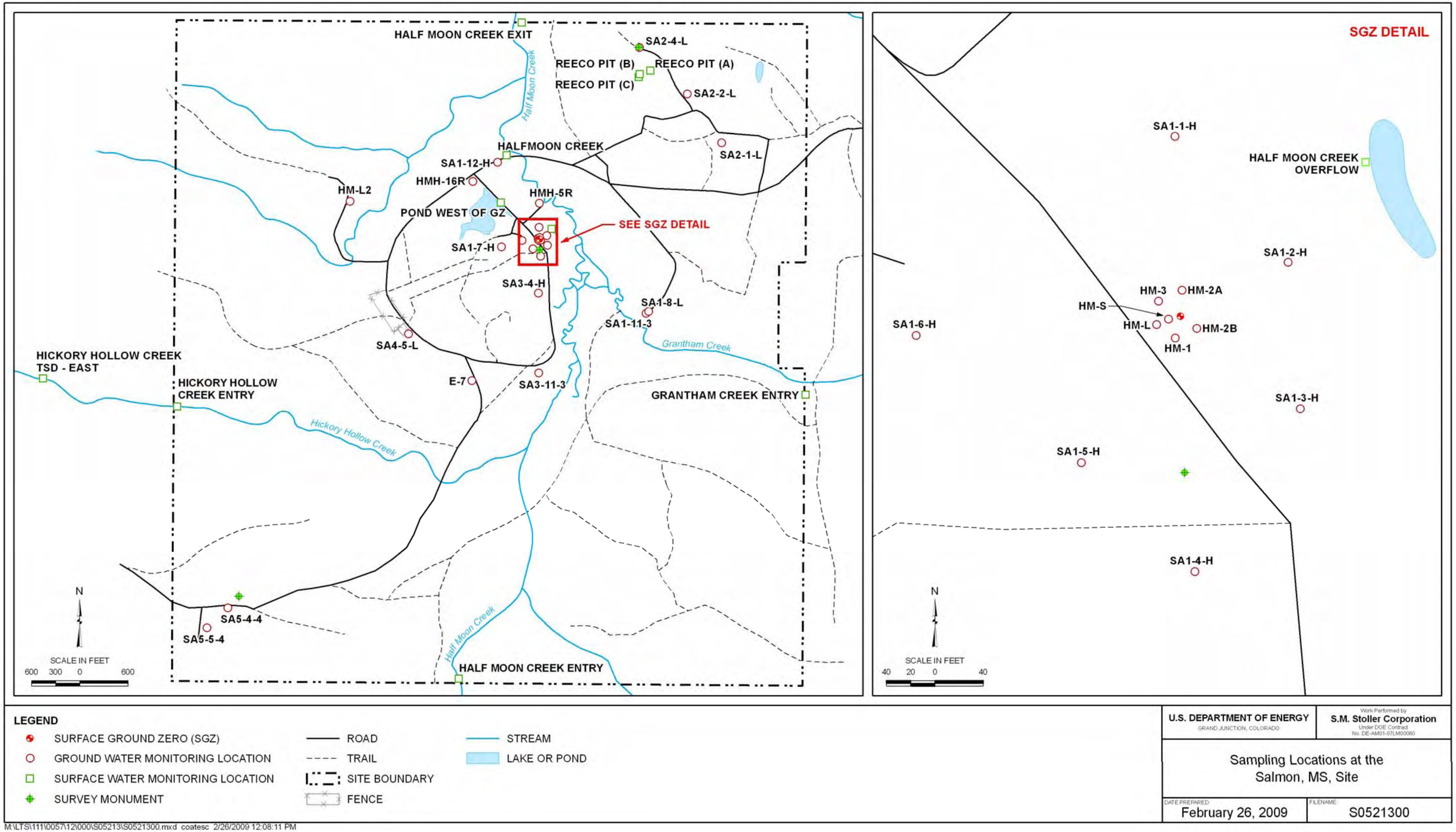

Figure 2. Sampling Locations at the Salmon, Mississippi, Site

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The determination of VOCs and metals as COCs was based on concentrations detected in groundwater samples collected in 2005 and 2006. Although tritium is a COC, it has not been detected on site since 2002. The source of the arsenic is unknown and may be unrelated to DOE activities. Methylene chloride and naphthalene have also been detected at concentrations above the MCL; however, the detections are sporadic. Since naphthalene is a common solvent and methylene chloride is a common laboratory contaminant, these compounds are not believed to be due to DOE activities at the site.

The surveillance and maintenance objectives shown in Table 1 are used as guidance for annual site inspections and sampling events.

Table 1. Long-Term Surveillance and Maintenance Objectives for the Salmon Site

Surveillance and Maintenance Objective	Strategies to Achieve Objective
Prevent exposure to radioactive materials contained in the salt dome	• Monitor groundwater and evaluate results • Monitor and maintain institutional controls
Control exposure to contaminated groundwater	• Monitor groundwater and evaluate results • Monitor institutional controls
Maintain the physical integrity of the site surface	• Conduct regular inspections • Perform needed maintenance • Maintain access controls
Prevent loss of knowledge	• Comply with DOE requirements of mandatory surveillance and maintenance program • Communicate with regulators and stakeholders regularly (including public education, outreach information, and notices) • Record site institutional controls in Lamar County with real property records and management agencies • Comply with National Archives and Records Administration records management requirements • Maintain local records collection, and make annual reports available

In 2008, the site inspection and sampling event occurred in April. Two additional maintenance visits occurred in March and November. The visits are documented in trip reports and site photographs. Selected photographs are included in Appendix A. Analytical results are included in Appendix B.

2.0 Inspection and Maintenance Activities

2.1 Institutional, Engineering, and Physical Controls

2.1.1 Deed Restrictions

The real-property file for the site was reviewed, and an additional easement right for the east entry was found. A review of access to the site was completed, and DOE has perpetual easement. No additional action on deed restrictions was required during 2008.

2.1.2 Fences

Site inspections in 2007 showed that the fence around the property was in very poor condition because of damage by falling trees (DOE 2008). Although the fence is no longer functional in most areas, the dense vegetation prevents access along much of the site boundary. No action was taken on fences during 2008.

2.1.3 Gates and Locks

A private road from Tatum Salt Dome Road (west of the site) provides access to the southwest gate on the Salmon site. This road is used for oversize and heavy equipment and serves as the emergency exit. DOE has a recorded easement that allows use of the private road. In 2008, the land owner and their lessee made arrangements so DOE could also put its lock on the gate at Tatum Salt Dome Road. There were no significant issues with other site gates or locks.

2.1.4 Signs

All signs were in good condition.

