June 25, 2013

MEMORANDUM

TO: Erick Neher, Regional Administrator, IFRO.
Greg Eager, PE, Regional Engineering Manager, IFRO.

FROM: Jennifer Wester, PE, Staff Engineer, TS
Tom Rackow, PE, Staff Engineer, IFRO.

RE: I-161-02 INL Advanced Test Reactor Complex (ATR) Cold Waste Pond (CWP), Staff Analysis.

Introduction

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400.04 for issuing Wastewater Reuse Permits. It states the principal facts and significant questions considered in preparing the draft permit conditions and provides a summary of the basis for the draft permit. The analysis references applicable requirements and supporting materials as appropriate.

A wastewater reuse permit renewal application for the INL Advanced Test Reactor Complex Cold Waste Pond was submitted to DEQ by the Idaho National Laboratory (INL) in August 2012 to facilitate the renewal of the current wastewater land application permit LA-000161-01, which expires February 25, 2013. A history of the permit renewal process is as follows:

- The current permit, LA-000161-01, was issued to INL on February 26, 2008.
- LA-000161-01 Modification "B" was issued to INL on August 20, 2008 to recognize the facility name change from "Reactor Technology Complex (RTC)" to "Advanced Test Reactor Complex (ATR Complex)."
- A permit renewal pre-application meeting between INL and DEQ was held on March 8, 2012 to initiate the permit renewal process and to discuss possible changes to INL's operation as well as potential changes to the new permit.
- A permit renewal application package was submitted to DEQ by INL on August 21, 2012 and contained both a technical report as well as a 'red-lined' copy of the current permit showing INL's proposed changes for the new permit.
- The permit application was determined by DEQ to be substantially complete on October 12, 2012 with a projected schedule to issue the final permit by February 25, 2013.

I. Site Location and Ownership

The Advanced Test Reactor (ATR) Complex Cold Waste Pond (CWP) is located on the restricted access Idaho National Laboratory (INL) Site. The INL Site is a federal government-owned, contractor-operated facility managed by the Department of Energy's Idaho Operations Office. Battelle Energy Alliance, LLC (BEA) is the current INL management and operating contractor responsible for operating the ATR Complex. For reference, the facility was also known previously as both the Test Reactor Area (TRA) and the Reactor Technology Complex (RTC).

II. Process Description

The ATR Complex has separate drains and wastewater systems for warm waste, hot waste, sewage, and cold waste. The wastewater discharged to the Cold Waste Ponds consists primarily of non-contact cooling tower blowdown water with additional volume from once-through cooling water for air conditioning units, compressors, secondary system drains and other non-radioactive drains throughout the ATR Complex. The Advanced Test Reactor secondary cooling system removes heat from the primary water loops through heat exchangers. The secondary cooling system heated water is circulated through a cooling tower to dissipate the heat. The water in the secondary cooling system is recirculated multiple times. About half of the water evaporates and the other half becomes the blowdown sent to the Cold Waste Ponds. The chemicals used as corrosion inhibitors and biocides in the cooling system are primarily magnesium-, sodium-, potassium-, phosphorus-, or sulfate-based products (INL, 2012b).

All cold waste effluent is sent through collection piping to the TRA-764 Cold Waste Sample Pit where the flow rate is recorded and grab samples are collected for water chemistry analysis. The wastewater then flows through screens to the TRA-703 Cold Waste Sump Pit where it is pumped to one of the two Cold Waste Ponds.

The CWP is comprised of two identical unlined cells, each 180 feet by 430 feet across the top of the berms, with a depth of 10 feet. The total surface area of the CWP is approximately 3.55 acres (1.775 acres/cell) and the maximum combined capacity of both cells is approximately 10.2 million gallons (MG). Typically only one cell is used at a time, although both can be used at once. Wastewater enters through the concrete inlet basin near the west end of each cell and generally percolates into the porous ground within a short distance. The entire floor of the cell is rarely submerged, but if the water level rises above 5 feet in either cell, flow is diverted to the other cell. A 24-inch overflow pipe connects the two cells near the top of the center berm between the cells (INL, 2012b).

The application states in the recent past, flow to each basin has been rotated on an annual basis. That type of operation results in more of a 'disposal' system rather than a final 'treatment' system. In order to qualify as a rapid infiltration treatment-based system, the basins must be operated using designed periods of wetting and drying

cycles at set frequencies to provide for both anaerobic and aerobic treatment of the wastewater through the vadose zone. IDAPA 58.01.17.200.31.

According to the permit application, in the event of a power loss, emergency diesel generator power is available. The Cold Waste Sump Pit pumps can be operated manually in "Hand Mode", if necessary, to bypass the float switches in the sump. And in the unlikely event of radiological contamination of the cold wastewater, the wastewater can be pumped to the Warm Waste Evaporation Lagoons through the use of portable submersible pumps placed into manholes. The shear gate in manhole MH-22C can be closed to prevent further discharge into the Cold Waste Sump Pit, allowing the submersible pumps to transfer all flow to the Warm Waste Evaporative Lagoons. The facility does not have a formal contingency to divert non-radiological wastewater if it cannot be sent to the CWP. Past efforts included diverting cold waste water to the ATR Complex sanitary sewer manholes where possible and short term reductions in wastewater generation where possible (INL, 2012b).

III. Site Characteristics

A. Site Management History

The ATR Complex Cold Waste Ponds have been managed as an above-ground disposal system for non-radiologically contaminated wastewater since constructed in 1982 when operation of the TRA Disposal Well ceased. The application states the Cold Waste Ponds were built to provide some degree of wastewater treatment through the vadose zone and to segregate cold wastewater from radiologically-contaminated (warm) wastewater (INL, 2012b).

B. Ground Water Contamination History

The application states all existing release sites at the INL site have been evaluated under the Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) and the Federal Facility Agreement and Consent Order (FFA/CO). Remedial investigations, feasibility studies, and Records of Decision (ROD's) are complete for every portion of the INL site, and response actions are either complete or ongoing. The ATR Complex is designated as Waste Area Group (WAG) 2. Release sites under WAG 2 are rolled up under Operable Unit (OU) 2-13.

Release sites noted in the application for the ATR Complex include wastewater holding ponds, percolation ponds, underground storage tanks, rubble piles, cooling towers, injection wells, French drains, and assorted spill sites. WAG 2 includes three main sources of contamination: 1) contaminants injected directly into the aquifer at the TRA Disposal Well, 2) contaminated perched water derived from one shallow injection well and several wastewater ponds, and 3) contaminated surface and near-surface soils and pond sediments. The principle CERCLA contaminants noted in the application for the ATR Complex include chromium, tritium, Sr-90, Co-60, and fuel hydrocarbons.

According to the application, the TRA Disposal Well, USGS-053 Disposal Well, Warm Waste Pond, Chemical Waste Pond, and Sewage Leach Pond were responsible

for much of the perched water and ground water contamination at TRA. All of them have been removed from service. Use of the TRA Disposal Well ceased in 1972. Discharges to the USGS-053 disposal well were discontinued in 1964. A new, lined evaporation pond replaced the Warm Waste Pond in 1993. The Chemical Waste Pond, used as an infiltration pond for effluent containing mineral salts from the ATR demineralization plant, was removed from service in 1982. And the Sewage Leach Ponds (2 cells) were removed from service in 1995. Capping of the Warm Waste, Chemical Waste and Sewage Leach ponds was completed in 1999. The only 'disposal' or leaching pond remaining at the ATR Complex are the Cold Waste Ponds under consideration for this permit renewal (INL, 2012b).

C. Climatic Characteristics

The climatic characteristics of the ATR Complex CWP site are typical of the high-desert characteristics of the surrounding area and are described in detail in the permit application. Climate data from is summarized in Section 4.3 of the permit application as follows:

- Average annual precipitation of 8.71 inches.
- Minimum monthly precipitation of 0.00 inches.
- Maximum monthly precipitation of 5 inches.
- Average summer (June – August) temperature of 64.8 degrees F.
- Average winter (December – February) temperature of 18.8 deg. F.
- Average annual snowfall of 27.6 inches, with a low of 6.8 inches.
- Minimum average annual relative humidity of 27 percent.
- Maximum average annual relative humidity of 79 percent.
- Winds generally out of the southwest.

D. Soils

Soil types down to 55 feet below land surface are described in detail in Section 4.4 of the permit application and are categorized as well- to poorly-graded, sandy gravel to gravelly sand with minor amounts of silt and clay. No specific soil survey map is available for the ATR Complex site, but the general area map shows site soils as Typic Camborhids and Typic Calciorthids. The high infiltrative capacity indicated by the identified soils is conducive to the high infiltration rates of the Cold Waste Ponds.

E. Surface Water

The nearest surface water is the Big Lost River, approximately 4,480 feet southeast of the ATR Complex security fence. INL flood plain studies estimate a peak flood elevation (for a 100-year flood) of 4,918 feet above mean sea level (MSL). Undisturbed ground surface elevation at the CWP is approximately 4,920 feet MSL with the berm top elevation at approximately 4,927 feet MSL. Therefore the ATR Complex CWP is considered to be outside the hypothetical floodplain. There are no perennial streams on the INL site (INL, 2012b).

