INL/EXT-16-37731

2015 Annual Reuse Report for the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste Ponds

February 2016

The INL is a U.S. Department of Energy National Laboratory
operated by Battelle Energy Alliance

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Idaho National Laboratory
Idaho Falls, Idaho 83415

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ABSTRACT

This report describes conditions and information, as required by the state of Idaho, Department of Environmental Quality Reuse Permit I-161-02, for the Advanced Test Reactor Complex Cold Waste Ponds located at Idaho National Laboratory from November 1, 2014–October 31, 2015. The effective date of Reuse Permit I-161-02 is November 20, 2014 with an expiration date of November 19, 2019. This report contains the following information:

- Facility and system description
- Permit required effluent monitoring data and loading rates
- Permit required groundwater monitoring data
- Status of compliance activities
- Noncompliance issues
- Discussion of the facility's environmental impacts.

During the 2015 permit year, approximately 228 million gallons of wastewater were discharged to the Cold Waste Ponds. This is well below the maximum annual permit limit of 375 million gallons.

As shown by the groundwater sampling data, sulfate and total dissolved solids concentrations are highest in well USGS-065, which is the closest downgradient well to the Cold Waste Ponds. Sulfate and total dissolved solids concentrations decrease rapidly as the distance downgradient from the Cold Waste Ponds increases. Although concentrations of sulfate and total dissolved solids are significantly higher in well USGS-065 than in the other monitoring wells, both parameters were below the Ground Water Quality Rule Secondary Constituent Standards in well USGS-065.

There were no noncompliance issues associated with the Cold Waste Ponds during the 2015 permit year.

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TABLES

ACRONYMS

ATR	Advanced Test Reactor
CCN	correspondence control number
CFR	Code of Federal Regulations
CTS	Commitment Tracking System
CWP	Cold Waste Pond(s)
DEQ	Idaho Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
FM	flow measurement or monitoring description or identifier
GW	prefix for groundwater reporting serial number
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
IWRP	Industrial Wastewater Reuse Permit
MG	Million gallons
MS	matrix spike
MU	prefix for management unit reporting environmental serial number
NA	Not Applicable
NAVD	North American Vertical Datum
OOS	out of service
PCS	Primary Constituent Standard
PO	Plan of Operation
QAPP	Quality Assurance Project Plan
R&MS	Regulatory and Monitoring Services
SCS	Secondary Constituent Standard
s.u.	standard units for pH
SwRI	Southwest Research Institute
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TRA	prefix for groundwater reporting (well) common designation number
TSS	total suspended solids
USGS	prefix for groundwater reporting (well) common designation number
WW	prefix for wastewater reporting serial number

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1. INTRODUCTION

The Advanced Test Reactor (ATR) Complex Cold Waste Ponds (CWP) is a reuse facility operated by Battelle Energy Alliance, LLC at Idaho National Laboratory (INL) under Reuse Permit No. I-161-02 issued by the State of Idaho Department of Environmental Quality (DEQ) on November 20, 2014 (Neher 2014a) and expires on November 19, 2019.

The previous permit (LA-000161-01, Modification B) expired on February 25, 2013. However, the Idaho Administrative Procedures Act (IDAPA) 58.01.17.400.10.a (Continuation of Expiring Permits) allows continued coverage under the existing permit provided the permittee submits a timely and sufficient application. A timely and sufficient application is one where the DEQ has determined the application is complete and the applications effective date (date application was determined complete) is prior to the expiration date of the permit. The paragraph below provides the timeline and associated documents to show the application was timely and sufficient.

An application for renewal of the Reuse Permit was submitted to DEQ on August 21, 2012 (Stenzel 2012). The application was determined "substantially complete" with an effective date of October 12, 2012 (Rackow 2012a). The preliminary decision to prepare a draft permit (Rackow 2012b) was made by DEQ on October 12, 2012. On June 25, 2013, DEQ (Neher 2013) issued a draft Reuse Permit (I-161-02) and a staff analysis for review and comment. Idaho National Laboratory submitted comments to DEQ on the draft permit on July 23, 2013 (Mascareñas 2013). DEQ addressed the comments and issued Draft Permit #2 on March 26, 2014 (Neher 2014b) for review and comment. Included with Draft Permit #2 was a new requirement to identify a Responsible Official(s) and Authorized Representative(s), and certify the renewal application. On September 15, 2014 (Miller 2014), INL submitted a comment on the Draft Permit #2, the applicable DEQ forms for designating a Responsible Official and Authorized Representative, and a certification for the renewal application. As stated above, the final permit was issued on November 20, 2014.

Following the Section 2 CWP facility, system, and operation description, this report presents the effluent and groundwater monitoring data, compliance activities, noncompliances, and environmental impacts of the CWP operation during the 2015 permit year (November 1, 2014–October 31, 2015).

2. FACILITY, SYSTEM DESCRIPTION, AND OPERATION

The ATR Complex (Figure 1) is located on approximately 100 acres in the southwestern portion of INL, approximately 47 miles west of Idaho Falls, Idaho, in Butte County. The ATR Complex consists of buildings and structures utilized to conduct research associated with developing, testing, and analyzing materials used in nuclear and reactor applications and both radiological and nonradiological laboratory analyses.

The CWP are located approximately 450 ft from the southeast corner of the ATR Complex compound and approximately 3/4 of a mile northwest of the Big Lost River channel (Figure 1). The existing CWP were excavated in 1982. The CWP consist of two cells, each with dimensions of 180 × 430 ft across the top of the berms, and a depth of 10 ft. Total surface area for the two cells at the top of the berms is approximately 3.55 acres. Maximum capacity is approximately 10,220,000 gal (31.3 acre ft).

Wastewater discharged to the CWP consists primarily of noncontact cooling tower blowdown, once-through cooling water for air conditioning units, coolant water from air compressors, secondary system drains, and other nonradioactive drains throughout the ATR Complex. The wastewater flows through collection piping to the TRA-764 Cold Waste Sample Pit (Figure 2) where the flow rate is recorded and compliance monitoring samples are collected. The wastewater then flows to the Cold Waste Sump Pit (TRA-703). The sump pit contains submersible pumps that route the water to the appropriate pond through 8-in. valves.

Wastewater enters the ponds through concrete inlet basins located near the west end. Most of the water percolates into the porous ground within a short distance from the inlet basins. The entire floor of a pond is rarely submerged. If the water level rises significantly in a pond (e.g., 5 ft), the flow would be diverted to the adjacent pond, allowing the first pond to dry out. An overflow pipe connects the two ponds at the 9-ft level.

Normal operation is to route the wastewater to one pond at a time. Historically, the flow to the ponds was switched annually. Section 4.2 of the Reuse Permit states "DEQ recommends each basin be operated using periods of wetting and drying cycles at set frequencies that provide for both anaerobic and aerobic treatment of the wastewater through the vadose zone."

Beginning in February 2015, the frequency for switching ponds was increased to approximately monthly. The dates when the effluent flow to the ponds were switched can be found in Appendix A. The change in frequency is based on a modeled vadose zone drain-out period for the zone above the shallow perched water zone below the CWP.

There are no existing or planned cross-connections or interconnections between the Cold Waste System wastewater and any water supplies (potable or nonpotable) that would require backflow prevention devices or methods.