2.2 Physical Site Conditions

2.2.1 Roads and Roadwork

Several roads at the site were damaged by erosion where water had flowed across the road. Some of the damaged areas were due to culvert collapse (Photo A−1). To repair the damage, six new culverts were installed.

- Two culverts, each 30 ft long and 24 inches in diameter, were replaced where Hickory Hollow Creek runs beneath the road that leads to the southwest corner.
- A culvert, 40 ft long and 24 inches in diameter, was replaced under the road to Hickory Hollow Creek. The original culvert failed due to the weight of truck traffic during the installation of the two culverts carrying Hickory Hollow Creek (Photo A−2).
- A culvert that was 20 ft long and 24 inches in diameter was installed near well HM-L2, and another culvert, with the same dimensions, was replaced on the road to well HM-L2.
- A culvert connecting the south and north ponds was replaced with one that was 50 ft long and 36 inches in diameter (Photo A−3).

Three eroded road sections were bladed with additional gravel that was brought in and dumped where needed. Two of the areas bladed are on the primary access road between the east entry gate and the turnoff to source area 2, close to Half Moon Creek. The third road repair was done on the road between wells SA2-2-L and SA2-4-L.

Fallen trees blocking the roads were removed. Trees that were dead, were leaning, and appeared likely to fall and block the roads were also removed. The removed material (approximately 90 cubic yards) was taken to a local recycling facility (Photo A−4).

Encroaching vegetation along the sides of the roads was cut.

2.2.2 Trespassing/Site Disturbances

Corn was observed on the ground in the southwest corner of the site; the corn was spread by trespassers to attract wildlife for hunting. A DOE representative met with the conservation officer for the Mississippi Department of Wildlife, Fisheries, and Parks and told him that DOE does not want people to trespass or hunt on the site. To help the Mississippi Department of Wildlife, Fisheries, and Parks monitor the site, the conservation officer was given a key to the site. The conservation officer in Purvis was also given a key.

2.2.3 Other Site Conditions

The pipes and pumps removed during work on monitor wells were transported to a landfill. This material had been stored in the lay-down area since September 2007.

Several trees that blocked benchmark number three from GPS satellites were removed.

Because it has been difficult to safely access surface water sample locations on the western and southern boundaries (Hickory Hollow Creek and Half Moon Creek, respectively), The property owner was asked for written permission to leave the easement road and travel to these locations. Because there was no response to the request, water samples from Hickory Hollow Creek Entry and Half Moon Creek Entry were not collected. Hickory Hollow Creek, where it flows under Tatum Salt Dome Road (HickHCrTSD-East), was used as a substitute sample collection point for Hickory Hollow Creek Entry.

The property owner to the east, just south of the access road, gave verbal permission for access to collect Grantham Creek Entry water samples.

2.3 Monitoring Wells

After 26 new bladder pumps were installed in 2007, 5 pumps could not be centered in the screened interval. To correct the problem, a borehole video camera was used to assist in placing the pumps at the proper depth.

A pump test was performed to verify that the pumps were operating properly prior to the annual sampling event.

New stainless steel identification labels were riveted to each of the site wells. The plates were stamped with the well number and also have an easily readable adhesive label attached.

All other wells were in good condition, with the exception of SA1-2-H, which has a broken hinge.

Two water-level telemetry units were installed and calibrated (Photo A−5). The telemetry system transmits water level data, which is monitored remotely using LM's System Operation and Analysis at Remote Sites system.

New well-casing elevations were surveyed during April and June 2008 (Photo A−6). The removal of the electric pumps in September 2007 and the installation of the bladder pumps in 26 of 28 wells modified the well configurations for which elevations were previously determined.

Vegetation was removed from around each of the 28 site wells (Photo A−7).

2.4 Site Ecology Conditions

2.4.1 Timber

Wildlife Mississippi, a nonprofit foundation specializing in conservation, performed a timber survey to gather data on existing site conditions, determine the value of existing timber, and recommend future management activities. The timber survey report also included detailed information on the soil types at the site.

As part of the survey, a timber cruise was performed, with data collected from 1,470 points, each representing a 0.20-acre plot. The survey determined that the dominant canopy of the site is from 50 to 60 years old and consists of longleaf, loblolly, and shortleaf pine, with mixed hardwoods on the lower elevations. This is a natural stand with no timber management during the growth of the current stand. In many cases, pine regeneration, especially longleaf, is nonexistent due to reduced sunlight and a lack of fire.

The timber cruise yielded a current marketable timber value of $2,318,793.00, or $1,577.41 per acre for 1,470 acres.

The report recommends that the site be managed by selective thinning of timber, followed by herbicide sprays to suppress brushy undergrowth to improve germination of desirable species. It also recommends that controlled burning be conducted afterward. A 30-ft-wide fire buffer around the perimeter of the site is recommended to prevent wildfire from coming onto the site from adjoining properties or leaving the site in prescribed burns conducted later.

2.4.2 Other Vegetation

During the timber survey, four patches of cogongrass (*Imperata cylindrical*), a noxious weed, were found. During November maintenance, three of the patches were sprayed with herbicide (2 percent glyphosate with 1.5 percent imazapyr). The herbicide mix is recommended by the State of Mississippi. Due to culvert replacement construction on the road to the southwest corner, the fourth patch of cogongrass in the southwest corner could not be sprayed. It will be sprayed in 2009.

During the timber survey, yellow pitcher plant (*Sarracenia flava*) was discovered growing in several small areas. Its preferred habitat is savannas, pine lands, and sandy bogs (Photo A−8.). It contributes to desirable plant diversity at the site.

2.4.3 Gopher Tortoise Habitat

During the timber survey, two gopher tortoise (*Gopherus polyphemus*) burrows were identified, one in the southwest corner of the property, the other near the eastern property boundary. On subsequent site visits, these burrows were judged to be abandoned.

Gopher tortoises are a federally listed threatened species and are also listed by the State of Mississippi as endangered. Gopher tortoise habitat consists of well-drained, open areas, preferably in longleaf pine forests. The proposed timber and habitat management plan would improve gopher tortoise habitat.

2.4.4 Beavers

In 2007, extensive work was done to repair flood damage to site roads due to beaver damming of culverts (DOE 2007). In 2008, DOE entered into an agreement with the U.S. Department of Agriculture Animal and Plant Health Inspection Service, Wildlife Services, for beaver management. A number of beavers were removed prior to the April 2008 sampling event.

2.5 Cultural Resource Conditions

No activities that affected cultural resources were performed.

2.6 Public Information Access

Digital photographs of all 26 site wells, as seen from the north, were taken. They will be posted on the Geospatial Environmental Mapping System (GEMS), which is a publicly accessible interactive website maintained by LM at http://gems.lm.doe.gov/imf/sites/gems_continental_us/jsp/launch.jsp. Historical results for tritium and water levels are also available. Future analytical data will be added to GEMS.