F. Ground Water Hydrogeology and Quality

The Eastern Snake River Plain Aquifer (ESRPA) underlies the INL. The ESRPA at the ATR Complex is approximately 480 feet below ground surface and flows to the

south-southwest, away from the ATR Complex facilities. The four public water supply wells that serve ATR are located in the northeast corner of the complex and up-gradient of the CWP

The application states two perched water zones formed at ATR primarily in response to infiltration of disposed wastewater to unlined ponds (Cold Waste, Warm Waste, Chemical Waste, and Sewage Leaching ponds), of which only the Cold Waste Ponds remain.

Since constructed in 1982, the Cold Waste Ponds have been the largest contributor to the perched water zones. Water level trends in perched water monitoring wells correspond directly to the disposal rates to the CWP. Water levels for the deep perched layer show the highest perched water levels are around the southeast corner of ATR near the CWP. The principal source of perched water in this area is the recharge from the CWP. Deep perched water levels have declined by 5-16 feet from 2003 to 2010 and several of the perched monitoring wells are now frequently dry (INL, 2012b).

The shallow perched zone formed on a layer of fine grained sediments at the alluvium-basalt interface at about 50 feet deep. Eleven wells were installed but most of the wells have experienced episodic wetting and drying since 1990 and are no longer sampled as part of the CERCLA OU 2-13 monitoring program (INL, 2012b).

The deep perched zone is approximately 70-190 feet deep. It is elongated in a northwest-to-southeast direction and has a broad, flat top with steeply sloping flanks. Water levels and water quality in the deep perched zone are currently monitored by CERCLA under the OU 2-13 monitoring program (INL, 2012b). Review of the 2012 Ground Water Monitoring Status Report for Waste Area Group 2 (INL, 2012c) show the deep perched wells are monitored for chromium, gamma-emitting isotopes, strontium-90, tritium, diesel range organics, and gasoline range organics. The CERCLA OU2-13 monitoring program does not sample or monitor the perched water for the primary components being discharged into it (TDS, sulfates and other salts) by the CWP, even though those compounds are regulated by Idaho's Ground Water Quality Rule, IDAPA 58.01.11. However, the deep perched water is localized under ATR and drains into to the regional aquifer, which is sampled and monitored for the major constituents in the CWP effluent to determine compliance with the Ground Water Quality Rule. The localized perched water zone is not expanding, does not vary seasonally, does not have any existing or projected future beneficial uses and does not appear to threaten public health or safety. Therefore, sampling the perched zone is not necessary at this time. The deep perched zone drains into the regional aquifer up gradient of the monitoring wells required in the reuse permit. Sampling and monitoring the regional aquifer quality using the current monitoring wells down gradient of the facility is sufficient to evaluate ground water impacts and determine compliance with the Ground Water Quality Rule.

The regional Eastern Snake River Plain (ESRP) aquifer is approximately 480 feet deep and generally flows in a southwesterly direction. The deep perched water drains into the regional aquifer over a diffuse area and does not cause mounding of the aquifer. The effluent draining into the aquifer is rapidly diluted due to the relatively high (4.3 ft/day) conductivity of the ESRP. The aquifer thickness in the ATR Complex area is estimated to be about 300 feet deep. The water surface begins at about 480 feet below ground and extends to about 750 feet below ground (INL, 2012b).

The current permit LA-000161-01 requires aquifer monitoring in five down-gradient regional aquifer monitoring wells. The wells are identified as USGS-065 (GW-016102), TRA-07 (GW-016103), USGS-076 (GW-016104), TRA-08 (GW-016105), and Middle-1823 (GW-016106). All five wells have dedicated pump locations and screen intervals appropriately positioned to sample the uppermost portion of the aquifer.

The permit application only compares ground water monitoring results to the primary or secondary constituent standards (i.e. 'MCL's) which is an incomplete analysis that cannot be used to determine compliance with the Ground Water Quality Rule. The rule also requires analysis and evaluation of ground water degradation even if it doesn't exceed a numerical standard (i.e. a parameter shows major increases over background water quality while remaining below the numerical standard). Ground water degradation, even if below the numerical standards in the rule, can be a violation and must be evaluated to determine compliance with IDAPA 58.01.11.

Graphs of the ground water monitoring results from the previous permit cycle are attached to the end of this analysis for review. The data collected under the current reuse permit show the regional aquifer in the localized area under the CWP is impacted by salts (TDS and sulfates). Wells TRA-07 and USGS-065 show approximately a 70% increase in TDS and a 300% increase in sulfate concentrations above the local aquifer background levels. Figures 1 and 2 show the TDS and sulfate impacts, respectively. The salt impacts in TRA-07 and USGS-065 show that these wells are within the localized 'plume' created by the CWP discharge and the impacts dissipate back to background levels by the time the ground water reaches the down-gradient boundary well Middle-1823 (GW-016106). While the concentrations are high within the localized impact 'plume', the sulfate and TDS concentrations in TRA-07 and USGS-065 also seem to be holding steady at around 160 mg/L and 440 mg/L, respectively, and do not appear to be trending up or down. Provided operations do not increase salt loading to the CWP, ground water quality within the discharge plume is not expected to exceed the secondary constituent standards for sulfate (250 mg/L) or TDS (500 mg/L). Because there are no users of the aquifer between the CWP and the down gradient boundary monitoring well Middle-1823 – where the regional aquifer returns to background concentrations – beneficial uses and public health do not appear to be impacted by the salt loading. The sulfate plume presented in the permit application is shown in Figure 3. Although not provided in the permit application, the shape and extent of the TDS plume is presumed to be similar.

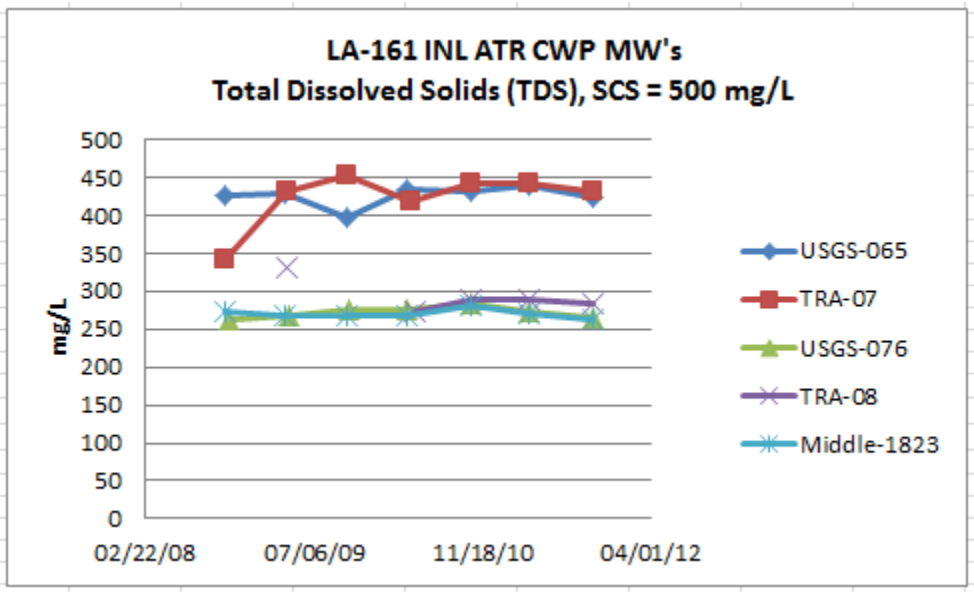


Figure 1. Ground water Total Dissolved Solids concentrations in regional aquifer monitoring wells. Neither the permit application nor the annual reports provide explanation why the October 2008 TDS concentration in TRA-07 is unusually low, although the 2008 annual report does mention abnormally high purging volume in TRA-07 in October 2008.

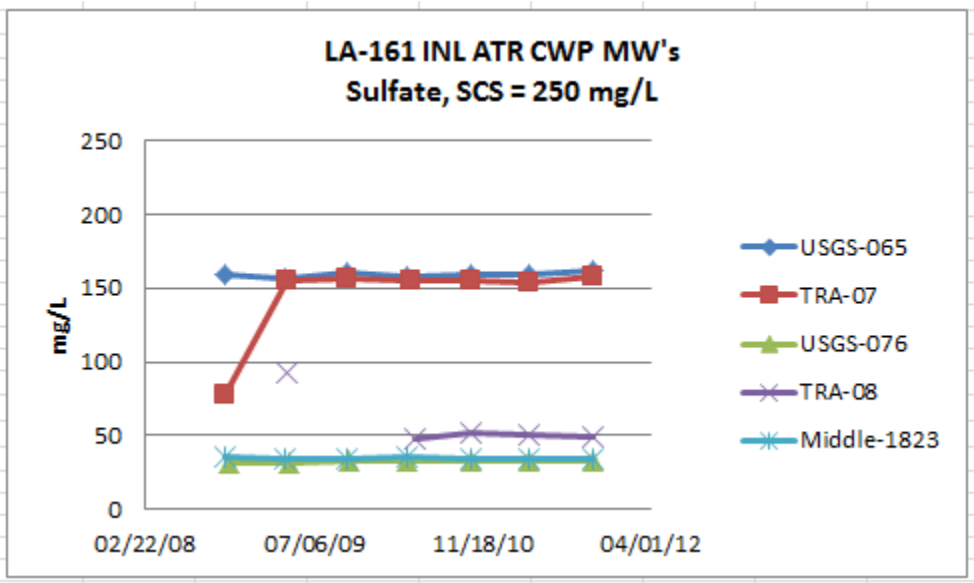


Figure 2. Ground Water Sulfate concentrations in regional aquifer monitoring wells. The unusually low sulfate value in TRA-07 from October 2008 is also unexplained by the applicant as discussed in Figure 1.