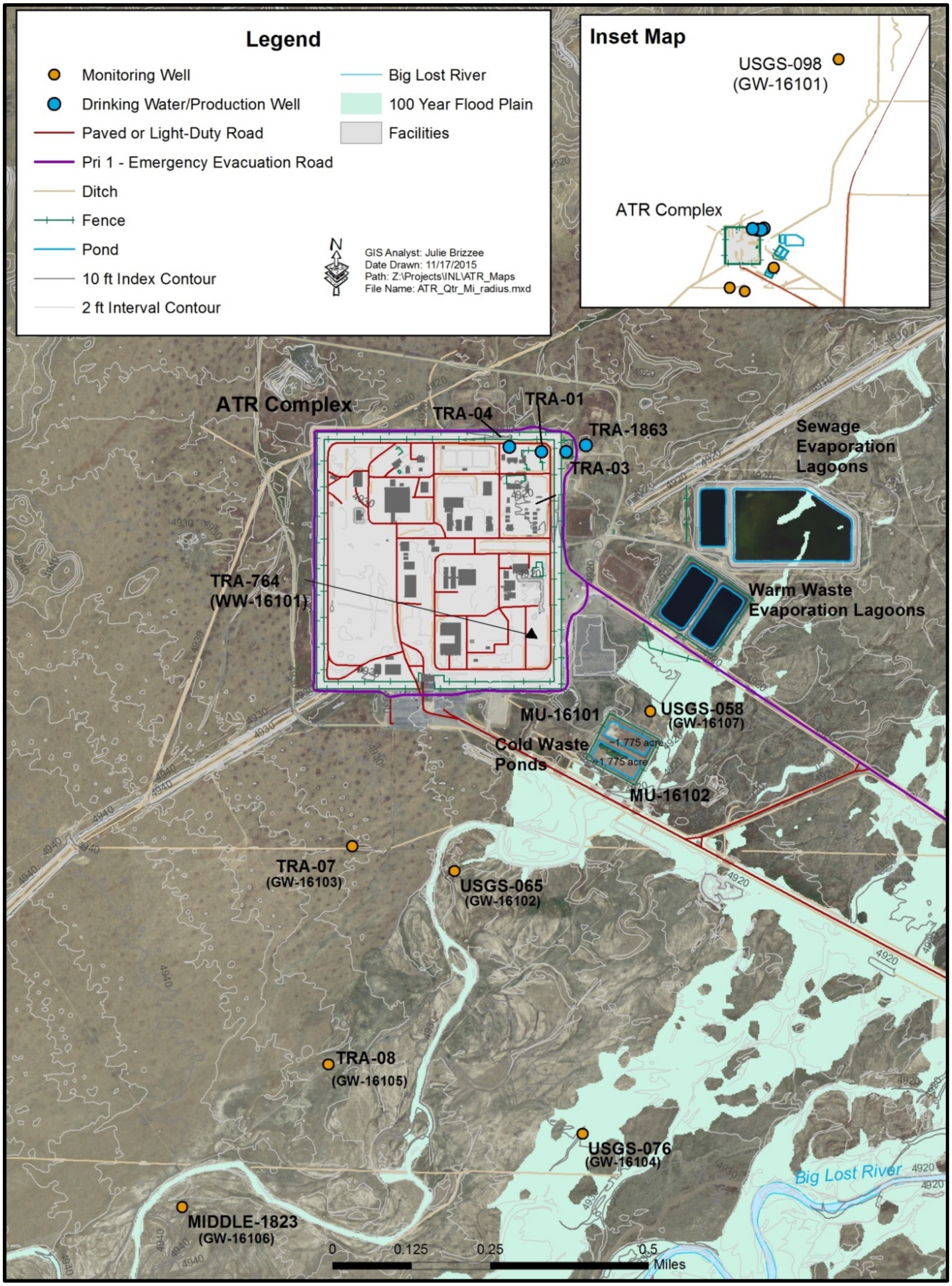

Figure 1. Advanced Test Reactor Complex facility map showing location of the Cold Waste Ponds, monitoring and drinking water wells, Big Lost River, and other associated surface features.

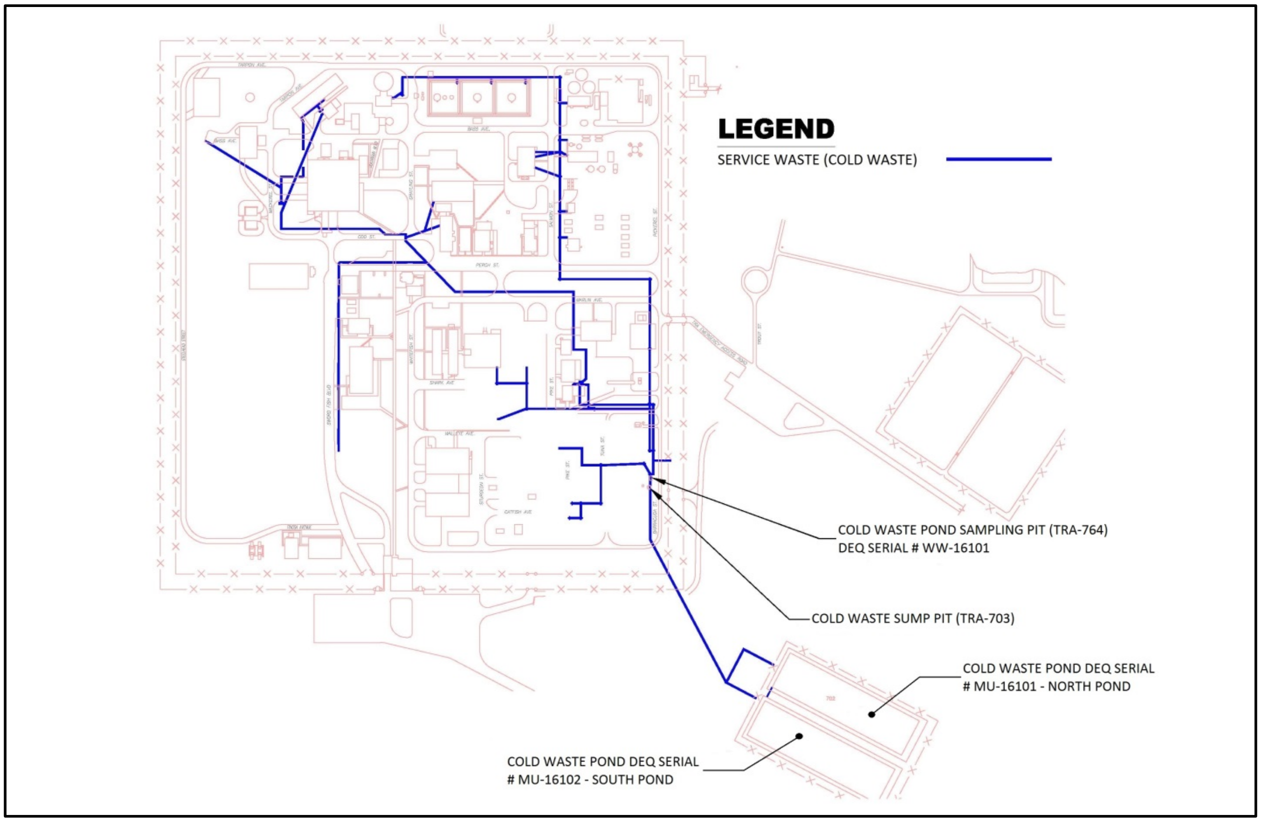

Figure 2. Advanced Test Reactor Complex Cold Waste system flow schematic.

3. COLD WASTE PONDS EFFLUENT MONITORING

This section describes the sampling and analytical methods used in the ATR Complex CWP effluent monitoring program. Effluent monitoring and flow data for wastewater discharged to the ATR Complex CWP are provided.

3.1 Sampling Program and Analytical Methods

Battelle Energy Alliance, LLC, Regulatory and Monitoring Services (R&MS) personnel monitor effluent discharges at the ATR Complex CWP. The R&MS program involves sampling, analysis, and data interpretation carried out under a quality assurance program. A Quality Assurance Project Plan (QAPP), as required by the Reuse Permit, was submitted to DEQ on May 18, 2015 (Miller 2015a).

The QAPP identifies the scope of monitoring, the organization and individuals involved, data quality objectives, monitoring procedures, and specific quality control measures. The purpose of the QAPP is to ensure data of sufficient quantity and quality are collected to meet permit and regulatory expectations.

Regulatory and Monitoring Services personnel collect monthly effluent sampling as required in Section 5.1.1 of the Reuse Permit. Effluent samples were collected from the TRA-764 Cold Waste Sample Pit (sampling location WW-16101) prior to discharge to the CWP. All samples were collected according to established programmatic sampling procedures. These procedures are now identified in the QAPP.

The monthly effluent sampling schedule at WW-16101 is randomly established at the beginning of each calendar year. The WW-16101 March 2015 sampling evolution, originally scheduled for March 11-12, 2015, was rescheduled to March 18-19, 2015, due to maintenance at the TRA-703 pump pit to replace level control switches. Sampling personnel were informed that this maintenance activity included efforts within the ATR Complex to temporarily minimize wastewater generation and the TRA-703 pump pit fill rate, which could result in atypical effluent flows being sampled (i.e., effluent flow could be unusually low during the sampling period or effluent could back up into the sample basin resulting in a non-representative sample). Therefore, the sampling evolution was rescheduled."

Analytical methods specified in 40 Code of Federal Regulations (CFR) 141, “National Primary Drinking Water Regulations”; 40 CFR 143, “National Secondary Drinking Water Regulations,” or 40 CFR 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants” were used for analysis of all permit-required parameters.

Permit required effluent pH and conductivity analyses are performed at the time of sample collection by R&MS personnel using a calibrated meter. All other permit-required samples are submitted under full chain of custody to Southwest Research Institute’s (SwRI) Analytical and Environmental Chemistry Department located in San Antonio, Texas, for analysis.

3.2 Effluent Monitoring Results

The permit year covered in this report is November 1, 2014–October 31, 2015.

Effluent samples were collected monthly from the TRA-764 Cold Waste Sample Pit (prior to discharge to the CWP) during the permit year. Effluent samples were collected as 24-hour flow proportional composite samples.

All samples were collected and analyzed as required by the applicable permit in effect at the time of sampling. Table 1 shows the parameters and sample results required by Industrial Wastewater Reuse Permit (IWRP) LA-000161-01, Modification B. This permit was still in effect at the time the November 2014 compliance samples were collected.

Table 2 shows the parameters and sample results required by Reuse Permit I-161-02 that became effective on November 20, 2014 and replaced IWRP LA-000161-01, Modification B.

Prior to the issuance of Reuse Permit I-161-02, sampling and analysis required by IWRP LA-000161-01, Modification B, demonstrated that some wastewater constituent concentrations were sufficiently low enough or not detected which warranted removal of some parameters from monitoring. Therefore, the DEQ did not require the following parameters to be monitored in the current permit:

- Total metals - arsenic, barium, cadmium, cobalt, copper, iron, manganese, mercury, and silver.
- Inorganics – fluoride, selenium, and total suspended solids (TSS).

The current permit replaced unfiltered aluminum, iron, and manganese parameters with filtered aluminum, iron, and manganese; and also added chromium.

Section F of the previous permit, LA-000161-01, Modification B, specified effluent permit limits based on a 30-day average for total nitrogen (TN) and TSS of 20 mg/L and 100 mg/L, respectively. Total nitrogen is calculated as the sum of total Kjeldahl nitrogen (TKN) and nitrate plus nitrite nitrogen. The November 2014 sample result for TN was 1.049 mg/L and below the laboratory instrument detection limit of 4 mg/L for TSS (Table 1). The current permit does not specify a limit for TN, and TSS was removed as a permit required parameter.

Although, there are no effluent permit limits for total dissolved solids (TDS) or sulfate, a summary comparison of these parameters with the Ground Water Quality Rule Secondary Constituent Standards (SCS) found in IDAPA 58.01.11.200.01.b. is provided below:

The TDS SCS is 500 mg/L. The TDS concentration in the effluent to the CWP ranged from 217 mg/L in the October 2015 sample to 1,330 mg/L in the August 2015 sample (Tables 1 and 2). Concentrations of TDS in the effluent were above the SCS level in 3 out of the 12 months.