3.0 Analytical Results and Interpretation

In 2008, DOE sampled 48 locations. On site, 28 monitoring wells and 8 surface locations were sampled (Photo A−9). Off site, seven surface water and five municipal water supplies were sampled. Temperature, pH, turbidity, and conductivity were measured before each well was sampled. VOC and metal analytical results above the laboratory detection limits are shown in Appendix B, Table B−1. Tritium levels above the laboratory detection limits are shown in Table B−2. No gamma-emitting elements were detected.

3.1 Sample Results Greater than the U.S. Environmental Protection Agency (EPA) MCL or the Mississippi TRG

There were 127 unique results above the detection limit. Of these, five met or exceeded the MCL or TRG. These are shown in Table 2.

Table 2. 2008 Analytical Results Exceeding the MCL or TRG

Location	Date	Analyte	Result	MCL or TRG	Units
HM-3	14-Apr-08	Chromium	0.12	0.1	mg/L
SA1-3-H	15-Apr-08	Arsenic	0.019	0.01	mg/L
SA4-5-L	16-Apr-08	Barium	2.1	2.0	mg/L
HMH-5R	17-Apr-08	Trichloroethene	130	5	µg/L
HMH-5R	17-Apr-08	*cis*-1,2-dichloroethene	90	70	µg/L

mg/L = milligrams per liter (1×10^{-3} grams per liter)
µg/L = micrograms per liter (1×10^{-6} grams per liter)

3.2 Contaminant Concentration Trends

In the past, lead was detected at well SA1-6-H at a concentration slightly above the TRG (DOE 2008). During this sampling event, there were no locations that exceeded the TRG.

Contaminant concentration trends for chromium, arsenic, and trichloroethene for selected wells are shown in Figures 3, 4, and 5.