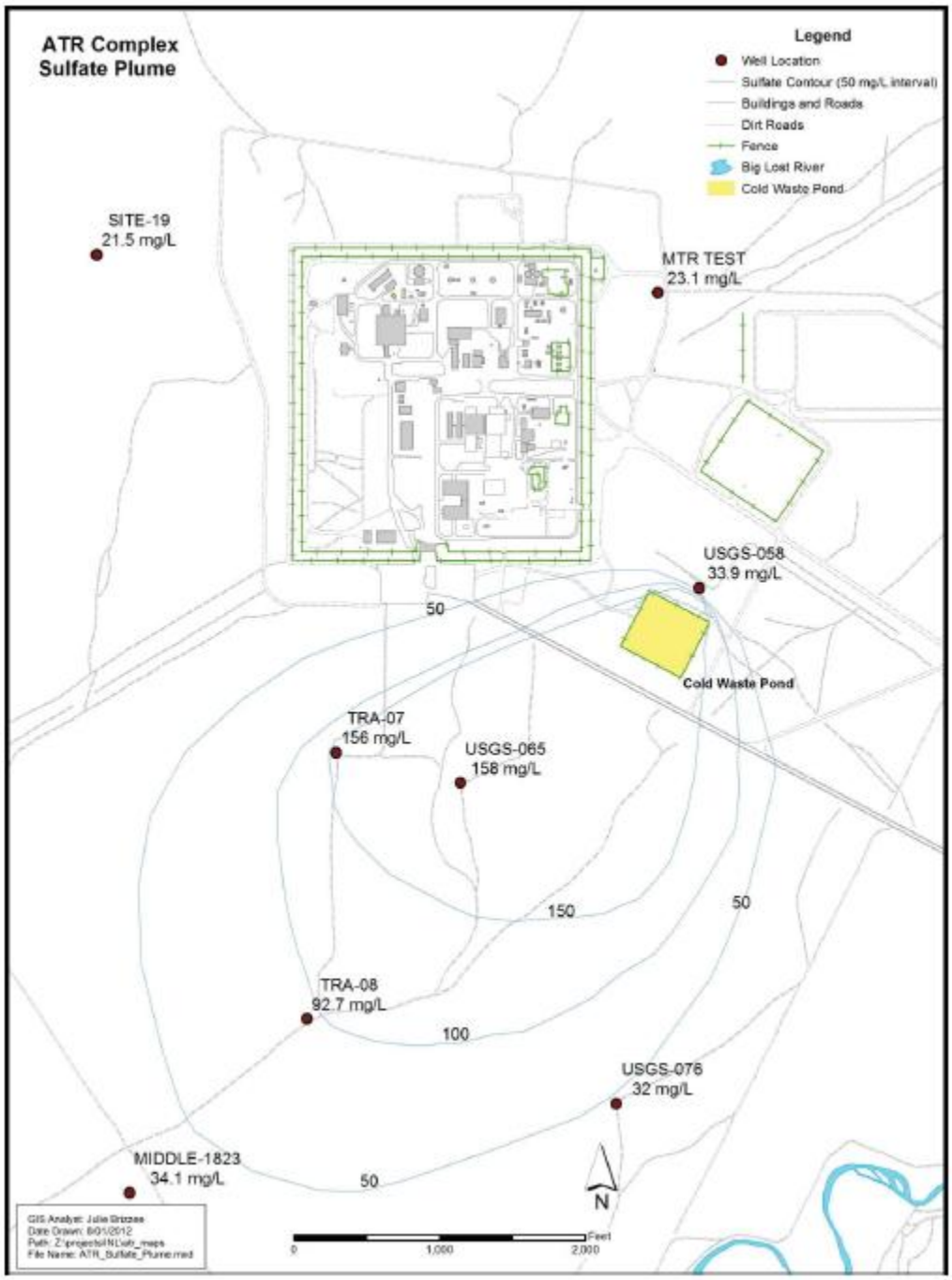


Figure 3. Sulfate 'plume' in the regional aquifer down gradient of the Cold Waste Ponds (INL, 2012b, Figure 6-3).

As shown in Figure 4, pH values from the ground water monitoring data provided during the previous permit cycle show that ground water pH slightly increased from around 7.8-7.9 in 2008 to around 8.1 by 2010 in all regional monitoring wells except TRA-08, which appears to have decreased from about 8.4 in 2009 to 8.1 by 2010. A cursory review of monitoring well pH values at other wastewater reuse facilities at

INL may indicate a similar increasing trend over the same time period, even in up gradient wells unaffected by INL operations. It is perhaps a natural phenomenon occurring in the aquifer that staff are unable to explain at this time. The data set is too limited to draw many conclusions, but it appears ground water pH values have stabilized since 2010 at about 8.1. The draft permit will continue monitoring ground water pH.

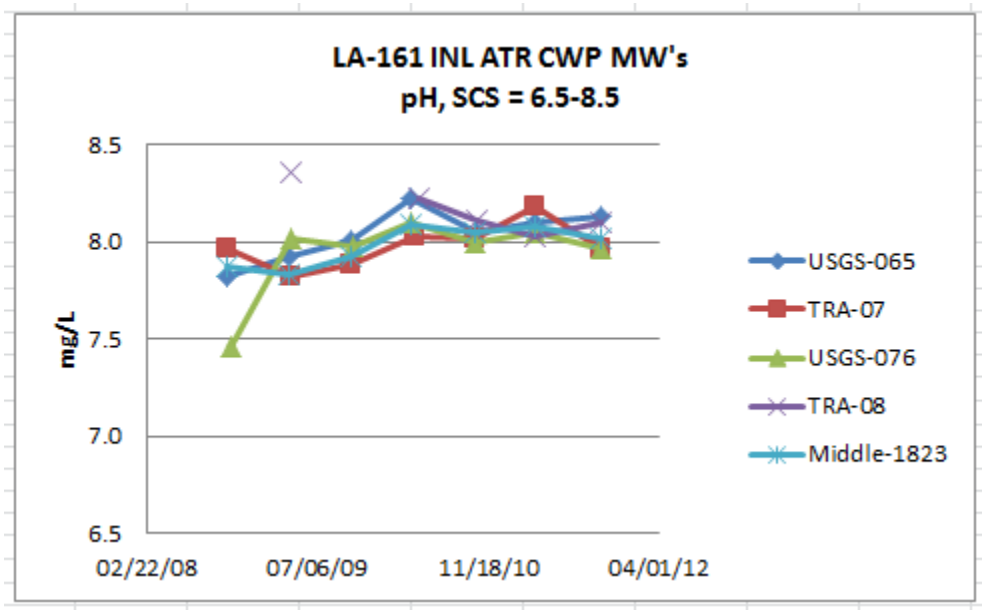


Figure 4. Ground water pH in regional aquifer monitoring wells.

The permit renewal application (INL, 2012b) identifies chromium as one of the principal CERCLA ground water contaminants at the ATR Complex, primarily caused by the historical discharges described above (injection wells and other discharge ponds). Although the current reuse permit did not require ground water monitoring for chromium, the permit application provides a brief discussion on its status. INL's 2012 Ground Water Monitoring Status Report for Waste Area Group 2 (INL, 2012c) also provides an evaluation of current chromium impacts to the regional aquifer. The following discussion is based on Section 2.2 of that status report: chromium was detected in all aquifer samples, but filtered chromium concentrations were "below the EPA-defined MCL of 100 ug/L in all wells." The report does not compare the well concentrations to the aquifer background levels to determine if the impacts are significant and possibly in violation of Idaho's Ground Water Quality Rule, even if below the 'MCL'. Further review indicates the highest chromium concentration in the regional aquifer was 750 ug/L in monitoring well USGS-065 in January 1974. Total chromium concentrations still exceed Idaho's primary constituent standard of 100 ug/L specified in IDAPA 58.01.11. Filtered chromium concentrations have steadily decreased over time and are now less than 100 ug/L as shown in Figure 5. Note that the filtered concentration of just under 100 ug/L represents a significant impact above the aquifer background concentration of 2-3 ug/L in this area. Some limited data reviewed for monitoring well USGS-098,

upgradient of the ATR Complex show the up gradient 'background' concentration for total (unfiltered) chromium to be around 6 ug/L.