Similar to the TDS effluent levels, sulfate concentrations were above the SCS of 250 mg/L in 3 of the 12 monthly samples (Tables 1 and 2). Sulfate ranged from a minimum of 19.8 mg/L in the September 2015 sample to a maximum of 661 mg/L in the August 2015 sample.

The ATR evaporative cooling process evaporates approximately one-half of the water volume and concentrates naturally occurring dissolved solids and additives in the blowdown discharged to the CWP. Elevated sulfate levels are generated by reactions between sulfuric acid additives placed in the cooling water and calcium and magnesium carbonates in the water.

The metals concentrations in the CWP effluent remained at low levels (Tables 1 and 2).

Table 1. Advanced Test Reactor Complex Cold Waste Ponds effluent data (WW-16101) for unfiltered samples collected on November 12, 2014 under permit LA-000161-01, Modification B.

Nitrite + nitrate as nitrogen (mg/L)	Total Kjeldahl nitrogen (mg/L)	Total nitrogen[a] (mg/L)	Total suspended solids (mg/L)	Total dissolved solids (mg/L)
0.831	0.218	1.049	4.0 U[b]	254
Chloride (mg/L)	**Electrical conductivity (µS/cm)**	**Arsenic (mg/L)**	**Barium (mg/L)**	**Cadmium (mg/L)**
12 J[c]	424	0.005 U	0.0448	0.001 U
Chromium (mg/L)	**Cobalt (mg/L)**	**Copper (mg/L)**	**Fluoride (mg/L)**	**Iron (mg/L)**
0.00303	0.0025 U	0.00424	0.156	0.0877
Manganese (mg/L)	**Mercury (mg/L)**	**Selenium (mg/L)**	**Silver (mg/L)**	**Sulfate (mg/L)**
0.0025 U	0.0002 U	0.00115	0.005 U	26.8

a. Total nitrogen is calculated as the sum of the TKN, nitrite nitrogen, and nitrate nitrogen.
b. U flag indicates that the result was reported as below the instrument detection limit by the analytical laboratory.
c. J flag indicates the associated value is detected at the reported concentration, but the reported concentration is an estimate. See Section 3.2 for additional discussion.

Table 2. Advanced Test Reactor Complex Cold Waste Ponds effluent (WW-16101) data for samples collected in accordance with Reuse Permit I-161-02.

Sample Month	December	January	February	March	April[a]	May	June	July	August	September	October
Sample Date	12/11/14	01/15/15	02/17/15	03/19/15	04/09/15	05/12/15	06/11/15	07/15/15	08/11/15	09/02/15	10/15/15
Nitrite + nitrate as nitrogen (mg/L)	0.825	0.829	0.955 J[b]	0.815	0.822 [0.83]	0.883	2.53	2.43	3.38	0.822	0.853
Total Kjeldahl nitrogen (mg/L)	0.172	0.103	0.247	0.205	0.146 [0.156]	0.224	0.863	0.905	1.5	0.208	0.1 U[c]
Total nitrogen[d] (mg/L)	0.997	0.932	1.202	1.02	0.968 [0.986]	1.107	3.393	3.335	4.88	1.03	<0.953
pH (s.u.)	7.72	7.4	7.46	6.89	7.64	8.24	7.89	7.9	7.93	8.08	8.11
Electrical conductivity (µS/cm)	418	475	537	459	487	424	1,158	1,331	1,727	449	430
Chloride (mg/L)	11.9 J	12.5	12.1	9.8	10.5 [10.1]	11.7	34.1	31.6	57.7	10.3	10.6
Sulfate (mg/L)	24.6	27.3	49.3 J	20.9	20.7 [20.8]	30.4	410	402	661	19.8	21.2
Total dissolved solids (mg/L)	233	245	278	242	239 [248]	262	899	909	1,330	221	217
Aluminum, filtered (mg/L)	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U [0.025 U]	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Chromium, total (mg/L)	0.00281	0.00289	0.00402	0.00357	0.00417 [0.00414]	0.00306	0.0105	0.0081	0.0124	0.00369	0.0035
Chromium, filtered (mg/L)	0.00303	0.00285	0.00477	0.00292	0.00411 [0.00414]	0.0028	0.0113	0.00773	0.0121	0.00355	0.00356
Iron, filtered (mg/L)	0.0553	0.0443	0.025 U	0.025 U	0.0646 [0.0705]	0.025 U	0.217	0.025 U	0.025 U	0.025 U	0.025 U
Manganese, filtered (mg/L)	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U [0.0025 U]	0.0025 U	0.00822	0.0025 U	0.0042	0.0025 U	0.0025 U

a. Results shown in brackets are from field duplicate samples.

b. J flag indicates the associated value is detected at the reported concentration, but the reported concentration is an estimate. See Section 3.2 for additional discussion.

c. U flag indicates that the result was reported as below the instrument detection limit by the analytical laboratory.

d. Total nitrogen is calculated as the sum of the TKN, nitrite nitrogen, and nitrate nitrogen. For results reported below the instrument detection limit, the detection limit for that parameter is used in the calculation. The resulting total nitrogen is then reported as a less than (<) number.

Several effluent sample results were qualified during data validation. Although the reported concentrations may be considered questionable, inaccurate, or imprecise, the estimated values are provided in Tables 1 and 2. These qualified data are discussed below:

- The chloride results for samples collected on November 12, 2014, and December 11, 2014, were assigned a J flag because of low matrix spike (MS) recovery. A MS is an aliquot of a field sample that has been fortified (spiked) with known quantities of pertinent analytes before being processed in an identical manner as is required for the unspiked version of the same field sample. The MS result for chloride was 82.5% and was outside the 90-110% acceptance criteria per U.S. EPA Method 300 and Inorganic Analyses Data Validation for INL (GDE-8511), section 4.3.9.5.4. The J flag denotes the data is detected at the reported concentration, but the reported concentration is an estimate due to low MS recovery.
- The nitrate+nitrite as nitrogen sample collected on February 17, 2015, was qualified with a J flag during data validation because the sample was above the instrument detection level but exceeded the 48-hour holding time. Holding time is the time between sample collection and sample analysis. The J flag denotes the data is detected at the reported concentration, but the reported concentration is an estimate due to the exceeded holding time.
- The February 17, 2015, sulfate sample result was J flagged during data validation. The sulfate sample result was above the instrument detection level but outside the MS 90-110% acceptance criteria per U.S. EPA Method 300 and Inorganic Analyses Data Validation for INL (GDE-8511), section 4.3.9.5.4 at 87%. The J flag for the February 17, 2015, sulfate sample denotes the data is detected at the reported concentration, but the reported concentration is an estimate due to low MS recovery.

3.3 Flow Volumes and Hydraulic Loading Rates

Daily flow readings were taken by ATR Complex CWP Operations during the 2015 permit year, as required by Section 5.1.2 of the Reuse Permit, at the TRA-764 Cold Waste Sample Pit where the flow meter (FM-16101) is located. The flow meter measures flow to the North Pond (MU-16101) and to the South Pond (MU-16102). All flow readings were recorded in gallons per day.

Table 3 summarizes monthly and annual flow data. Daily effluent flow data is provided in Appendix A.

Table 3. Cold Waste Ponds flow summaries.

Month	North Pond (MU-16101) (MG)[a]	South Pond (MU-16102) (MG)	Monthly Total for Both Ponds (MG)
November 2014	0.00	23.93	23.93
December 2014	0.00	24.85	24.85
January 2015	0.00	25.16	25.16
February 2015	20.55	0.92	21.47
March 2015	8.15	9.80	17.95
April 2015	12.66	0.92	13.58
May 2015	0.00	20.91	20.91
June 2015	0.00	12.84	12.84
July 2015	15.86	0.00	15.86
August 2015	0.00	16.45	16.45

Month	North Pond (MU-16101) (MG)[a]	South Pond (MU-16102) (MG)	Monthly Total for Both Ponds (MG)
September 2015	16.77	0.67	17.44
October 2015	0.00	17.63	17.63
Annual Total	**73.99**	**154.09**	**228.08**
a. MG-million gallons. Reuse Permit I-161-02 requires monthly flow volumes to be report to the nearest 0.00 MG.			

Section 4.2 of the permit requires that the total annual volume discharged to the North and South Ponds shall not exceed a 5-year moving annual average of 300 million gallons (MG)/year. No single year shall exceed 375 MG/yr. Annual hydraulic loading data from previous reporting years under IWRP LA-000161-01 are used to determine compliance with the moving annual average. Flow recording became a permit requirement when IWRP LA000161-01 was issued on February 26, 2008. Because permit year 2008 was only a partial year, data from permit year 2009 and subsequent years was used to calculate the 5-year moving average (Figure 3).