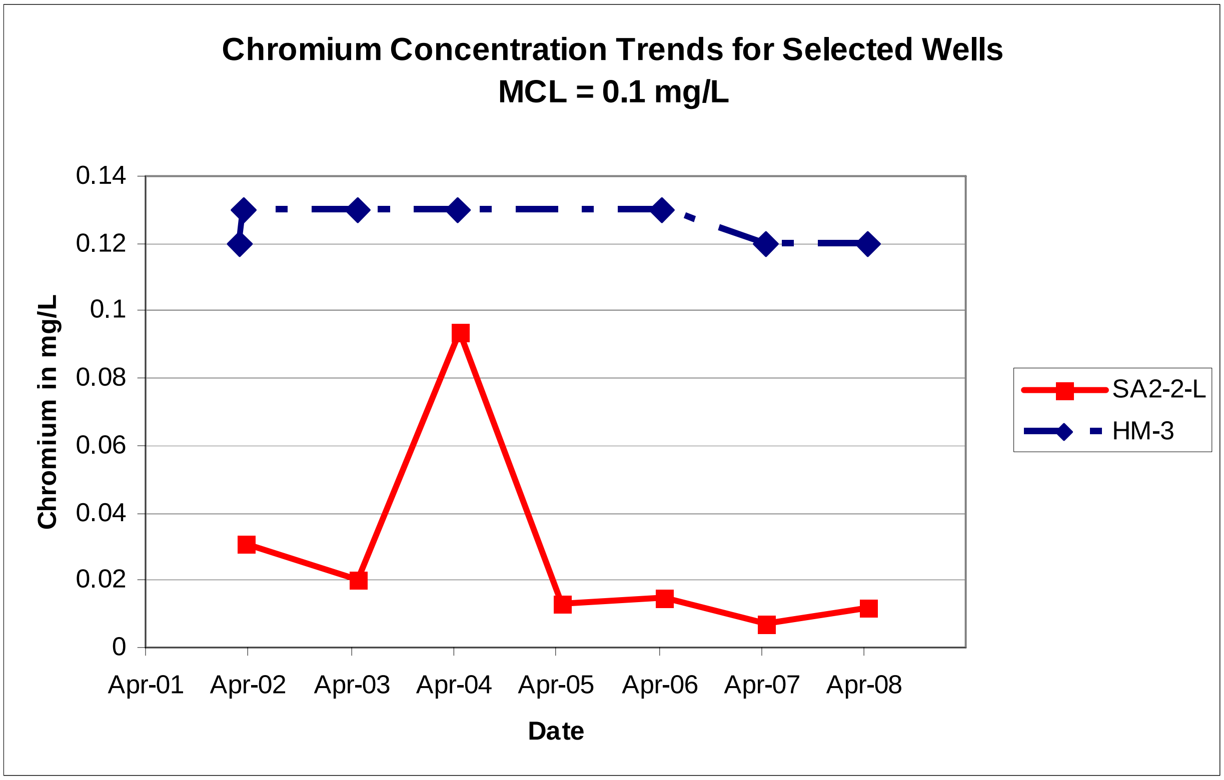

Figure 3. Chromium Concentration Trends for Selected Wells

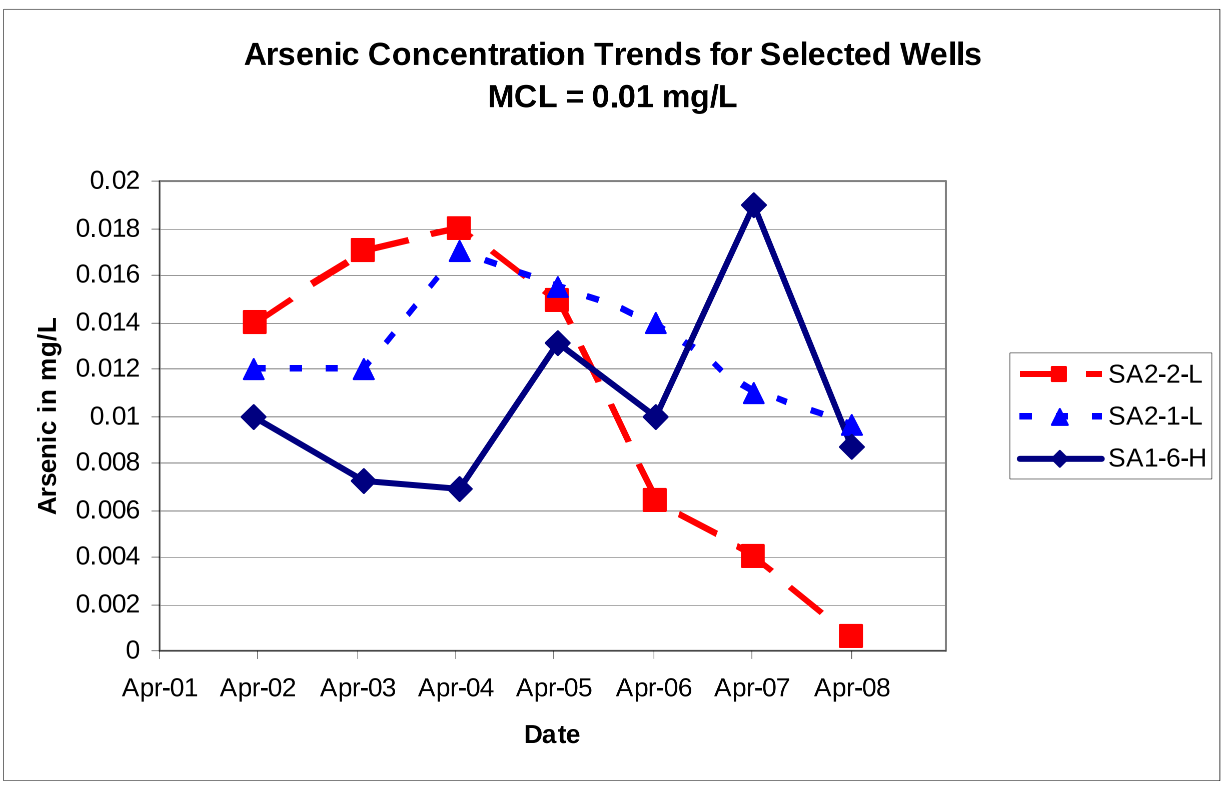

Figure 4. Arsenic Concentration Trends for Selected Wells

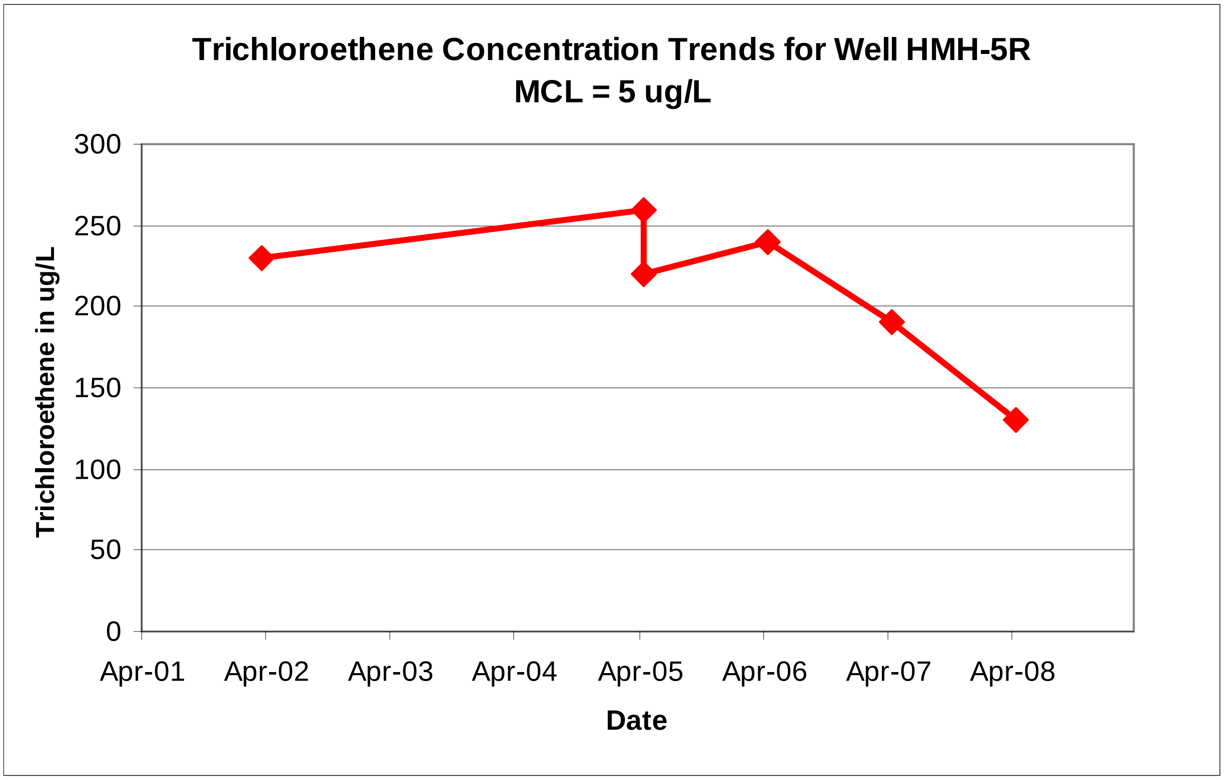

Figure 5. Trichloroethene Concentration Trends for Well HMH-5R

Figure 6 shows tritium concentrations in off-site municipal well water. Results for off-site surface locations are shown in Figure 7. These graphs are semilog plots of data collected by EPA (Las Vegas) from locations near the Salmon Site since 1972. Beginning in 2008, the samples were collected by DOE. The MCL for tritium is 20,000 picocuries per liter (pCi/L). All 2008 results were below the detection limit. For comparison of decay trends, the graph also shows tritium in precipitation (Brown 1995). The large increase in the 1950s and 1960s is due to atmospheric testing of nuclear weapons. The upper decay trend line represents a starting concentration of 2,000 pCi/L tritium; the lower line represents a starting concentration of 200 pCi/L tritium.