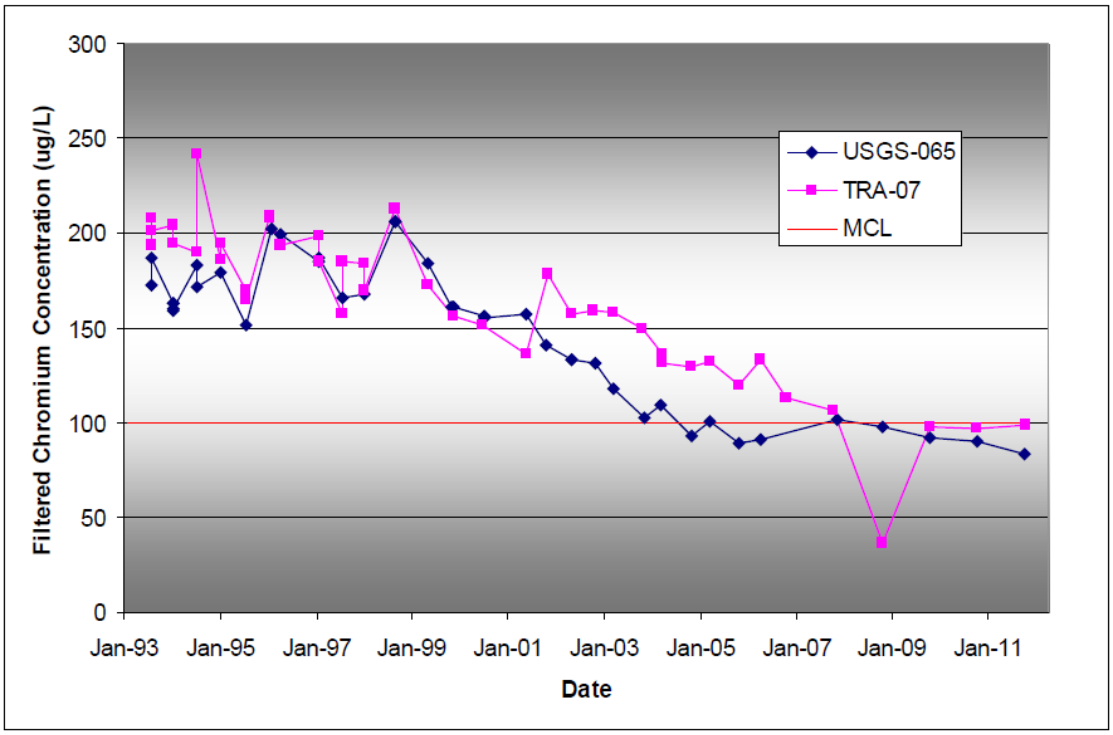


Figure 5. Filtered chromium results in regional aquifer wells at ATR Complex (INL, 2012c, Figure 2-10).

Chromium is still present in the CWP wastewater being discharged to the aquifer. But it appears much of the chromium impacts to the perched and regional aquifer were caused by historical operations of injection wells and various disposal ponds that have since been closed and removed from service. However, since chromium is still present in the CWP effluent, albeit at low concentrations, and since the CWP discharge remains as the largest source still hydraulically contributing to the perched water and contributing to the movement of chromium through the deep perched zone and into the regional aquifer, staff recommend that ground water chromium concentration be added to the list of monitoring parameters for the next permit cycle.

Unfiltered aluminum, iron, and manganese impacts also occur in monitoring wells TRA-07 and TRA-08. Filtered results for all three parameters are generally very low or non-detect as shown in the graphs attached to the end of this memorandum. The application states that the low concentrations of Al, Fe, and Mn in samples collected from the CWP effluent indicate that discharges to the CWP are not expected to be the direct cause of the high Al, Fe, and Mn in wells TRA-07 and TRA-08, and the higher concentrations in the wells are likely due to suspended solids found within the wells (INL, 2012b). Although this is a possibility, hydraulic 'overloading' of the soil profile or vadose zone can also contribute to secondary contamination of ground water. As stated in DEQ's reuse guidance manual (DEQ, 2007), excessive hydraulic

loading coupled with low temperatures limits microbial oxidation and causes accumulation of COD in the soil profile. The rise of soil temperatures during spring thaws with high soil COD levels may cause reducing conditions to develop in the soil, causing a reduction of iron and manganese (and aluminum) in the soil to mobile forms that can leach. The ATR Complex Cold Waste Ponds are not currently operated as a rapid infiltration treatment system with cycles of wetting and drying periods designed to maintain aerobic conditions under each pond to avoid the reducing conditions that mobilize Al, Fe, and Mn. Rather, the CWP has historically been operated as a percolation system where one pond is operated for an extended period of time (1 year or more) before switching to the other cell. This extended operation completely saturates the 'drainage' zone under the pond and might be creating the anaerobic, reducing conditions that are mobilizing the metals. So it is quite possible that the method of operation of the CWP is creating the Al, Fe and Mn impacts in ground water, even though the effluent concentrations are low. Staff recommend that the new permit continue the practice approved by DEQ in 2010 allowing the facility to collect and present filtered results for Al, Fe, and Mn as compliance samples in accordance with IDAPA 58.01.11.400.05.d. Staff also recommend that the facility design and develop frequencies for wetting and drying periods in each basin to provide for both anaerobic and aerobic treatment of the wastewater through the vadose zone as a BMP to help reduce iron, manganese, and aluminum impacts to the aquifer. The operational frequencies for switching hydraulic loading between basins, to achieve the optimum wetting and drying frequencies, should be addressed in the facility's updated Plan of Operation.

In summary, salts and chromium appear to be the primary constituents of concern that are impacting the regional aquifer at the ATR complex. However, the impacts subside and return to background levels at the down gradient monitoring wells specified in the reuse permit for the ATR Cold Waste Ponds. Although salt concentrations for TDS and sulfate are elevated within the plume, they do not appear to be increasing (or decreasing) and are not expected to exceed the secondary constituent standards specified in IDAPA 58.01.11.200.01.b. Although the corrosion inhibitors include potassium and phosphorus-based compounds – in addition to SO_4 – there are no ground water standards for P or K, so staff recommend the new permit continue to track only sulfates and TDS. Analyzing for TDS in essence captures the other inorganic salts.

IV. Wastewater Loading Rates and Characterization

A. Hydraulic Loading Rate

Wastewater at the ATR CWP is discharged year-round. Annual and 5-yr moving average flows are shown in Figure 6. The annual discharge volumes to the CWP have ranged from 143 million gallons (MG) in 1992 to a maximum of 318 MG in 2004. The 1982-2011 annual average hydraulic loading is 213 MG/yr, with the 5-year rolling average reaching a maximum of 253 MG in 2005 The current permit specifies an annual hydraulic loading limit of 300 million gallons (MG) as a five-year average with no single year exceeding 375 MG. The rolling average and peak limits were specified in the previous permit because, as stated in the facility's 2006 and

2012 permit renewal applications, fluctuations in facility operations may require increased discharges ranging up to a maximum of 380 MG/year, and there is no capacity for storage in the cold waste system. Therefore, to avoid unnecessary permit violations, both peak and rolling average loading limits were established. As shown in Figure 6, wastewater loading to the CWP remains significantly less than the permit limit. The 2012 permit application proposes to maintain the existing permit loading limits; therefore, no changes are recommended for the hydraulic loading rate limit in the new permit. Staff recommend that the new permit clarify that data from 2008-2012 annual reports provided under LA-000161-01will be used to calculate compliance with the 5-year moving average during the next permit cycle under permit I-161-02.

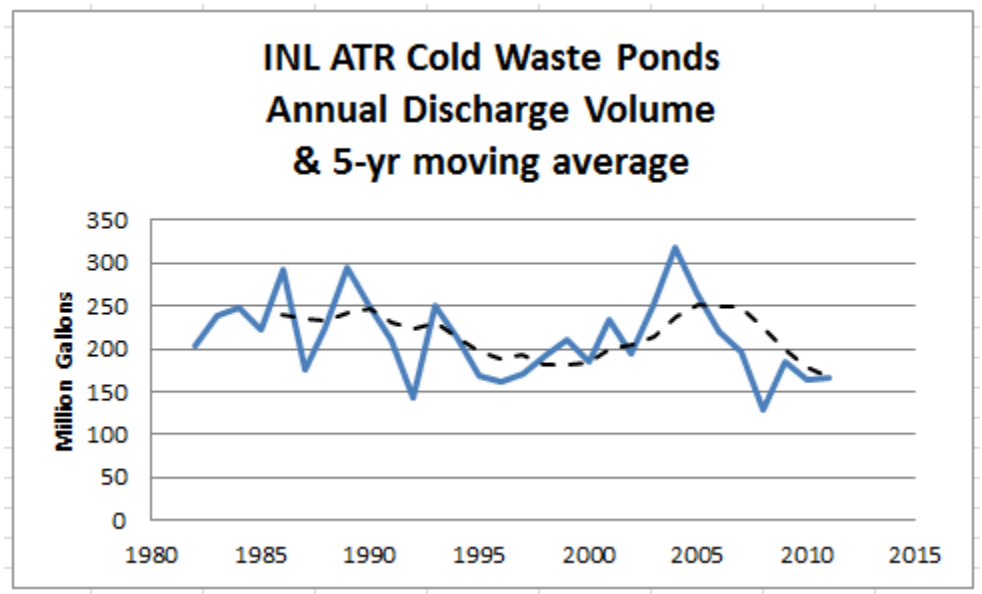


Figure 6. Discharge volumes to the INL ATR Cold Waste Ponds.