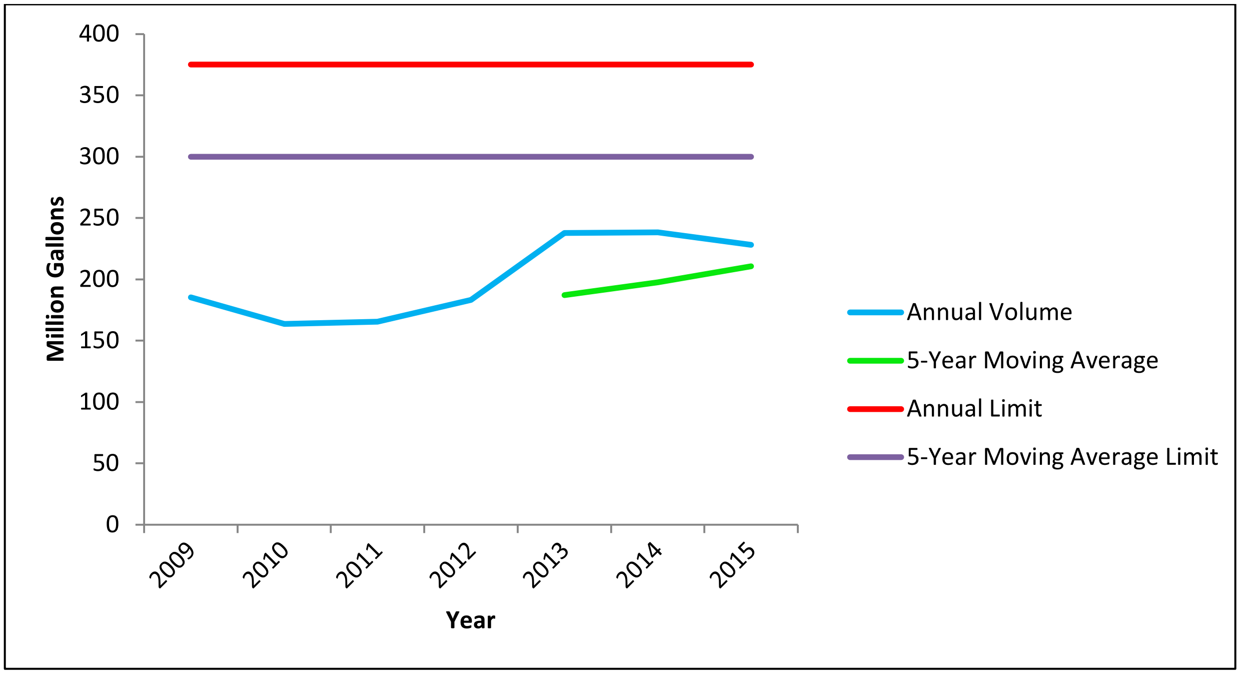

Figure 3. Advanced Test Reactor Complex Cold Waste Ponds wastewater 5-year moving average.

For permit year 2015, the total volume discharged to the North and South ponds was 73.99 MG and 154.09 MG, respectively. The total annual volume discharged to both ponds was 228.08 MG and significantly less than the maximum Reuse Permit annual limit of 375 MG.

3.3.1 Flow Meter Calibration

Prior to the issuance of the current Reuse Permit on November 20, 2014, Section G of IWRP No. LA-000161-01 Modification B issued on February 26, 2008, required annual calibration of all flow meters and pumps used directly or indirectly to measure all wastewater applied to the CWP. The IWRP was in effect for 19 days during report year 2015 before the current Reuse Permit was issued. However, a previous calibration during report year 2014 was performed on May 27, 2014, and therefore not due during the remainder of the time the IWRP was in effect.

Calibration is performed annually and was performed on June 15, 2015, by the ATR Complex maintenance organization. The calibrations were performed to +/- 2% of full scale (full scale = 1400 gpm). The as found calibration of the flow meter was determined to be satisfactory."

4. GROUNDWATER MONITORING

The groundwater monitoring sections provide information concerning the INL sampling program, analytical methods used, and monitoring results, and water table information.

4.1 Sampling Program

The ATR Complex CWP Reuse Permit identifies six INL compliance wells. The permit requires that groundwater samples be collected from these six compliance wells semiannually in April or May and September or October.

The R&MS personnel collected groundwater samples in May and October 2015. The R&MS personnel use project-specific sampling and analysis plans and procedures that govern sampling activities and quality control protocols. The October 2015 sampling was conducted in accordance with the QAPP that was submitted to DEQ on May 18, 2015 (Miller 2015a). The permit identifies a specified list of parameters that are to be analyzed in the groundwater samples. Constituent concentrations in the compliance wells are limited by primary constituent standards (PCS) and SCS specified in IDAPA 58.01.11, “Ground Water Quality Rule” with the exception of chromium. In accordance with Reuse Permit, Section 5.2.2, footnote a., “compliance with the Primary Constituent Standard for Chromium, under this permit, shall not apply.”

As required by the Reuse Permit, unfiltered samples were collected and analyzed for nitrate + nitrite, as nitrogen, TKN, TDS, pH, electrical conductivity, chloride, chromium, and sulfate. Filtered samples were collected and analyzed for aluminum, chromium, iron, and manganese.

Groundwater pH and conductivity analyses are performed at the time of sample collection by R&MS personnel using a calibrated meter(s). All other permit required groundwater samples are submitted under full chain of custody to SwRI’s Analytical and Environmental Chemistry Department located in San Antonio, Texas, for analysis.

4.2 Analytical Methods

Analytical methods specified in 40 CFR 141, “National Primary Drinking Water Regulations”; 40 CFR 143, “National Secondary Drinking Water Regulations” or 40 CFR 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants” were used for analysis of all permit-required parameters.

4.3 Monitoring Wells

To measure potential impacts to groundwater from the ATR Complex CWP, the permit requires that groundwater samples be collected from six monitoring wells located in the Snake River Plain Aquifer (Figure 1):

- USGS-098 (GW-16101)
- USGS-065 (GW-16102)
- USGS-076 (GW-16104)
- TRA-08 (GW-16105)
- Middle-1823 (GW-16106)
- USGS-058 (GW-16107).

All six wells are Reuse Permit compliance points. Wells with sufficient water volume are purged to a minimum of three casing volumes or one well volume with three successive field measurements, taken not less than one minute apart, for pH, conductivity, and temperature and meet the following conditions: temperature must be within $1^{o}C$ of each other, and conductivity values must be within 10% of each other (LI-330).

Groundwater monitoring well TRA-07 (GW-16103) was required under the previous permit as a compliance point monitoring well. However, under the current Reuse Permit Section 5.2.1 "Ground Water Monitoring Point Descriptions" table references TRA-07 in the table's footnotes as "not required under this permit". Therefore, no samples or water level information were obtained from this well.

4.4 Groundwater Monitoring Results

Table 4 shows the 2015 reporting year water table elevations and depth to water table, determined prior to purging and sampling, and the analytical results for all parameters specified by the permit for the six aquifer wells. For well USGS-058, the Reuse Permit only requires sampling, analysis, and reporting of TDS and sulfate.

With the exception of upgradient monitoring well USGS-098, the permit-required parameters were below their respective Ground Water Quality Rule (IDAPA 58.01.11) PCSs or SCSs during the 2015 reporting year for all six wells. The May 6, 2015, chromium sample concentration in well USGS-098 was 0.149 mg/L in the unfiltered sample and above the chromium PCS of 0.1 mg/L. No issues were identified by the laboratory or during data validation. The chromium concentration in the unfiltered sample collected on October 13, 2015, from USGS-098 was 0.0064 mg/L and significantly lower than the PCS and May 6, 2015, sample result. The May chromium sample concentration may have been an anomaly. As previously discussed in Section 4.1, compliance with the chromium PCS is not applicable under the current Reuse Permit and therefore, the high chromium sample result is not a violation of the Reuse Permit requirements.

Chromium concentrations in the filtered and unfiltered samples from the other four monitoring wells were all significantly lower than the PCS.

Aluminum, iron, and manganese concentrations in the filtered samples from all five wells were significantly lower than their respective SCS. Filtered iron and manganese concentrations in the five monitoring wells were typically below the laboratory instrument minimum detection limits or just slightly above.

Monitoring well USGS-065 is a downgradient well located southwest of the CWP. Sulfate and TDS concentrations in this well are consistently high but less than the applicable sulfate and TDS SCS of 250 mg/L and 500 mg/L, respectively. Sulfate concentration was highest in the October 14, 2015, sample at 157 mg/L. The highest TDS concentration for this well occurred in the May sample at 429 mg/L.

Sulfate and TDS concentrations in the other five wells, including USGS-058, were significantly lower than those in well USGS-065. Well USGS-058, slightly upgradient of the North Pond, showed sulfate and TDS concentrations similar to well Middle-1823 which is the downgradient well located farthest from the CWP.

A few groundwater sample results were qualified during data validation. Although the reported concentrations may be considered questionable, inaccurate, or imprecise, the estimated values are provided in Table 4. These qualified data are discussed below:

- All May 2015 groundwater chloride results (Table 4) were assigned a J flag because of low MS recovery. The MS result for chloride was 87.5% and was outside the 90-110% acceptance criteria per U.S. EPA Method 300. The J flag denotes the data is detected at the reported concentration, but the reported concentration is an estimate due to low MS recovery.

- For well USGS-065, the May 7, 2015, sample result for nitrite + nitrate as nitrogen (Table 4) was assigned a J flag because the required 48-hour hold time was exceeded. The actual hold time was approximately 121 hours. The J flag denotes the data is detected at the reported concentration, but the reported concentration is an estimate due to the exceeded holding time.

4.5 Water Table Information

Depth to water and water table elevations for the May and October sampling events are shown in Figure 4 and Figure 5, respectively. The elevations are presented in North American Vertical Datum of 1988 (NAVD 88). In addition, the figures show the inferred general groundwater flow direction in the vicinity of the ATR Complex. In this area, the flow is in a south to southwest direction. The general groundwater flow direction at the INL Site is to the southwest.

Table 4. Advanced Test Reactor Complex Cold Waste Ponds aquifer monitoring well data for the 2015 reporting year.