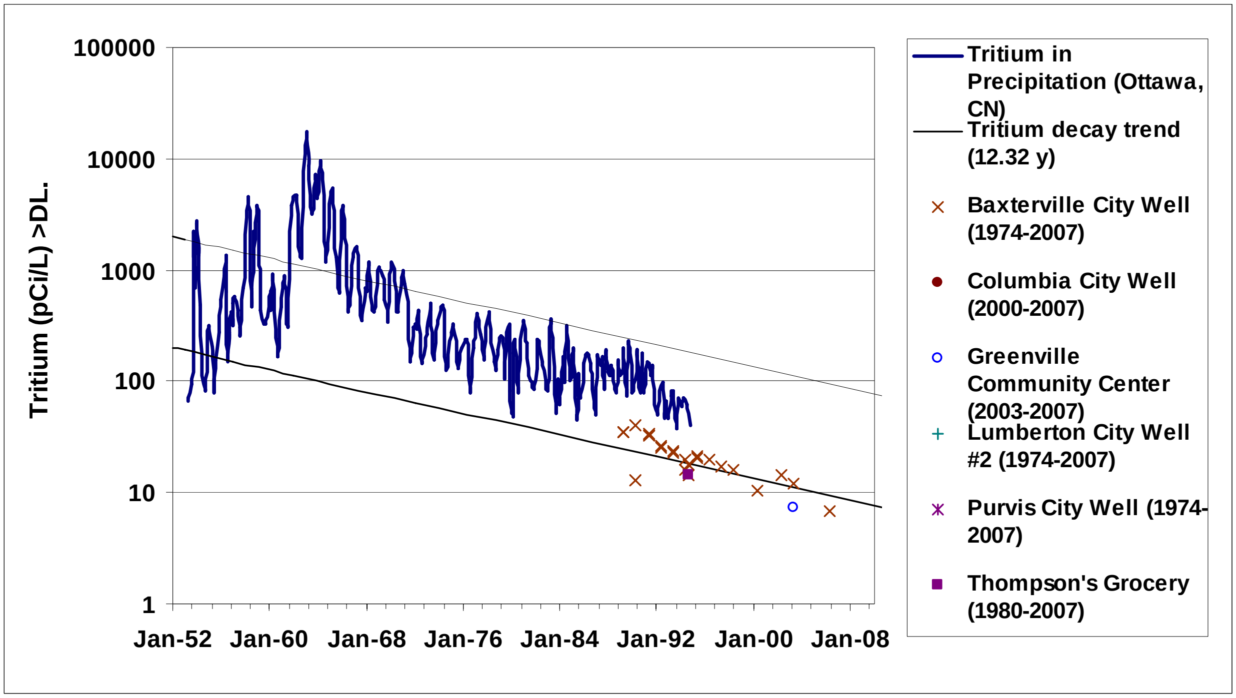

Figure 6. Tritium Decay Trend and Off-Site Sample Concentrations Above the Detection Limit

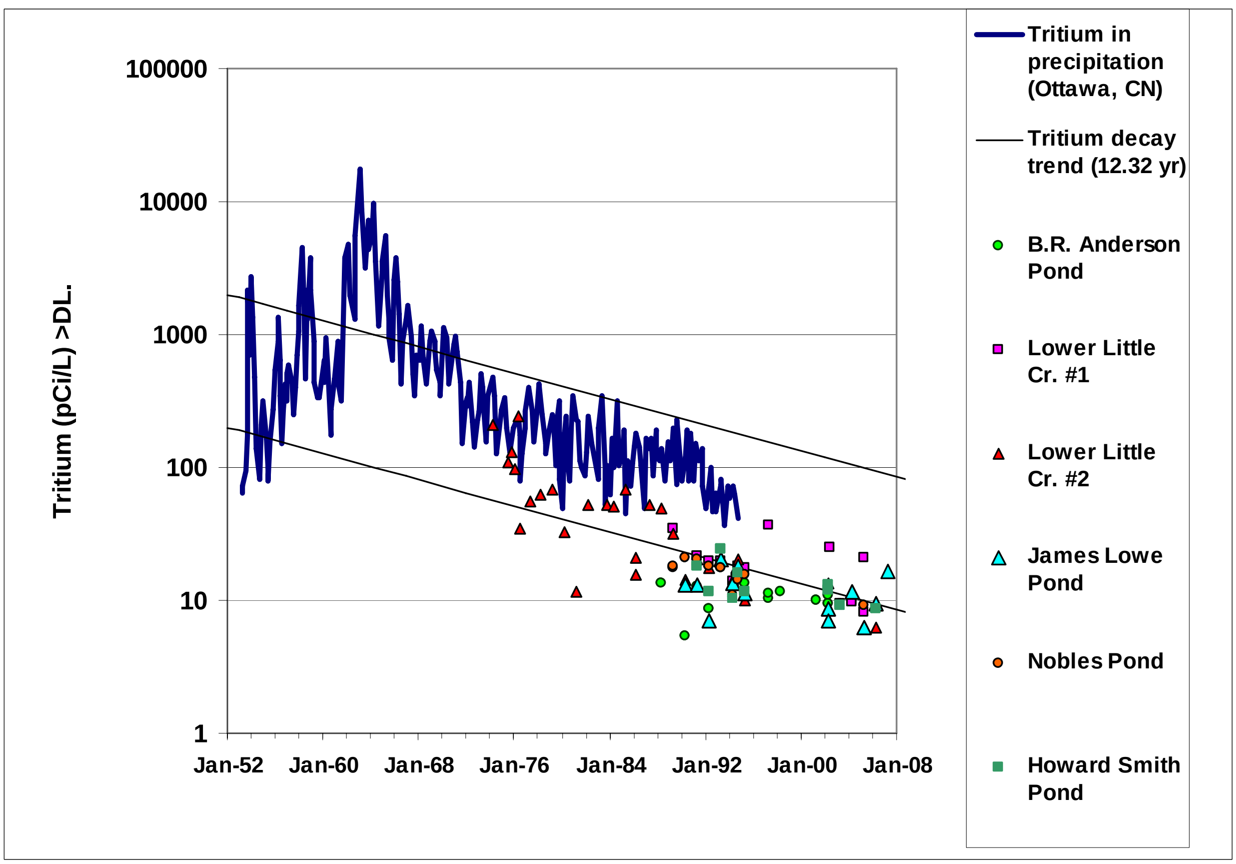

Figure 7. Tritium Decay Trend and Off-Site Surface Water Sample Concentrations Above the Detection Limit

The tritium results for the Baxterville well are not believed to be due to contamination from the site. If the contamination had originated at the site, the decay curve for that well would show both the normal tritium decay curve and the effects of dilution in the groundwater. This would result in a curve steeper than the tritium decay trend line. Tritium in the samples collected in Baxterville in April 2007 and 2008 was below the detection limit.

3.3 Water Level Trends

Water levels were measured during three site visits in 2008. Groundwater elevations are shown in Appendix B, Table B−3. Figure 8 is a trend plot that shows yearly groundwater elevations for representative wells in selected aquifers. In 2008, all measuring point elevations were resurveyed, and all well pumps were correctly placed.