B. Wastewater Characterization

Wastewater sources discharged to the ATR Cold Waste Ponds include non-contact cooling tower blowdown, with some contribution from once-through cooling water for air conditioning units, compressors, secondary system drains, and other non-radiological drains. Annual average constituent concentrations from 2008 – 2011 are shown in Table 1.

Table 1. Annual Average Wastewater Effluent Quality for ATR CWP.

Constituent (mg/L unless specified)	2008[a]	2009	2010	2011	Overall Average
Nitrate+Nitrite	2.31	1.94	2.05	1.63	1.98
TKN	0.352	0.352	0.319	0.29	0.328
TN	2.67	2.29	2.37	1.92	2.31
TSS	ND	ND	4.23[c]	ND	4.05
TDS	667[b]	640	693	546	636.5
Chloride	25.9	22.4	23.7	23.3	23.8
Electrical Conductivity (µS/cm)	1001	834	862	787	871
Arsenic	0.0055[c]	0.0048[c]	0.0054[c]	0.0051[c]	0.0052[c]
Barium	0.114	0.098	0.101	0.084	0.099
Cadmium	ND	ND	ND	ND	ND
Chromium	0.0071	0.0066	0.0064	0.0057	0.0064
Cobalt	ND	ND	ND	ND	ND
Copper	0.0032[c]	0.0029[c]	0.0021[c]	0.0036[c]	0.0030[c]
Fluoride	0.374	0.335	0.329	0.285	0.331
Iron	0.087[c]	0.0579[c]	0.0692[c]	0.092[c]	0.0765[c]
Manganese	0.0035[c]	0.0026[c]	ND	0.0033[c]	0.0030[c]
Mercury	ND	ND	ND	ND	ND
Selenium	0.0032	0.0026	0.0028	0.0023	0.0027
Silver	ND	ND	ND	ND	ND
Sulfate	359	280	315	202	289

[a] 2008 is a partial year for all constituents since permit was issued February 26, 2008 and first sample collected in March.
[b] 2008 TDS data is for March and April only due to incorrect sample preservation and data rejection.
c The method detection limit value was used in the averages for non-detect (ND) samples.

As Table 1 shows, effluent concentrations remain quite low with the exception of TDS and sulfate. Graphs of the wastewater chloride, chromium, nitrate+nitrite, sulfate, and TDS concentrations are shown in Figures 7 through 11, respectively.

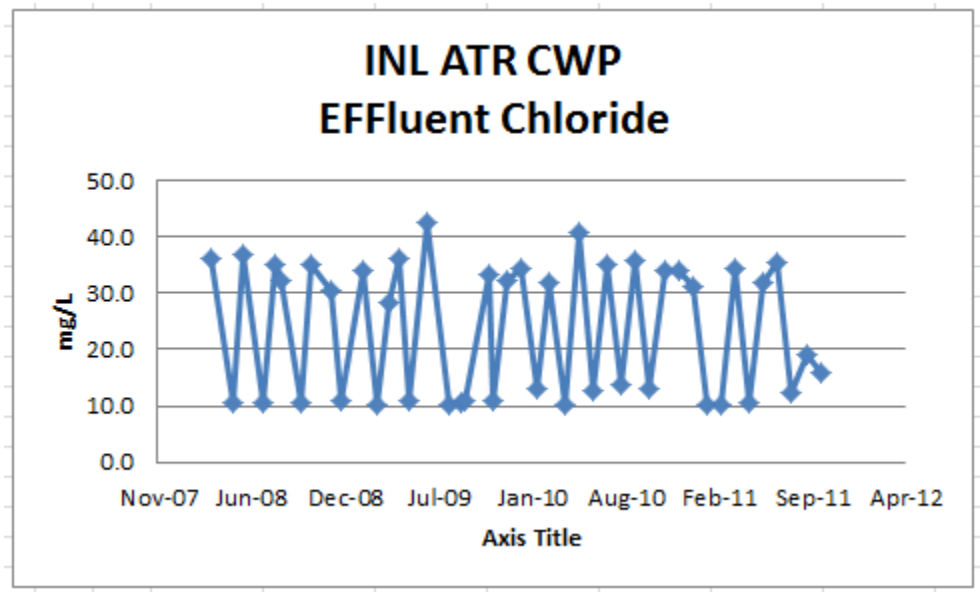


Figure 7. Wastewater chloride concentrations.

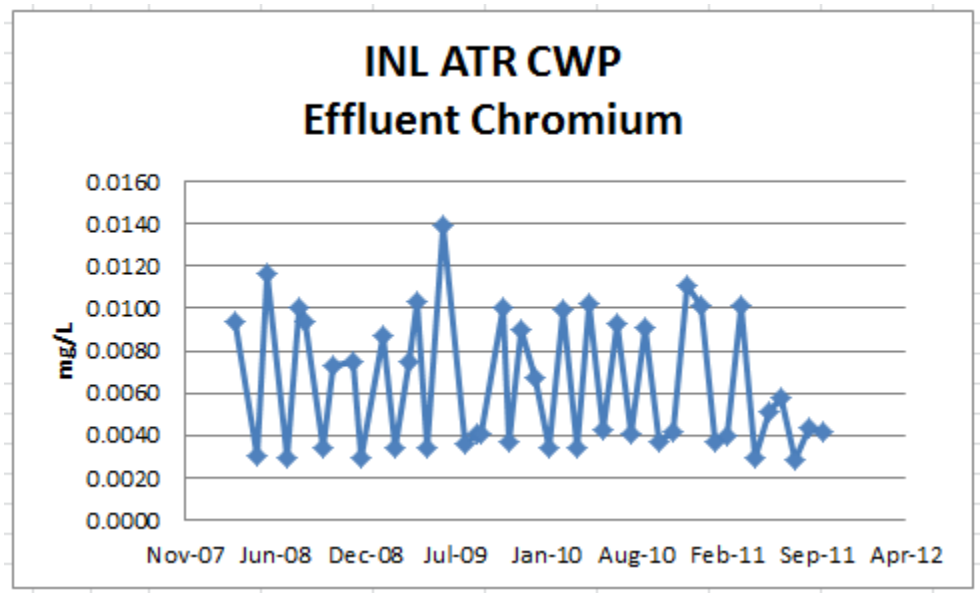


Figure 8. Wastewater chromium concentrations.

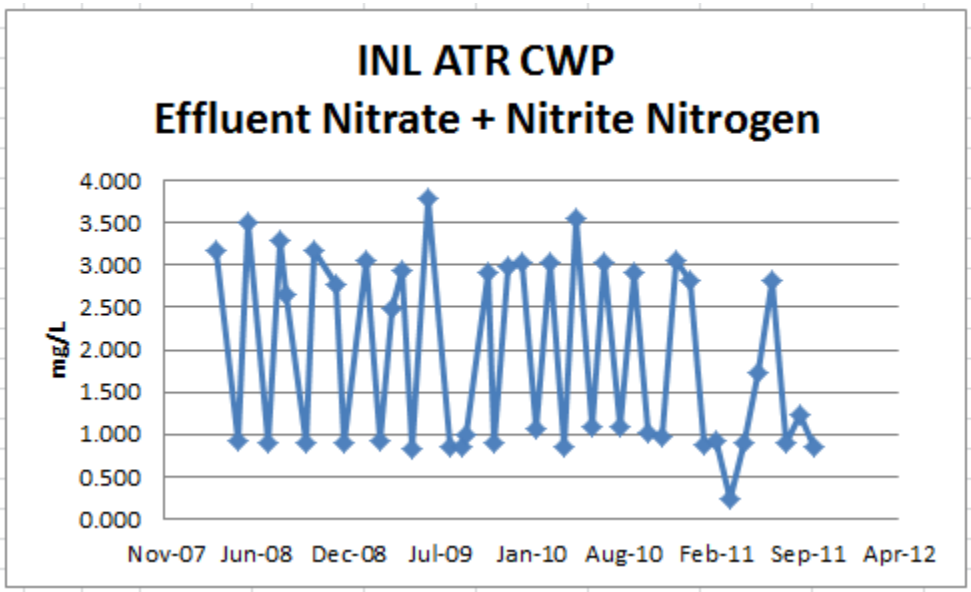


Figure 9. Wastewater nitrogen concentrations.