WELL NAME	USGS-098 (GW-16101)		USGS-065 (GW-16102)		USGS-076 (GW-16104)		TRA-08 (GW-16105)		Middle-1823 (GW-16106)		USGS-058 (GW-16107)		PCS/SCS[a]
Sample Date	05/06/15	10/13/15	05/07/15	10/14/15	05/06/15	10/13/15	05/07/15	10/14/15	05/06/15	10/13/15	05/07/15	10/14/15	
Water Table Depth (ft below ground surface)	426.66	427.54	475.91	477.19	484.45	485.51	489.77	490.83	494.16	495.32	472.51	473.5	NA[b]
Water Table Elevation (above mean sea level in ft)[c]	4460.2	4459.32	4452.61	4451.33	4448.76	4447.7	4448.66	4447.6	4448.71	4447.55	4449.38	4448.39	NA
Borehole Correction Factor (ft)[d]	2.58	2.58	NA	NA	NA	NA	0.63	0.63	NA	NA	NA	NA	NA
Nitrite + nitrate as nitrogen (mg/L)	0.99	0.96	1.46 J[e]	1.44	1	0.994	0.915	0.964	0.969	0.934 [0.947][f]	NR[g]	NR	NA
Total Kjeldahl nitrogen (mg/L)	0.165	0.1 U[h]	0.136	0.193	0.432	0.19	0.172	0.193	0.182	0.167 [0.171]	NR	NR	NA
Total nitrogen[i] (mg/L)	1.155	<1.06	1.596	1.633	1.432	1.184	1.087	1.157	1.151	1.101 [1.118]	NR	NR	NA
pH (s.u.)	8.15	8.01	8.15	8	8.13	7.9	8.33	8.1	8.12	7.96	NR	NR	6.5 to 8.5
Electrical conductivity (µS/cm)	384	409	594	604	426	414	424	435	418	435	NR	NR	NA
Chloride (mg/L)	14.2 J	14.9	19.3 J	19.8	13.1 J	13.4	11.7 J	12.3	11.6 J	11.8 [11.8]	NR	NR	250 (SCS)
Sulfate (mg/L)	21.6	21.4	145	157	34.2	35.3	43.4	47.7	35	35.6 [35.6]	34.4	34.9	250 (SCS)
Total dissolved solids (mg/L)	236	222	429	401	272	248	263	252	276	242 [246]	269	245	500 (SCS)
Aluminum, filtered (mg/L)	0.00389	0.005 U	0.0079	0.0163	0.00671	0.00752	0.0154	0.0093	0.00431	0.00555 [0.00511]	NR	NR	0.2 (SCS)
Chromium[j], total (mg/L)	0.149	0.0064	0.0706	0.0733	0.0108	0.0105	0.082	0.0345	0.0117	0.00923 [0.00957]	NR	NR	0.1 (PCS)
Chromium[j], filtered (mg/L)	0.0025 U	0.00544	0.0704	0.0729	0.00982	0.0105	0.0155	0.0175	0.00963	0.00950 [0.00964]	NR	NR	0.1 (PCS)
Iron, filtered (mg/L)	0.050 U	0.0578	0.050 U	0.0611	0.050 U	0.0544	0.050 U	0.0558	0.050 U	0.050 U [0.0556]	NR	NR	0.3 (SCS)
Manganese, filtered (mg/L)	0.00785	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U [0.0025 U]	NR	NR	0.05 (SCS)

a. Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in the Ground Water Quality Rule, IDAPA 58.01.11.200.01.a and b.

b. NA- Not applicable.

c. Elevation data provided using the North American Vertical Datum of 1988 (NAVD 88).

d. The United States Geological Survey performed gyroscopic surveys on Wells TRA-07 and TRA-08 circa 2002 to 2005. The surveys revealed these two wells were not perfectly straight or vertical which can cause the water level measurements to be greater than the true distance from the measuring point on the well to the water table. The water table elevations for these two wells have been adjusted using the borehole correction factors that were determined from the gyroscopic surveys.

e. J flag indicates the associated value is an estimate and may be inaccurate or imprecise. See Section 4.4 for additional discussion.

f. Results shown in brackets are the results from field duplicate samples.

g. NR indicates the parameter is not required by the Reuse Permit.

h. U flag indicates that the result was reported as below the instrument detection limit by the analytical laboratory.

i. Total nitrogen is calculated as the sum of the TKN, nitrite nitrogen, and nitrate nitrogen. For results reported below the instrument detection limit, the detection limit for that parameter is used in the calculation. The resulting total nitrogen is then reported as a less than (<) number.

j. In accordance with Reuse Permit I-161-02, Section 5.2.2, footnote a., compliance with the PCS for chromium, under the Reuse Permit, shall not apply.

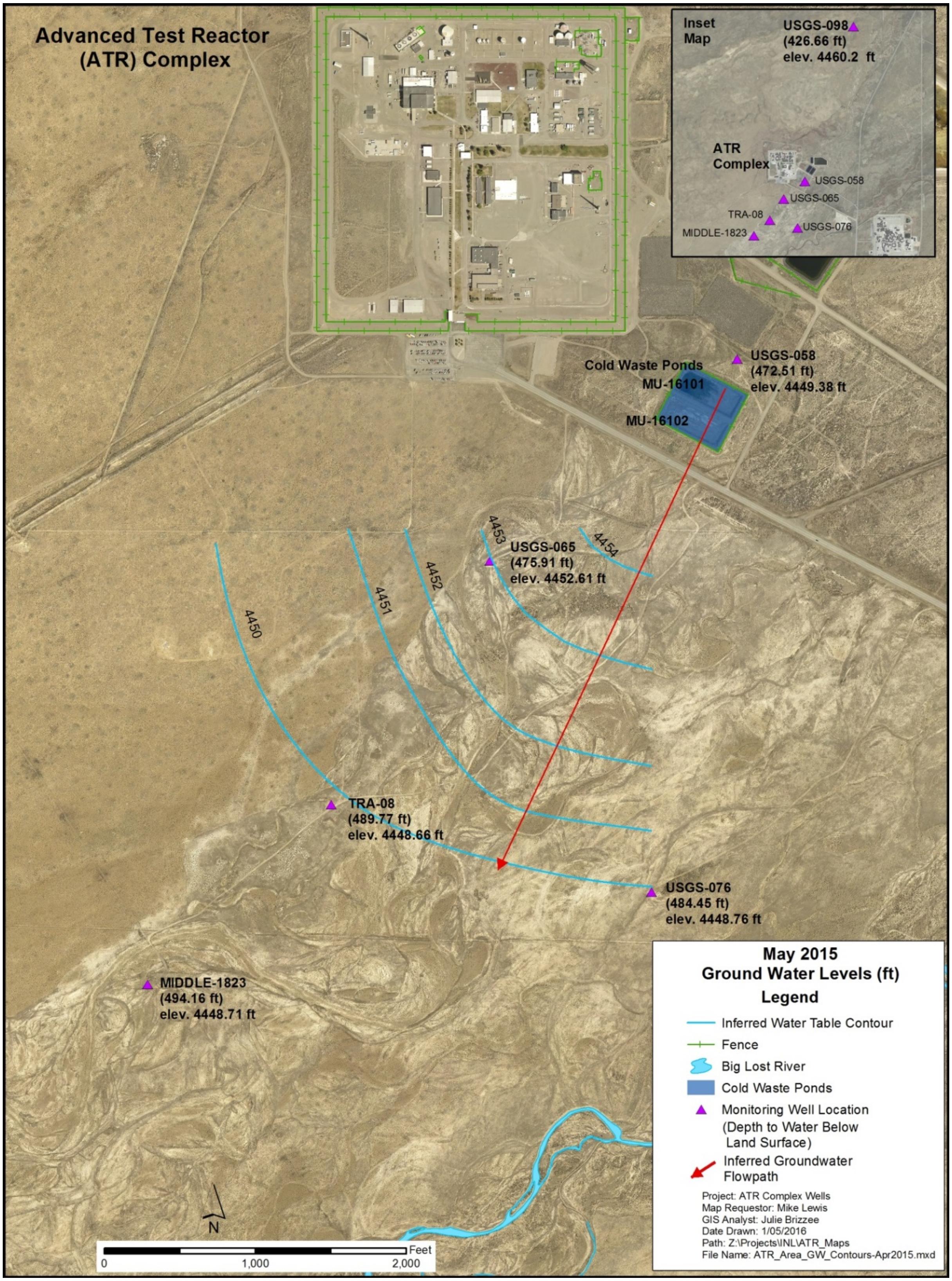

Figure 4. Groundwater contour map based on the May 2015 water level measurements.