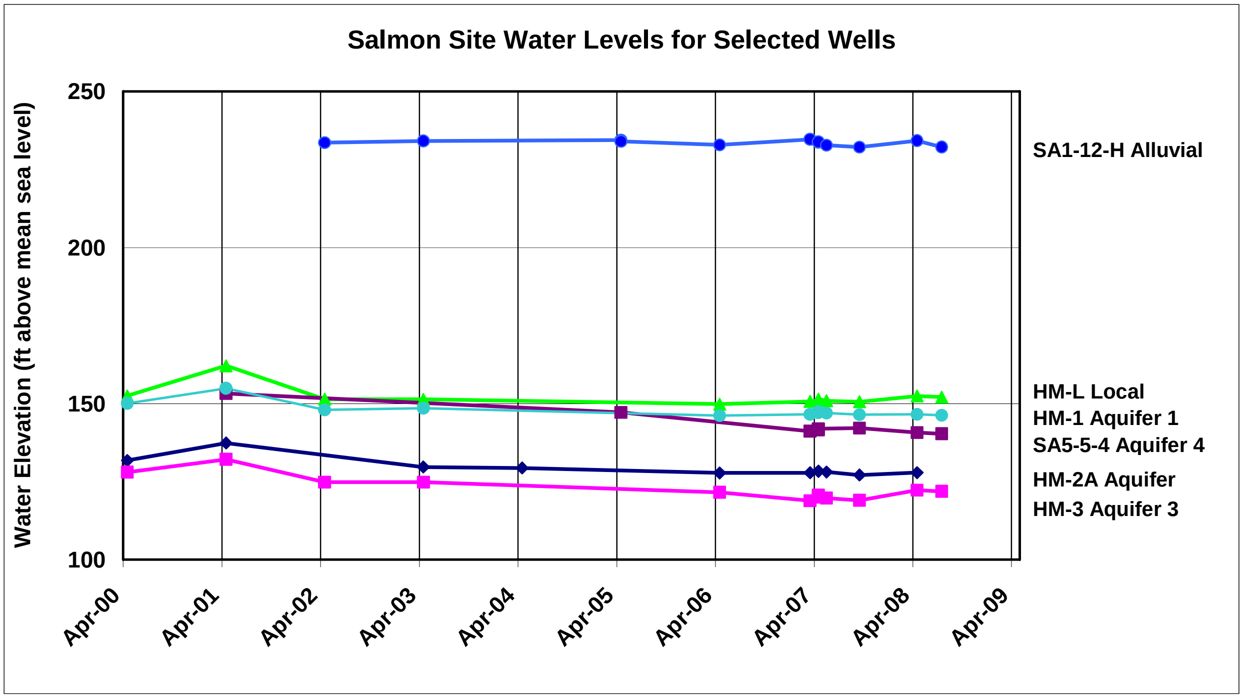

Figure 8. Hydrograph for Selected Wells

The elevation for Aquifer 4 is shown as higher than the elevations for Aquifers 2 and 3. The higher elevation in Aquifer 4 is because the aquifer is confined, resulting in a higher potentiometric surface.

4.0 Recommendations

The following actions are recommended for the Salmon Site:

- Develop a long-range timber and habitat management plan for the site.
- Survey and assess culverts on all site roads, and use the data to prepare a plan for culvert maintenance, repair, or replacement.

- At the time of the next public meeting, conduct tours of the site for State, County, and City officials and the general public.
- For future site maintenance work, use businesses from nearby communities.
- Continue the interagency agreement for beaver control to prevent future road damage along the pond.
- Discontinue off-site tritium sampling in 2009.
- Continue the current on-site water sample plan that includes sampling of:
  - Resource Conservation and Recovery Act metals plus antimony, barium, beryllium, chromium, mercury, nickel, and zinc.
  - VOCs.
  - Tritium and appropriate gamma-emitting radionuclides.

5.0 References

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Appendix A

Site Photographs

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Photo A−1 Culvert with Corrosion of the Base

Photo A−2. Sinkhole in Road Caused by Culvert Failure

Photo A−3. Installation of Culvert Between North and South Ponds

Photo A−4. Loading Trees for Transport to a Recycling Facility

Photo A−5. Installation of Telemetry Base Station at Well SA1-7-H

Photo A−6. Surveyors Preparing to Measure Well Elevation

Photo A−7 Mowing Vegetation Near Ground Zero

Photo A−8. Pitcher Plant

Photo A−9 Water Sampling

Appendix B

Analytical Results

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Table B−1. April 2008 Volatile and Metal Analytical Results Above the Laboratory Detection Limit

Location Type	Location	Date Sampled	Analyte	Result	Units	Lab Qualifier	MCL or TRG
WL	HM-3	14-Apr-08	Arsenic	0.00044	mg/L		
WL	HM-3	14-Apr-08	Barium	0.21	mg/L		
WL	**HM-3**	**14-Apr-08**	**Chromium**	**0.12**	**mg/L**		**0.1**
WL	HM-3	14-Apr-08	Mercury	0.000011	mg/L	B	
WL	HM-3	14-Apr-08	Selenium	0.000047	mg/L	B	
WL	HM-L	14-Apr-08	Arsenic	0.00079	mg/L		
WL	HM-L	14-Apr-08	Barium	0.43	mg/L		
WL	HM-L	14-Apr-08	Chromium	0.0018	mg/L	B	
WL	HM-L	14-Apr-08	Mercury	0.000011	mg/L	B	
WL	HM-S	14-Apr-08	Barium	0.031	mg/L		
WL	HM-S	14-Apr-08	Benzene	0.29	µg/L	J	
WL	HM-S	14-Apr-08	Mercury	0.000011	mg/L	B	
WL	HM-S	14-Apr-08	Selenium	0.000059	mg/L	B	
WL	HM-S	14-Apr-08	Trichloroethene	1.8	µg/L		
WL	HM-S	14-Apr-08	*cis*-1,2-dichloroethene	3.7	µg/L		
WL	HM-S	14-Apr-08	*trans*-1,2-dichloroethene	0.57	µg/L	J	
WL	SA1-1-H	14-Apr-08	Arsenic	0.0068	mg/L		
WL	SA1-1-H	14-Apr-08	Barium	0.32	mg/L		
WL	SA1-1-H	14-Apr-08	Selenium	0.000045	mg/L	B	
WL	SA1-1-H	14-Apr-08	Trichloroethene	2.7	µg/L		
WL	SA1-1-H	14-Apr-08	*cis*-1,2-dichloroethene	6.5	µg/L		
WL	SA1-1-H	14-Apr-08	*trans*-1,2-dichloroethene	1.8	µg/L		
WL	SA1-2-H	14-Apr-08	Arsenic	0.0068	mg/L		
WL	SA1-2-H	14-Apr-08	Barium	0.053	mg/L		
WL	SA1-2-H	14-Apr-08	Benzene	0.46	µg/L	J	
WL	SA1-2-H	14-Apr-08	Selenium	0.000068	mg/L	B	
WL	SA1-2-H	14-Apr-08	Tetrachloroethene	0.26	µg/L	J	
WL	SA1-2-H	14-Apr-08	Trichloroethene	2	µg/L		
WL	SA1-2-H	14-Apr-08	Vinyl chloride	1.1	µg/L		
WL	SA1-2-H	14-Apr-08	*cis*-1,2-dichloroethene	15	µg/L		
WL	SA1-2-H	14-Apr-08	*trans*-1,2-dichloroethene	2.3	µg/L		
WL	SA1-5-H	14-Apr-08	Arsenic	0.0013	mg/L		
WL	SA1-5-H	14-Apr-08	Barium	0.021	mg/L		
WL	SA1-5-H	14-Apr-08	Chromium	0.00088	mg/L	B	
WL	SA1-5-H	14-Apr-08	Mercury	0.000013	mg/L	B	
WL	SA1-5-H	14-Apr-08	Selenium	0.0001	mg/L		
WL	SA1-5-H	14-Apr-08	Trichloroethene	0.26	µg/L	J	
WL	SA1-5-H	14-Apr-08	*cis*-1,2-dichloroethene	5.6	µg/L		
WL	SA1-5-H	14-Apr-08	*trans*-1,2-dichloroethene	1.8	µg/L		
WL	**SA1-3-H**	**15-Apr-08**	**Arsenic**	**0.019**	**mg/L**		**0.01**
WL	SA1-3-H	15-Apr-08	Barium	0.044	mg/L		
WL	SA1-3-H	15-Apr-08	Benzene	0.38	µg/L	J	
WL	SA1-3-H	15-Apr-08	Chromium	0.0019	mg/L	B	
WL	SA1-3-H	15-Apr-08	Mercury	0.000012	mg/L	B	
WL	SA1-3-H	15-Apr-08	Selenium	0.00009	mg/L	B	