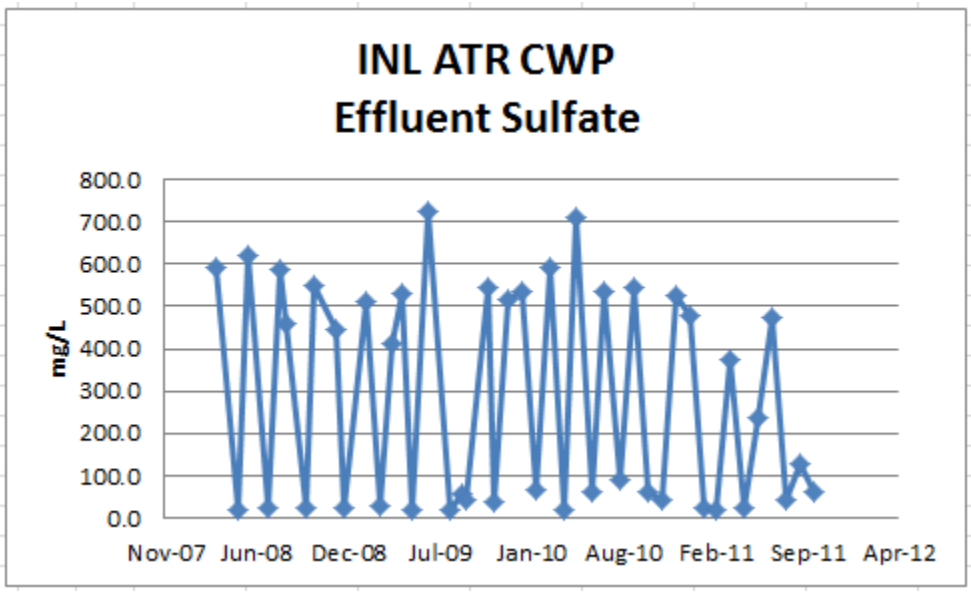


Figure 10. Wastewater sulfate concentrations.

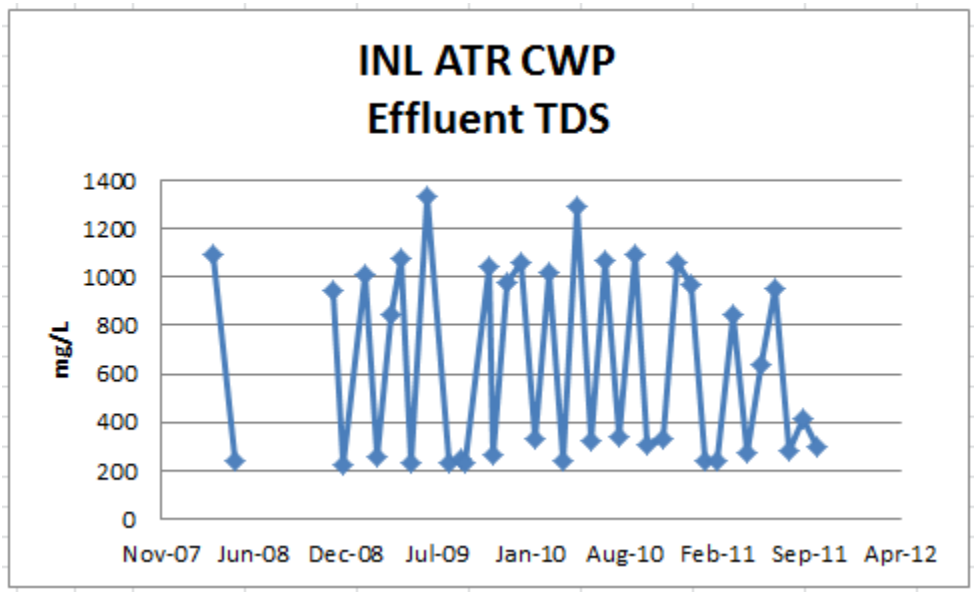


Figure 11. Wastewater TDS concentrations.

The wastewater charts above show the monthly variability that is directly related to flow rates through the cooling tower system. When the discharge volume is high, the constituent concentrations are lower in most cases. This is expected in a batch-process operation such as the ATR Complex secondary cooling system, which contributes the majority of effluent to the CWP. When the cooling tower is not operating, approximately half of the water in the system evaporates which concentrates the salts. Conversely, when the cooling system is running, large amounts of water are used and concentrations decrease from dilution (INL, 2012b). This concept is represented very well in INL's permit application and shown in Figure 12.

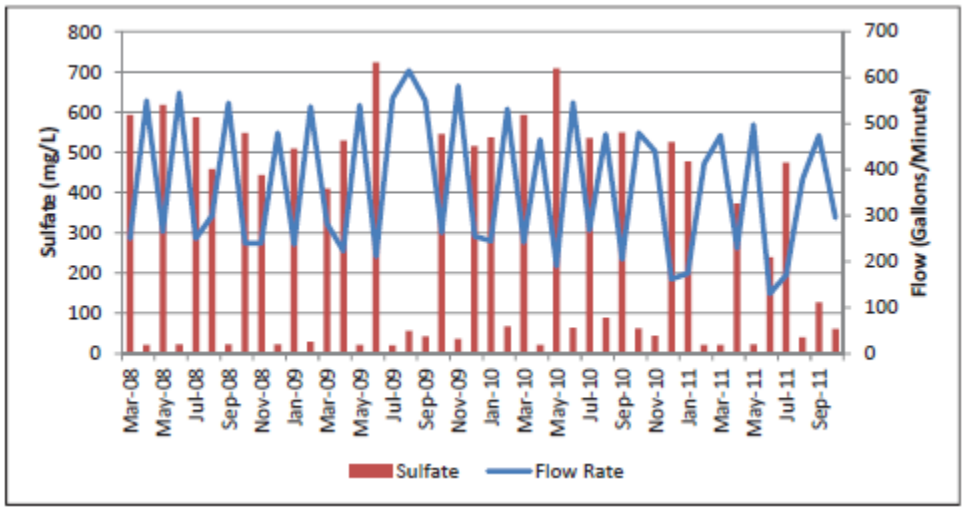


Figure 12. Monthly wastewater sulfate concentrations in relation to the flow rate to the Cold Waste Ponds (INL, 2012b, Figure 7-3).

Numerous constituents monitored during the previous permit cycle are at very low or non-detect values as shown in Table 2. DEQ recommends discontinuing wastewater monitoring for the following constituents in the new permit: antimony, arsenic, barium, cadmium, cobalt, copper, fluoride, mercury, selenium, and silver.

LA-000161-01 included Maximum Effluent Concentration Limits of 100 mg/L for TSS and 20 mg/L for total nitrogen because the wastewater reuse regulations in effect during that permit cycle required them. The numerical limits for TSS and nitrogen have been removed from IDAPA 58.01.17 and DEQ recommends removing both concentration limits in the new permit. Disinfection is not required and infiltration rates through the bottom of the CWP remain adequate, so there is no need for a TSS effluent limit. Likewise, total nitrogen concentrations in the effluent and impacts to ground water are both low, so a numerical effluent limit is not necessary at this time.

Table 2. Wastewater quality[1] to the INL ATR Cold Waste Ponds, 2008-2011.