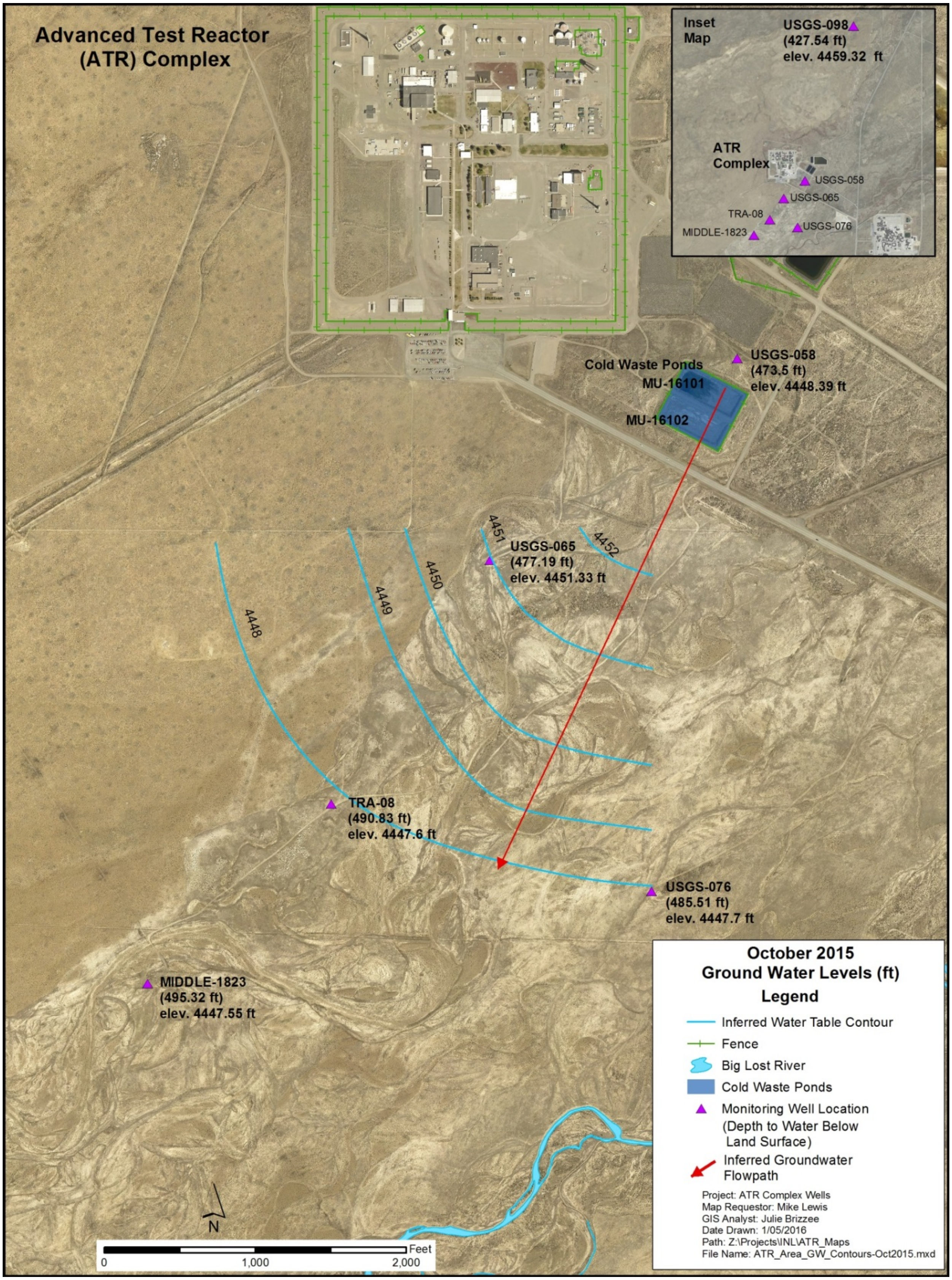

Figure 5. Groundwater contour map based on the October 2015 water level measurements.

5. PERMIT YEAR SUMMARIES

This section provides information and status associated with permit required compliance activities and noncompliance issues.

5.1 Status of Permit Required Compliance Activities

Section 3 of the Reuse Permit identifies four compliance activities (CA-161-01 through 04) discussed below:

CA-161-01 – Within 12 months of permit issuance, the permittee shall submit for review and approval a Plan of Operation (PO) that reflects current operations and incorporates the requirements of the Reuse Permit. The PO shall be updated as needed to reflect current operations. The permittee shall notify DEQ of material changes to the PO and copies shall be kept on site and made available to DEQ upon request.

The PO was submitted to DEQ on November 19, 2015 (Miller 2015b). Approval of the PO from DEQ has not been received.

CA-161-02 – Within 6 months of permit issuance, the permittee is required to prepare and implement a Quality Assurance Project Plan (QAPP) that incorporates all monitoring and reporting required by the permit. A copy of the QAPP and a written notice that the QAPP has been implemented shall be provided to DEQ.

A copy of the QAPP and the implementation notice were submitted to DEQ on May 18, 2015 (Miller 2015a).

CA-161-03 – Twelve months prior to permit expiration, the permittee shall contact DEQ and schedule a pre-application workshop to discuss the compliance status of the facility and the content required for the reuse permit application package.

This requirement has been added to the INL electronic Commitment Tracking System (CTS). This system provides automatic reminders to those responsible for completing the action. The first reminder date for this activity is May 18, 2018.

CA-161-04 – Six months prior to permit expiration the permittee shall submit to DEQ a complete permit renewal application package, which fulfills the requirements specified at the pre-application workshop identified in CA-161-03.

The first CTS reminder date for this activity is also May 18, 2018.

5.2 Noncompliance Issues

There were no permit noncompliance issues for the 2015 reporting year.

6. ENVIRONMENTAL IMPACTS

The Reuse Permit allows 300 MG/year as a 5-year annual average, not to exceed 375 MG annually. The total volume discharged to the CWP for this period (November 1, 2014–October 31, 2015) was 228.08 MG. No runoff occurred from the application area.

High-effluent concentrations of TSS have the potential to reduce the infiltration capacity of the soil. Historical concentrations of TSS have been at or near the laboratory instrument minimum detection level of 4 mg/L. Because of the consistently low levels of TSS in the effluent discharged to the CWP, the requirement to monitor this parameter was removed from the current Reuse Permit. Table 1 shows the November 2014 TSS sample result required by the previous permit as undetected at 4 mg/L. No negative impacts to the soil infiltration capacity from typical TSS loading are expected.

Total nitrogen concentrations in the effluent ranged between 0.932 mg/L in the October 2015 sample to 4.88 mg/L in the August 2015 sample (Tables 1 and 2). Nitrogen can be lost or removed from the soil by leaching, ammonia volatilization, and denitrification. Total nitrogen in the nearest downgradient well (USGS-065) from the CWP was 1.596 mg/L in the May 2015 sample and 1.633 mg/L in the October 2015 sample. The upgradient well (USGS-098) had TN concentrations in the May and October 2015 samples of 1.155 mg/L and less than 1.06 mg/L, respectively. The impact of TN on the groundwater from the CWP appears to be minimal.

Sulfate and TDS concentrations (Tables 1 and 2) in the effluent have the potential to impact groundwater. Sulfate has high solubility and tends to move at a similar velocity as the groundwater (DEQ 2007). Only 2015 sulfate and TDS concentrations are available for USGS-098 and USGS-058. Sampling wells USGS-098 and USGS-058 was not required by the previous permit.

Sulfate concentrations in the 2015 permit year effluent monthly samples ranged from a low of 19.8 mg/L in the September 2015 sample to a high of 661 mg/L in the August 2015 sample. The TDS effluent concentrations ranged from a low of 217 mg/L in the October 2015 sample to a high of 1,330 mg/L in the August 2015 sample. There are no Reuse Permit effluent limits for sulfate and TDS. However, as discussed below, there are groundwater quality standards for these two parameters.

Figures 6 and 7 show the sulfate and TDS concentrations in samples collected from the Reuse Permit CWP monitoring wells. Sulfate and TDS data were not available for Well TRA-08 for October 2009 due to insufficient water available to collect a representative sample. Where a duplicate sample was collected, the average of the original sample and the duplicate sample were used in generating the graphs.

Well USGS-065 has the highest sulfate concentrations of the six monitoring wells. Of the six wells, USGS-065 is the closest downgradient well to the CWP. As shown in Figure 6, the sulfate concentration in well USGS-065 has remained stable at approximately 160 mg/L and below the SCS of 250 mg/L.

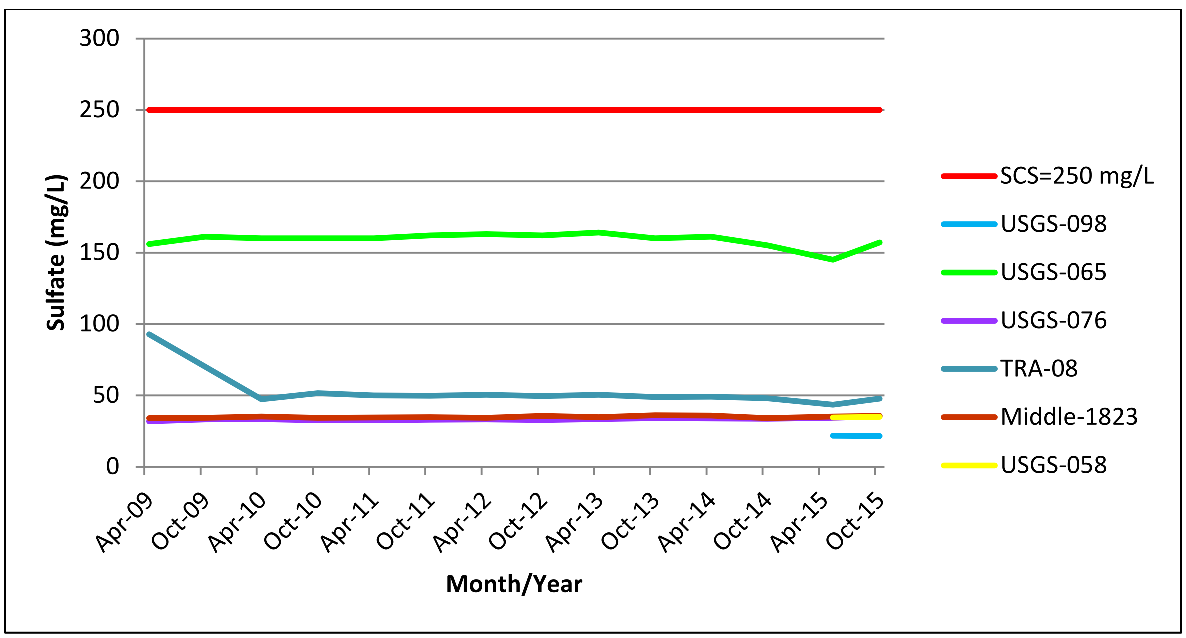

Figure 6. Sulfate concentrations in the Cold Waste Ponds monitoring wells.