Table B−1 (continued). April 2008 Analytical Results

Location Type	Location	Date Sampled	Analyte	Result	Units	Lab Qualifier	MCL or TRG
WL	SA1-3-H	15-Apr-08	Trichloroethene	0.88	µg/L	J	
WL	SA1-3-H	15-Apr-08	Vinyl chloride	0.34	µg/L	J	
WL	SA1-3-H	15-Apr-08	*cis*-1,2-dichloroethene	12	µg/L		
WL	SA1-3-H	15-Apr-08	*trans*-1,2-dichloroethene	5.2	µg/L		
WL	SA1-4-H	15-Apr-08	Arsenic	0.00035	mg/L		
WL	SA1-4-H	15-Apr-08	Barium	0.33	mg/L		
WL	SA1-4-H	15-Apr-08	Beryllium	0.00049	mg/L	B	
WL	SA1-4-H	15-Apr-08	Mercury	0.000012	mg/L	B	
WL	SA1-4-H	15-Apr-08	Selenium	0.000047	mg/L	B	
WL	SA1-4-H	15-Apr-08	*cis*-1,2-dichloroethene	0.42	µg/L	J	
WL	E-7	16-Apr-08	Naphthalene	0.33	µg/L	J	
WL	HM-L2	16-Apr-08	Barium	0.11	mg/L		
WL	HM-L2	16-Apr-08	Chromium	0.00067	mg/L	B	
WL	HM-L2	16-Apr-08	Mercury	0.000012	mg/L	B	
WL	HMH-16R	16-Apr-08	Arsenic	0.00014	mg/L		
WL	HMH-16R duplicate	16-Apr-08	Arsenic	0.00018	mg/L		
WL	HMH-16R	16-Apr-08	Barium	0.34	mg/L		
WL	HMH-16R duplicate	16-Apr-08	Barium	0.35	mg/L		
WL	HMH-16R	16-Apr-08	Mercury	0.000013	mg/L	B	
WL	HMH-16R duplicate	16-Apr-08	Mercury	0.000015	mg/L	B	
WL	HMH-16R	16-Apr-08	Selenium	0.000042	mg/L	B	
WL	HMH-16R	16-Apr-08	m,p-Xylene	0.35	µg/L	J	
WL	SA1-8-L	16-Apr-08	Arsenic	0.0082	mg/L		
WL	SA1-8-L	16-Apr-08	Barium	0.23	mg/L		
WL	SA1-8-L	16-Apr-08	Mercury	0.000016	mg/L	B	
WL	SA1-8-L	16-Apr-08	Zinc	0.038	mg/L		
WL	SA3-4-H	16-Apr-08	Arsenic	0.00031	mg/L		
WL	SA3-4-H	16-Apr-08	Barium	0.33	mg/L		
WL	SA3-4-H	16-Apr-08	Mercury	0.000013	mg/L	B	
WL	SA4-5-L	16-Apr-08	Antimony	0.00065	mg/L		
WL	SA4-5-L	16-Apr-08	Arsenic	0.000076	mg/L	B	
WL	**SA4-5-L**	**16-Apr-08**	**Barium**	**2.1**	**mg/L**		**2.0**
WL	SA4-5-L	16-Apr-08	Beryllium	0.0007	mg/L	B	
WL	SA4-5-L	16-Apr-08	Chromium	0.032	mg/L		
WL	SA4-5-L	16-Apr-08	Lead	0.0038	mg/L		
WL	SA4-5-L	16-Apr-08	Mercury	0.000011	mg/L	B	
WL	SA4-5-L	16-Apr-08	Zinc	0.16	mg/L		
WL	HMH-5R	17-Apr-08	1,1-dichloroethene	0.54	µg/L	J	
WL	HMH-5R duplicate	17-Apr-08	1,1-dichloroethene	0.57	µg/L	J	
WL	HMH-5R	17-Apr-08	Arsenic	0.0045	mg/L		
WL	HMH-5R duplicate	17-Apr-08	Arsenic	0.0047	mg/L		
WL	HMH-5R	17-Apr-08	Barium	0.52	mg/L		
WL	HMH-5R duplicate	17-Apr-08	Barium	0.51	mg/L		
WL	HMH-5R	17-Apr-08	Chromium	0.0011	mg/L	B	