Wastewater Quality to Land Application Site																					
Date	WW (MG)	NNN (mg/L)	TKN (mg/L)	Total N (mg/L)	TSS (mg/L)	TDS (mg/L)	Chloride (mg/L)	E.C. (uS/cm)	Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Fluoride (mg/L)	Iron, total (mg/L)	Manganese, total (mg/L)	Mercury (mg/L)	Selenium (mg/L)	Silver (mg/L)	Sulfate (mg/L)
Mar-08	21.410	3.180	0.244	3.424	-4.0	1090	36.1	1300	0.0069	0.1680	-0.001	0.0094	-0.0025	0.0050	0.499	0.1850	0.0073	-0.0002	0.00480	-0.010	593.0
Apr-08	22.830	0.919	0.320	1.239	-4.0	244	10.6	624	-0.0050	0.0483	-0.001	0.0030	-0.0025	0.0014	0.186	-0.0500	-0.0025	-0.0002	0.00110	-0.005	21.2
May-08	10.990	3.500	0.371	3.871	-4.0		36.9	1400	0.0057	0.1630	-0.001	0.0116	-0.0025	0.0047	0.499	0.2250	0.0056	-0.0002	0.00440	-0.005	618.0
Jun-08	14.570	0.909	0.330	1.239	-4.0		10.6	544	-0.0050	0.0482	-0.001	0.0029	-0.0025	0.0011	0.186	-0.0025	-0.0025	-0.0002	0.00120	-0.005	22.2
Jul-08	14.600	3.280	0.424	3.704	-4.0		35.0	1291	0.0063	0.1470	-0.001	0.0100	-0.0025	0.0020	0.495	0.0777	-0.0025	-0.0002	0.00440	-0.005	586.0
Aug-08	14.220	2.650	0.338	2.988	-4.0		32.1	1142	-0.0050	0.1390	-0.001	0.0094	-0.0025	0.0064	0.452	0.0639	-0.0025	-0.0002	0.00400	-0.005	458.0
Sep-08	14.730	0.899	0.376	1.275	-4.0		10.7	453	-0.0050	0.0499	-0.001	0.0034	-0.0025	-0.0010	0.184	-0.0250	-0.0025	-0.0002	0.00120	-0.005	22.6
Oct-08	14.500	3.180	0.410	3.590	-4.0		35.1	1257	-0.0050	0.1510	-0.001	0.0073	-0.0025	0.0042	0.491	0.0416	-0.0025	-0.0002	0.00440	-0.005	548.0
Nov-08	12.020	2.780	0.376	3.156	-4.0	944	30.6	1293	0.0051	0.1300	-0.001	0.0075	-0.0025	0.0020	0.421	-0.0500	-0.0025	-0.0002	0.00390	-0.005	444.0
Dec-08	17.910	0.900	0.160	1.060	-4.0	226	11.0	405	-0.0025	0.0492	-0.001	0.0029	-0.0025	-0.0010	0.177	-0.0250	-0.0025	-0.0002	0.00100	-0.005	23.0
Jan-09	11.240	3.050	0.367	3.417	-4.0	1010	33.9	1289	0.0055	0.1430	-0.001	0.0087	-0.0025	0.0037	0.476	0.0324	-0.0025	-0.0002	0.00430	-0.005	510.0
Feb-09	12.720	0.914	0.168	1.082	-4.0	259	10.3	488	-0.0050	0.0493	-0.001	0.0034	-0.0025	-0.0010	0.184	-0.0250	-0.0025	-0.0002	0.00096	-0.005	28.7
Mar-09	16.170	2.480	0.364	2.844	-4.0	847	28.2	1054	-0.0050	0.1260	-0.001	0.0075	-0.0025	0.0034	0.401	0.0297	-0.0025	-0.0002	0.00250	-0.005	410.0
Apr-09	13.150	2.930	0.364	3.294	-4.0	1080	36.0	1149	-0.0050	0.1530	-0.001	0.0103	-0.0025	0.0048	0.476	0.0398	-0.0025	-0.0002	0.00380	-0.005	529.0
May-09	14.720	0.833	0.244	1.077	-4.0	236	10.8	416	-0.0025	0.0470	-0.001	0.0034	-0.0025	-0.0010	0.130	-0.0250	-0.0025	-0.0002	0.00095	-0.005	21.5
Jun-09	10.730	3.790	0.501	4.290	-4.0	1330	42.6	1418	0.0073	0.1930	-0.001	0.0139	-0.0025	0.0076	0.639	0.0902	0.0026	-0.0002	0.00590	-0.005	724.0
Jul-09	24.310	0.859	0.309	1.168	-4.0	234	10.3	393	-0.0050	0.0474	-0.001	0.0036	-0.0025	-0.0010	0.193	-0.0250	-0.0025	-0.0002	0.00120	-0.003	20.4
Aug-09	23.790	0.843	0.424	1.267	-4.0	248	10.6	414	-0.0050	0.0497	-0.001	0.0041	-0.0025	0.0023	0.206	0.1820	-0.0025	-0.0002	0.00110	-0.005	56.1
Sep-09	13.990	0.988	0.396	1.384	-4.0	229	11.1	491	-0.0050	0.0514	-0.001	0.0041	-0.0025	0.0036	0.200	0.1280	0.0034	-0.0002	0.00110	-0.005	42.6
Oct-09	14.670	2.910	0.548	3.458	-4.0	1040	33.4	1196	-0.0050	0.1320	-0.001	0.0100	-0.0025	0.0029	0.520	0.0427	-0.0025	-0.0002	0.00470	-0.005	546.0
Nov-09	18.350	0.909	0.161	1.070	-4.0	267	11.0	218	-0.0050	0.0487	-0.001	0.0037	-0.0025	0.0011	0.204	-0.0250	-0.0025	-0.0002	0.00130	-0.005	36.2
Dec-09	12.340	2.970	0.403	3.373	-4.0	980	32.4	1178	-0.0050	0.1340	-0.001	0.0090	-0.0025	0.0046	0.453	0.0506	-0.0025	-0.0002	0.00350	-0.005	516.0
Jan-10	14.570	3.030	0.397	3.427	-4.0	1060	34.2	1219	-0.0050	0.1380	-0.001	0.0067	-0.0025	0.0020	0.453	-0.0250	-0.0025	-0.0002	0.00440	-0.005	537.0
Feb-10	14.270	1.070	0.193	1.263	-4.0	329	13.1	436	-0.0050	0.0503	-0.001	0.0034	-0.0025	-0.0010	0.205	-0.0250	-0.0025	-0.0002	0.00120	-0.005	67.9
Mar-10	10.910	3.040	0.470	3.510	-4.0	1020	31.8	1238	0.0063	0.1470	-0.001	0.0099	-0.0025	0.0028	0.466	0.0618	-0.0025	-0.0002	0.00420	-0.005	593.0
Apr-10	16.470	0.851	0.200	1.051	-4.0	241	10.4	397	-0.0050	0.0479	-0.001	0.0034	-0.0025	-0.0010	0.149	-0.0250	-0.0025	-0.0002	0.00100	-0.005	21.6
May-10	11.590	3.550	0.531	4.081	-4.0	1290	40.9	1549	0.0075	0.1710	-0.001	0.0102	-0.0025	0.0029	0.484	0.0521	-0.0025	-0.0002	0.00520	-0.005	709.0
Jun-10	18.260	1.090	0.157	1.247	-4.0	323	12.8	487	-0.0050	0.0512	-0.001	0.0043	-0.0025	-0.0010	0.191	0.0477	-0.0025	-0.0002	0.00130	-0.005	64.1
Jul-10	10.630	3.030	0.361	3.391	-4.0	1070	35.2	1296	0.0058	0.1540	-0.001	0.0093	-0.0025	0.0026	0.486	0.1990	-0.0025	-0.0002	0.00420	-0.005	536.0
Aug-10	14.740	1.100	0.308	1.408	-4.0	343	13.6	542	-0.0050	0.0596	-0.001	0.0041	-0.0025	0.0012	0.211	0.0938	-0.0025	-0.0002	0.00150	-0.005	88.9
Sep-10	8.110	2.910	0.432	3.342	6.8	1090	35.7	1304	-0.0050	0.1510	-0.001	0.0091	-0.0025	0.0040	0.473	0.1630	-0.0025	-0.0002	0.00420	-0.005	545.0
Oct-10	13.320	1.010	0.214	1.224	-4.0	307	13.0	485	-0.0050	0.0550	-0.001	0.0037	-0.0025	-0.0010	0.178	0.0627	-0.0025	-0.0002	0.00130	-0.005	62.9
Nov-10	13.380	0.982	0.416	1.398	-4.0	330	34.1	538	-0.0050	0.0499	-0.001	0.0042	-0.0025	0.0022	0.131	0.1090	-0.0025	-0.0002	0.00140	-0.005	44.4
Dec-10	8.090	3.060	0.306	3.366	-4.0	1060	33.9	1313	0.0057	0.1450	-0.001	0.0111	-0.0025	0.0043	0.491	0.1690	-0.0025	-0.0002	0.00430	-0.005	526.0
Jan-11	16.630	2.810	0.467	3.277	-4.0	968	31.0	1341	-0.0050	0.1450	-0.001	0.0101	-0.0025	0.0033	0.456	0.1650	-0.0025	-0.0002	0.00360	-0.005	477.0
Feb-11	17.650	0.882	0.169	1.051	-4.0	241	10.2	460	-0.0050	0.0489	-0.001	0.0037	-0.0025	-0.0010	0.179	-0.0250	-0.0025	-0.0002	0.00100	-0.005	21.8
Mar-11	21.630	0.915	0.239	1.154	-4.0	243	10.4	437	-0.0050	0.0482	-0.001	0.0040	-0.0025	0.0015	0.191	0.0448	-0.0025	-0.0002	0.00100	-0.005	21.2
Apr-11	15.190	0.242	0.451	2.871	-4.0	847	34.4	1114	-0.0050	0.1500	-0.001	0.0101	-0.0025	0.0108	0.401	0.1740	0.0134	-0.0002	0.00310	-0.005	372.0
May-11	14.970	0.909	0.156	1.065	-4.0	272	10.6	443	-0.0050	0.0466	-0.001	0.0029	-0.0025	0.0018	0.183	-0.0250	-0.0025	-0.0002	0.00110	-0.005	21.9
Jun-11	9.620	1.720	0.315	2.035	-4.0	642	31.8	881	-0.0050	0.0882	-0.001	0.0051	-0.0025	0.0074	0.314	0.0780	0.0036	-0.0002	0.00220	-0.005	239.0
Jul-11	8.390	2.820	0.354	3.174	-4.0	956	35.3	1262	-0.0050	0.1320	-0.001	0.0058	-0.0025	0.0053	0.421	0.1010	0.0028	-0.0002	0.00480	-0.005	474.0
Aug-11	13.110	0.896	0.187	1.083	-4.0	282	12.3	495	-0.0050	0.0468	-0.001	0.0028	-0.0025	0.0013	0.207	0.0555	-0.0025	-0.0002	0.00150	-0.005	40.7
Sep-11	18.910	1.240	0.250	1.490	-4.0	411	19.0	663	-0.0050	0.0590	-0.001	0.0044	-0.0025	0.0023	0.246	0.0896	-0.0025	-0.0002	0.00190	-0.005	128.0
Oct-11	8.010	0.848	0.227	1.075	-4.0	296	16.0	491	-0.0050	0.0467	-0.001	0.0042	-0.0025	0.0032	0.195	0.0943	-0.0025	-0.0002	0.00120	-0.005	60.9

1. Non-detect results are presented as negative values at their associated detection limit.

V. Site Management

A. Buffer Zones

The ATR CWP wastewater reuse site is located on the INL where public access is restricted. Actual buffer distances, fencing, and posting are compared against distances typically recommended in DEQ (2007) in Table 3.