Similar to sulfate, TDS concentrations was the highest in well USGS-065 (Figure 7). The highest TDS concentration in USGS-065 occurred in April 2012 at 471 mg/L. The TDS concentration in USGS-065 has remained below the SCS of 500 mg/L and has been relatively stable over the last 6 years.

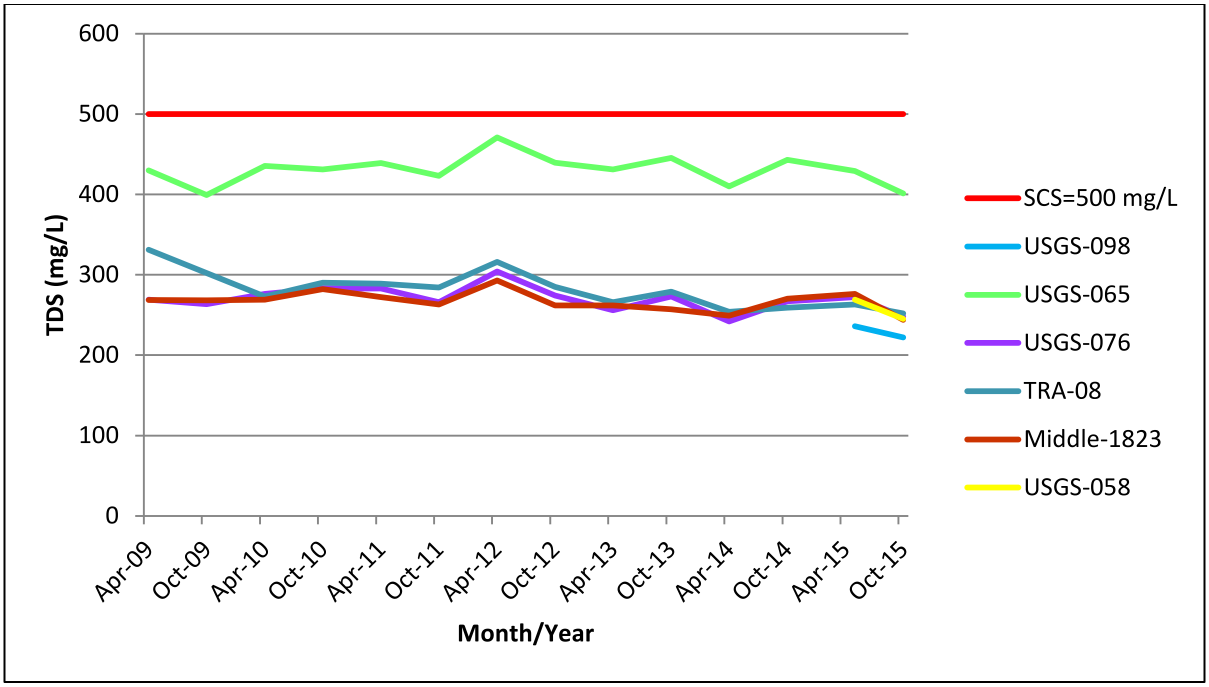

Figure 7. Total dissolved solids concentrations in the Cold Waste Ponds monitoring wells.

With the exception of USGS-065, sulfate and TDS concentrations in the groundwater wells (Figures 6 and 7) are only slightly elevated when compared to the concentrations in background well USGS-098. The sulfate and TDS quickly dissipate with distance from the ponds. This can be seen when comparing the 2015 permit year sulfate and TDS concentrations found in Wells USGS-065 and Middle-1823 (Figures 6 and 7). Well USGS-065, located approximately 1,200 ft downgradient of the CWP, had a maximum sulfate concentration of 157 mg/L and a TDS concentration of 429 mg/L. Well Middle-1823, located approximately 4,000 ft downgradient from the CWP, had maximum sulfate and TDS concentrations of 35.6 mg/L and 276 mg/L, respectively. The concentrations of sulfate and TDS in Well Middle-1823 are similar to the concentrations in the up/cross gradient Well USGS-076 (Figures 6 and 7).

As stated above, sulfate and TDS have SCSs for groundwater quality. The SCSs are generally based on aesthetic qualities including odor, taste, color, and foaming (EPA 1992). Sulfate is listed for causing a "salty taste" in drinking water. Total dissolved solids are listed for "hardness, deposits, colored water, staining, and salty taste." The nearest drinking water well is located approximately 3 miles downgradient of the CWP. Because the higher levels of sulfate and TDS are localized near the CWP and their SCSs are based on aesthetics, impacts to human health and the environment are expected to be minimal.

With the exception of total chromium in the May 2015 sample collected from upgradient monitoring well USGS-098, permit required groundwater sample results for aluminum, chromium, iron, and manganese, in wells USGS-065, USGS-076, TRA-08, and Middle-1823, were significantly lower than the applicable PCS or SCS (Table 4).

The May 2015 total chromium sample result from well USGS-098 was 0.149 mg/L and above the PCS 0.1 mg/L. The May 2015 filtered chromium sample result from USGS-098 was reported as below the laboratory instrument's minimum detection level at 0.0025 mg/L. Both the total and filtered chromium results of 0.0064 mg/L and 0.00544 mg/L, respectively, from samples collected in October 2015 from USGS-098 were significantly lower than the PCS. Because well USGS-098 is an upgradient well, there should be no impact on chromium concentrations in the groundwater from the CWP. In addition, the chromium concentrations in the CWP effluent are significantly lower than the chromium

PCS. The high total chromium sample result from well USGS-098 may have been an anomaly. Future chromium sample results from this well will be evaluated.

There are positive impacts to the environment associated with the operation of the CWP. These include returning a significant portion of the industrial wastewater to the aquifer and providing needed water for several native animal species in an otherwise semi-arid environment.

7. REFERENCES

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Appendix A

Daily Discharge Volumes to the Advanced Test Reactor Complex Cold Waste Ponds

Appendix A

Daily Discharge Volumes to the Advanced Test Reactor Complex Cold Waste Ponds

Table A-1. Daily discharge volumes to the ATR Complex CWP for the 2015 permit year.

Date	North Pond (gal)	South Pond (gal)	Date	North Pond (gal)	South Pond (gal)
11/01/14	OOS	802,550	12/10/14	OOS	732,400
11/02/14	OOS	772,210	12/11/14	OOS	824,800
11/03/14	OOS	825,230	12/12/14	OOS	784,200
11/04/14	OOS	754,360	12/13/14	OOS	754,470
11/05/14	OOS	806,670	12/14/14	OOS	776,180
11/06/14	OOS	698,170	12/15/14	OOS	857,730
11/07/14	OOS	876,790	12/16/14	OOS	741,430
11/08/14	OOS	769,760	12/17/14	OOS	826,700
11/09/14	OOS	840,860	12/18/14	OOS	804,060
11/10/14	OOS	701,750	12/19/14	OOS	755,640
11/11/14	OOS	840,280	12/20/14	OOS	792,600
11/12/14	OOS	724,790	12/21/14	OOS	837,540
11/13/14	OOS	827,700	12/22/14	OOS	788,100
11/14/14	OOS	955,400	12/23/14	OOS	827,140
11/15/14	OOS	817,050	12/24/14	OOS	816,250
11/16/14	OOS	728,500	12/25/14	OOS	770,200
11/17/14	OOS	916,140	12/26/14	OOS	866,500
11/18/14	OOS	669,490	12/27/14	OOS	749,000
11/19/14	OOS	818,480	12/28/14	OOS	774,000
11/20/14	OOS	777,780	12/29/14	OOS	860,920
11/21/14	OOS	841,100	12/30/14	OOS	719,600
11/22/14	OOS	777,900	12/31/14	OOS	911,370
11/23/14	OOS	746,500	01/01/15	OOS	796,620
11/24/14	OOS	796,610	01/02/15	OOS	731,380
11/25/14	OOS	814,210	01/03/15	OOS	873,670
11/26/14	OOS	799,810	01/04/15	OOS	898,350
11/27/14	OOS	744,260	01/05/15	OOS	591,600
11/28/14	OOS	887,460	01/06/15	OOS	816,900
11/29/14	OOS	788,720	01/07/15	OOS	888,340
11/30/14	OOS	808,780	01/08/15	OOS	777,060
12/01/14	OOS	740,010	01/09/15	OOS	799,300
12/02/14	OOS	800,700	01/10/15	OOS	844,540
12/03/14	OOS	826,530	01/11/15	OOS	789,860
12/04/14	OOS	797,450	01/12/15	OOS	790,200
12/05/14	OOS	814,870	01/13/15	OOS	836,810
12/06/14	OOS	882,430	01/14/15	OOS	814,890
12/07/14	OOS	804,190	01/15/15	OOS	818,000
12/08/14	OOS	794,620	01/16/15	OOS	833,900
12/09/14	OOS	823,260	01/17/15	OOS	698,000