Table B−1 (continued). April 2008 Analytical Results

Location Type	Location	Date Sampled	Analyte	Result	Units	Lab Qualifier	MCL or TRG
WL	HMH-5R	17-Apr-08	Ethylbenzene	0.18	µg/L	J	
WL	HMH-5R	17-Apr-08	Mercury	0.000015	mg/L	B	
WL	HMH-5R	17-Apr-08	Mercury	0.000014	mg/L	B	
WL	HMH-5R	17-Apr-08	Selenium	0.00005	mg/L	B	
WL	HMH-5R	17-Apr-08	Selenium	0.000047	mg/L	B	
WL	**HMH-5R**	**17-Apr-08**	**Trichloroethene**	**130**	**µg/L**		**0.005**
WL	**HMH-5R**	**17-Apr-08**	**Trichloroethene**	**140**	**µg/L**		**0.005**
WL	HMH-5R	17-Apr-08	Vinyl chloride	0.23	µg/L	J	
WL	HMH-5R	17-Apr-08	Vinyl chloride	0.28	µg/L	J	
WL	**HMH-5R**	**17-Apr-08**	***cis*-1,2-dichloroethene**	**90**	**µg/L**		**0.07**
WL	**HMH-5R**	**17-Apr-08**	***cis*-1,2-dichloroethene**	**91**	**µg/L**		**0.07**
WL	HMH-5R	17-Apr-08	m,p-Xylene	0.43	µg/L	J	
WL	HMH-5R	17-Apr-08	*trans*-1,2-dichloroethene	4.7	µg/L		
WL	HMH-5R	17-Apr-08	*trans*-1,2-dichloroethene	4.9	µg/L		
WL	SA1-12-H	17-Apr-08	Barium	0.35	mg/L		
WL	SA1-6-H	17-Apr-08	Arsenic	0.0087	mg/L		
WL	SA1-6-H	17-Apr-08	Barium	0.017	mg/L	B	
WL	SA1-6-H	17-Apr-08	Mercury	0.000016	mg/L	B	
WL	SA1-6-H	17-Apr-08	Selenium	0.000095	mg/L	B	
WL	SA1-6-H	17-Apr-08	m,p-Xylene	0.31	µg/L	J	
WL	SA1-7-H	17-Apr-08	Arsenic	0.0074	mg/L		
WL	SA1-7-H	17-Apr-08	Barium	0.26	mg/L		
WL	SA1-7-H	17-Apr-08	Mercury	0.000014	mg/L	B	
WL	SA1-7-H	17-Apr-08	Selenium	0.0002	mg/L		
WL	SA1-7-H	17-Apr-08	*cis*-1,2-dichloroethene	1.2	µg/L		
WL	SA2-1-L	17-Apr-08	Antimony	0.00032	mg/L		
WL	SA2-1-L	17-Apr-08	Arsenic	0.0096	mg/L		
WL	SA2-1-L	17-Apr-08	Barium	0.065	mg/L		
WL	SA2-1-L	17-Apr-08	Mercury	0.000015	mg/L	B	
WL	SA2-2-L	17-Apr-08	Antimony	0.0022	mg/L		
WL	SA2-2-L	17-Apr-08	Arsenic	0.00058	mg/L		
WL	SA2-2-L	17-Apr-08	Barium	0.69	mg/L		
WL	SA2-2-L	17-Apr-08	Chromium	0.012	mg/L		
WL	SA2-2-L	17-Apr-08	Lead	0.013	mg/L		
WL	SA2-2-L	17-Apr-08	Mercury	0.000013	mg/L	B	
WL	SA2-4-L	17-Apr-08	Arsenic	0.0097	mg/L		
WL	SA2-4-L	17-Apr-08	Barium	0.1	mg/L		
WL	SA2-4-L	17-Apr-08	Mercury	0.000014	mg/L	B	

Note: bold rows identify results that exceed the MCL or TRG
SL = Surface location; surface water sample
WL = Well
B = Result is between the instrument detection limit and contract required detection limit.
J = Estimated by the laboratory

Table B−1 (continued). April 2008 Analytical Results

Statistics:

37	Total number of sample locations (no duplicates)
1,441	Total number of lab analyses including duplicate samples
127	Number of lab analyses greater than the method detection limit or 5 times the method blank concentration (including duplicates)
12	Number of duplicate analyses
115	Number of unique lab analyses
5	Number of analyses greater than the MCL
4	Number of sample points with a lab analyses greater than the MCL

Table B−2. 2008 Tritium Above the Laboratory Detection Limit

Location Type	Location	Date Sampled	Analyte	Result	Units	Detection Limit	Lab Qualifier
WL	HM-L	14-Apr-08	Enriched Tritium	784.00	pCi/L	3.83	
WL	SA1-3-H	15-Apr-08	Enriched Tritium	358.00	pCi/L	5.12	
WL	HM-2B	15-Apr-08	Tritium	1,860.00	pCi/L	184	
WL	HM-3	14-Apr-08	Tritium	1,840.00	pCi/L	184	
WL	HMH-5R	17-Apr-08	Tritium	2,280.00	pCi/L	176	
WL	HM-L	14-Apr-08	Tritium	794.00	pCi/L	162	
WL	SA1-1-H	14-Apr-08	Tritium	5,210.00	pCi/L	176	
WL	SA1-2-H	14-Apr-08	Tritium	697.00	pCi/L	176	
WL	Bx.Cty WL #370007-04	15-Apr-08	Enriched Tritium	4.98	pCi/L	3.83	J
DS	Thompson's Blue Store	16-Apr-08	Enriched Tritium	5.77	pCi/L	3.81	J
WL	HM-S	14-Apr-08	Tritium	396.00	pCi/L	162	J
WL	SA1-3-H	15-Apr-08	Tritium	437.00	pCi/L	176	J

J = Value estimated by the laboratory
WL = Well
DS = Tap in domestic water system

Summary of all water sample results for tritium:

- 63 Total number of tritium analyses
- 2 Duplicate tritium analysis
- 1 Duplicate enriched tritium analysis
- 12 Number of unique enriched tritium analysis
- 48 Number of unique tritium analysis
- 8 Number of unique sample point results above the detection limit
- 0 Number of results above the tritium MCL

Table B−3. 2008 Water Level Measurements

Well ID	Aquifer	Water Level Elevation		
		April 17	May 30−31	September 21
HMH-16R	Alluvial	237.93	236.03	234.84
HMH-5R	Alluvial	234.82	233.48	234.31
HM-S	Alluvial	236.05	235.12	235.63
SA1-12-H	Alluvial	234.26	232.8	232.16
SA1-1-H	Alluvial	235.66	234.48	235.01
SA1-2-H	Alluvial	235.7	234.64	235.15
SA1-3-H	Alluvial	235.88	234.85	235.44
SA1-4-H	Alluvial	236.48	235.75	236.2
SA1-5-H	Alluvial	236.68	236.4	236.51
SA1-6-H	Alluvial	236.84	236.91	236.76
SA1-7-H	Alluvial	236.93	237.09	236.95
SA3-4-H	Alluvial	237.48	236.3	237.03
HM-L	Local	152.42	150.93	150.62
HM-L2	Local	155.6	ND	153.39
SA1-8-L	Local	156.72	156.58	155.97
SA2-1-L	Local	156.85	ND	156.05
SA2-2-L	Local	156.79	272.78	156.75
SA2-4-L	Local	157.12	156.99	156.21
SA4-5-L	Local	154.92	154.4	153.86
HM-1	A1	146.54	147	146.43
HM-2A	2A	127.87	128.07	127.14
HM-2B	2B	119.53	120.07	119.39
SA3-11-3	3A	118.07	118.37	117.83
HM-3	3B	122.27	119.74	119.05
SA1-11-3	3B	119.06	119.56	119.04
SA5-4-4	A4	139.94	208.45	193.59
SA5-5-4	A4	140.71	141.97	142.16
E-7	Caprock	121.74	121.89	121.37

Note: Water level elevations are in feet above mean sea level and are calculated based on depth to water measurements.
ND = not determined