Date	North Pond (gal)	South Pond (gal)
01/18/15	OOS	816,280
01/19/15	OOS	784,020
01/20/15	OOS	811,190
01/21/15	OOS	859,430
01/22/15	OOS	768,780
01/23/15	OOS	869,300
01/24/15	OOS	831,300
01/25/15	OOS	725,700
01/26/15	OOS	841,300
01/27/15	OOS	849,000
01/28/15	OOS	860,000
01/29/15	OOS	871,810
01/30/15	OOS	848,790
01/31/15	OOS	825,550
02/01/15	OOS	916,240
02/02/15	715,910	OOS
02/03/15	868,200	OOS
02/04/15	795,900	OOS
02/05/15	876,700	OOS
02/06/15	848,810	OOS
02/07/15	699,810	OOS
02/08/15	868,510	OOS
02/09/15	547,020	OOS
02/10/15	343,450	OOS
02/11/15	382,960	OOS
02/12/15	347,640	OOS
02/13/15	371,370	OOS
02/14/15	420,530	OOS
02/15/15	923,190	OOS
02/16/15	904,570	OOS
02/17/15	911,280	OOS
02/18/15	892,300	OOS
02/19/15	913,210	OOS
02/20/15	943,000	OOS
02/21/15	808,900	OOS
02/22/15	836,050	OOS
02/23/15	890,000	OOS
02/24/15	901,230	OOS
02/25/15	879,820	OOS
02/26/15	932,290	OOS
02/27/15	956,380	OOS
02/28/15	769,260	OOS
03/01/15	1,016,620	OOS
03/02/15	722,250	OOS
03/03/15	868,770	OOS
03/04/15	743,280	OOS

Date	North Pond (gal)	South Pond (gal)
03/05/15	921,350	OOS
03/06/15	957,720	OOS
03/07/15	937,760	OOS
03/08/15	1,135,890	OOS
03/09/15	850,470	OOS
03/10/15	OOS	659,560
03/11/15	OOS	430,050
03/12/15	OOS	417,780
03/13/15	OOS	479,220
03/14/15	OOS	433,900
03/15/15	OOS	388,800
03/16/15	OOS	426,200
03/17/15	OOS	462,670
03/18/15	OOS	460,490
03/19/15	OOS	431,870
03/20/15	OOS	440,870
03/21/15	OOS	435,000
03/22/15	OOS	449,560
03/23/15	OOS	412,680
03/24/15	OOS	434,110
03/25/15	OOS	452,330
03/26/15	OOS	412,300
03/27/15	OOS	568,020
03/28/15	OOS	327,210
03/29/15	OOS	509,560
03/30/15	OOS	372,350
03/31/15	OOS	398,580
04/01/15	OOS	456,700
04/02/15	OOS	462,100
04/03/15	424,550	OOS
04/04/15	449,690	OOS
04/05/15	427,450	OOS
04/06/15	477,330	OOS
04/07/15	430,980	OOS
04/08/15	515,670	OOS
04/09/15	425,200	OOS
04/10/15	483,000	OOS
04/11/15	456,400	OOS
04/12/15	422,700	OOS
04/13/15	459,540	OOS
04/14/15	429,470	OOS
04/15/15	433,820	OOS
04/16/15	446,810	OOS
04/17/15	482,600	OOS
04/18/15	351,100	OOS
04/19/15	430,950	OOS

Date	North Pond (gal)	South Pond (gal)
04/20/15	436,740	OOS
04/21/15	445,540	OOS
04/22/15	439,600	OOS
04/23/15	517,280	OOS
04/24/15	403,250	OOS
04/25/15	481,240	OOS
04/26/15	538,300	OOS
04/27/15	346,270	OOS
04/28/15	544,600	OOS
04/29/15	412,420	OOS
04/30/15	549,500	OOS
05/01/15	OOS	546,190
05/02/15	OOS	547,390
05/03/15	OOS	586,810
05/04/15	OOS	569,430
05/05/15	OOS	558,980
05/06/15	OOS	616,000
05/07/15	OOS	625,400
05/08/15	OOS	610,200
05/09/15	OOS	573,000
05/10/15	OOS	679,800
05/11/15	OOS	840,160
05/12/15	OOS	711,830
05/13/15	OOS	752,760
05/14/15	OOS	821,000
05/15/15	OOS	638,550
05/16/15	OOS	786,850
05/17/15	OOS	735,510
05/18/15	OOS	755,540
05/19/15	OOS	764,150
05/20/15	OOS	787,000
05/21/15	OOS	811,550
05/22/15	OOS	798,240
05/23/15	OOS	758,360
05/24/15	OOS	752,290
05/25/15	OOS	706,760
05/26/15	OOS	736,850
05/27/15	OOS	918,230
05/28/15	OOS	698,600
05/29/15	OOS	619,880
05/30/15	OOS	315,490
05/31/15	OOS	289,540
06/01/15	OOS	303,700
06/02/15	OOS	440,170
06/03/15	OOS	417,040
06/04/15	OOS	492,970

Date	North Pond (gal)	South Pond (gal)
06/05/15	OOS	338,480
06/06/15	OOS	438,200
06/07/15	OOS	419,600
06/08/15	OOS	435,400
06/09/15	OOS	426,300
06/10/15	OOS	518,910
06/11/15	OOS	380,700
06/12/15	OOS	443,400
06/13/15	OOS	441,400
06/14/15	OOS	408,910
06/15/15	OOS	427,000
06/16/15	OOS	415,480
06/17/15	OOS	526,700
06/18/15	OOS	352,160
06/19/15	OOS	421,920
06/20/15	OOS	456,020
06/21/15	OOS	402,700
06/22/15	OOS	433,250
06/23/15	OOS	432,460
06/24/15	OOS	384,790
06/25/15	OOS	456,500
06/26/15	OOS	494,210
06/27/15	OOS	377,100
06/28/15	OOS	455,190
06/29/15	OOS	467,950
06/30/15	OOS	435,510
07/01/15	410,840	OOS
07/02/15	490,800	OOS
07/03/15	407,360	OOS
07/04/15	403,200	OOS
07/05/15	447,660	OOS
07/06/15	431,780	OOS
07/07/15	476,970	OOS
07/08/15	408,760	OOS
07/09/15	454,360	OOS
07/10/15	427,010	OOS
07/11/15	424,300	OOS
07/12/15	434,900	OOS
07/13/15	481,600	OOS
07/14/15	401,850	OOS
07/15/15	423,390	OOS
07/16/15	514,700	OOS
07/17/15	477,750	OOS
07/18/15	427,100	OOS
07/19/15	431,410	OOS
07/20/15	457,570	OOS

Date	North Pond (gal)	South Pond (gal)
07/21/15	485,230	OOS
07/22/15	420,700	OOS
07/23/15	689,950	OOS
07/24/15	687,350	OOS
07/25/15	756,560	OOS
07/26/15	739,360	OOS
07/27/15	602,560	OOS
07/28/15	603,880	OOS
07/29/15	636,570	OOS
07/30/15	674,500	OOS
07/31/15	731,900	OOS
08/01/15	OOS	622,900
08/02/15	OOS	723,570
08/03/15	OOS	574,540
08/04/15	OOS	474,160
08/05/15	OOS	574,060
08/06/15	OOS	445,030
08/07/15	OOS	182,700
08/08/15	OOS	181,700
08/09/15	OOS	234,260
08/10/15	OOS	272,700
08/11/15	OOS	355,230
08/12/15	OOS	696,920
08/13/15	OOS	568,560
08/14/15	OOS	407,140
08/15/15	OOS	567,250
08/16/15	OOS	526,420
08/17/15	OOS	514,940
08/18/15	OOS	574,090
08/19/15	OOS	595,650
08/20/15	OOS	523,350
08/21/15	OOS	610,250
08/22/15	OOS	661,350
08/23/15	OOS	591,300
08/24/15	OOS	667,450
08/25/15	OOS	543,370
08/26/15	OOS	608,980
08/27/15	OOS	731,200
08/28/15	OOS	651,800
08/29/15	OOS	642,500
08/30/15	OOS	493,480
08/31/15	OOS	630,820
09/01/15	OOS	670,030
09/02/15	551,900	OOS
09/03/15	645,100	OOS
09/04/15	616,470	OOS
09/05/15	599,500	OOS
09/06/15	635,000	OOS
09/07/15	572,220	OOS
09/08/15	634,980	OOS
09/09/15	644,290	OOS
09/10/15	565,550	OOS
09/11/15	899,730	OOS
09/12/15	650,000	OOS
09/13/15	600,610	OOS
09/14/15	593,620	OOS
09/15/15	590,170	OOS
09/16/15	559,830	OOS
09/17/15	645,000	OOS
09/18/15	617,800	OOS
09/19/15	488,250	OOS
09/20/15	506,790	OOS
09/21/15	551,600	OOS
09/22/15	490,490	OOS
09/23/15	590,760	OOS
09/24/15	542,310	OOS
09/25/15	398,250	OOS
09/26/15	457,750	OOS
09/27/15	555,480	OOS
09/28/15	464,050	OOS
09/29/15	573,390	OOS
09/30/15	525,780	OOS
10/01/15	OOS	500,400
10/02/15	OOS	602,300
10/03/15	OOS	537,300
10/04/15	OOS	532,100
10/05/15	OOS	530,900
10/06/15	OOS	545,700
10/07/15	OOS	562,070
10/08/15	OOS	595,930
10/09/15	OOS	540,040
10/10/15	OOS	615,430
10/11/15	OOS	520,830
10/12/15	OOS	623,530
10/13/15	OOS	612,260
10/14/15	OOS	574,510
10/15/15	OOS	564,300
10/16/15	OOS	694,500
10/17/15	OOS	510,000
10/18/15	OOS	618,560
10/19/15	OOS	640,480
10/20/15	OOS	545,460

Date	North Pond (gal)	South Pond (gal)
10/21/15	OOS	614,190
10/22/15	OOS	634,500
10/23/15	OOS	515,800
10/24/15	OOS	547,900
10/25/15	OOS	521,300
10/26/15	OOS	558,280

Date	North Pond (gal)	South Pond (gal)
10/27/15	OOS	575,940
10/28/15	OOS	549,010
10/29/15	OOS	494,190
10/30/15	OOS	562,130
10/31/15	OOS	592,020
a. OOS indicates pond was out of service.		