Table 3. Buffer Zones for ATR CWP.

	Buffer Zone Guidance[a]	Actual ATR CWP Buffer
Nearest Inhabited Dwelling	200 ft	63,000 ft (Atomic city) 800 ft (Nearest occupied INL Building)
Nearest Public Water System	1,000 ft	2,250 ft (TRA-1863)
Nearest Private Water Supply	500 ft	63,000 ft (Atomic City)
Areas Accessible to the Public	0 ft	17,500 ft (Highway 20/26)
Nearest Surface Water	100 ft	3,600 ft (Big Lost River channel)
Nearest Irrigation Ditches/Canals	50 ft	80,000 ft (Arco/Butte City area)
Fencing	Not required	Sheep fence with barbed wire
Posting	Not required	None

a. Guidance recommendations specified within the DEQ Reuse Guidance Manual. Industrial effluent, no disinfection, furrow irrigated, no public access.

As shown in Table 3, all generally recommended buffer zones are being met. Occupied buildings at ATR are a sufficient distance from the Cold Waste Ponds. Surface water and irrigation ditches and canals do not exist at the facility. And INL is a secured government facility that does not allow public access without proper security clearances and/or facility escorts. Therefore, staff recommend the new permit only specify buffer distances for public water supply and private (domestic water supply) wells

B. Runoff

A runoff management plan was not required under LA-000161-01. Due to the nature of the discharge to the ATR Complex CWP, the wastewater is collected and discharged directly into the Cold Waste Ponds. As such, runoff is not generated on site. No runoff plan is proposed in the draft permit.

C. Waste Solids

A waste solids management plan was not required under LA-000161-01. Due to the nature of the discharge, solids are not generated. Therefore, no waste solids management plan is proposed in the draft permit.

D. Nuisance Odors

Nuisance odors have not been identified at this facility during inspections. And the remote, secure, and limited access nature of the INL facility supports the recommendation of not requiring an odor management plan at this time.

E. Salts

Salt loading to the Cold Waste Ponds is high and localized groundwater impacts are present within the zone of influence ('plume') directly under the CWP. However, as explained earlier, ground water quality returns to background levels by the time it reaches the down-gradient compliance monitoring wells surrounding ATR, which are still well within the secured INL boundary by several miles. Salt concentrations within the impacted zone also appear to be somewhat stabilized at levels below the secondary constituent standards specified in IDAPA 58.01.11. Therefore, a salt loading corrective action plan is not required at this time.

F. Lagoon Seepage

The CWP is designed and constructed as a percolation or rapid infiltration basin. Seepage testing is not applicable nor required in the new permit.

VI. Monitoring

A. Wastewater Monitoring

INL proposes to discontinue electrical conductivity, arsenic, barium, cadmium, chloride, chromium, cobalt, copper, fluoride, iron, manganese, mercury, selenium and silver monitoring of the CWP discharge. As discussed in Section IV.A of this staff analysis, DEQ recommends discontinuing monitoring for antimony, arsenic, barium, cadmium, cobalt, copper, fluoride, mercury, selenium, silver, and TSS due to a consistent history of near or non-detect values and/or evidence of no impacts to ground water quality.

The permit application also requests removal of Electrical Conductivity (E.C.) monitoring as the applicant states E.C. serves only as an estimate of TDS or dissolved ions in a sample. Although there is a site-specific relationship between E.C. and TDS, E.C. monitoring is not performed as a surrogate or indirect measurement of TDS as indicated in the permit application. Rather, E.C. is a measurement of the ionic activity and salinity in the wastewater that can negatively affect soil permeability and infiltration rates. Maintaining high permeability and infiltration rates is important for the rapid infiltration ponds at ATR CWP, so DEQ recommends retaining electrical conductivity measurements. The constituents retained in the draft permit are pH, filtered aluminum, chloride, filtered and unfiltered chromium, electrical conductivity, filtered iron, filtered manganese, nitrate nitrogen, total Kjeldahl nitrogen, sulfate and total dissolved solids (TDS). Total nitrogen concentrations are also specified since it is determined through a simple calculation. Both filtered and total chromium will be necessary since the Ground Water Quality Rule only allows filtered (dissolved) samples from secondary constituents to be used for compliance purposes. Chromium is listed as a Primary Constituent in the Ground Water Quality Rule.

B. Soil Monitoring

The current permit does not require soil monitoring. Monitoring wastewater salt and conductivity levels in the permit, as well as operational observations of water levels,

are suitable to track potential impacts to the rapid infiltration basin's infiltrative capacity. No change is proposed in the draft permit.

C. Ground Water Monitoring

The current permit requires monitoring for aluminum, antimony, arsenic, barium, cadmium, chloride, cobalt, copper, fluoride, iron, manganese, mercury, TKN, nitrate-nitrogen, nitrite-nitrogen, selenium, pH, silver, sulfate, TDS, water table depth and water table elevation on a semi-annual basis.

INL proposes to discontinue aluminum, antimony, arsenic, barium, cadmium, cobalt, copper, fluoride, iron, manganese, mercury, selenium and silver monitoring of groundwater. Based on very low or non-detect values that show no ground water impacts related to CWP discharges, DEQ recommends discontinuing ground water monitoring for the following: antimony, arsenic, barium, cadmium, cobalt, copper, fluoride, mercury, selenium, and silver. In the previous permit, the wastewater and ground water monitoring parameters varied slightly. The draft permit specifies monitoring of the same parameters in both wastewater and ground water so any potential relationships or impacts between the two can be evaluated.

Figure 3 shows the sulfate plume originating from the CWP discharges. As stated in the permit application, the CWP has been the largest source of water to the perched-water zones since placed into service in 1982. No data was supplied in the application to show whether there is a corresponding TDS plume although concentrations in the data appear to show similar trending with TRA-07 and USGS-065 having the highest concentrations (averages of 438 mg/L and 431 mg/L, respectively in 2011) and decreasing rapidly in the other three down-gradient wells. DEQ recommends that concentration maps of the 'plume', similar to Figure 3, be supplied in each annual report for both sulfate and TDS. In order to assess interim concentrations between the up-gradient well (USGS-098) and the CWP to take into account any contributions from the Warm Waste Evaporation Lagoons and/or the Sewage Evaporation Lagoons, DEQ recommends adding USGS-058 to the groundwater monitoring wells as GW-016107 with monitoring limited to sulfate and TDS twice per year. Including USGS-058 will help identify and document the plume concentrations on the up-gradient side of the Cold Waste Ponds to differentiate those caused by the CWP and other historical discharges. The sulfate and TDS concentration maps will be used to track yearly variation in both plumes and to evaluate compliance with the Ground Water Quality Rule IDAPA 58.01.11.

Two wells (TRA-07 and TRA-08) have exceeded the GWQR standards for unfiltered aluminum, iron, and manganese. Filtered samples for all three parameters in both wells continue to be mostly non-detect with only a few detections that remain well below the associated ground water standard. The permit application indicates the high aluminum, iron, and manganese concentrations in these wells might be caused by deterioration of the well casing materials, but with the increasing trend in ground water pH, this seems unlikely since metal solubility decreases with increasing pH. The application also indicates the possibility of suspended solids within the well

causing the exceedances. Not mentioned in the application, but discussed in Section III of this staff analysis, the hydraulic 'overloading' through continuous long-term discharge to the cold waste ponds could also be contributing to the mobilization and increase in Al, Fe, and Mn in these down-gradient wells, even when wastewater effluent concentrations are low. Nevertheless, filtered results are well within compliance, and staff recommend filtered sampling of Al, Fe, and Mn in the draft permit.

The permit application proposes removing monitoring well TRA-07 from the new permit because the limited water column depth in the well doesn't provide sufficient sampling volumes after purging. Well TRA-07 is completed to a depth of 493 feet with a static water depth of 484 feet in 2011 (9-ft of water column). The INL sampling team frequently has to reduce the pumping rate in TRA-07 to prevent the well from going dry prior to collecting samples. INL states if TRA-07 remains in the new permit, it may need to be deepened in order to collect future samples, just like TRA-08 was deepened from 500 to 531 feet in 2010. INL reasons that the expense of deepening well TRA-07 provides no value added to the ground water compliance evaluation given the similarities in well locations, construction and water quality between USGS-065 and TRA-07 (INL, 2012b). Based on a review of the water quality data for TRA-07 and USGS-065, staff concur with the request and feel that data obtained from USGS-065 will be sufficient to evaluate ground water quality and impacts in this location. Monitoring well TRA-07 has been removed from the draft permit.

The constituents that DEQ recommends retaining for the groundwater monitoring wells are: pH, filtered aluminum, chloride, chromium, electrical conductivity, filtered iron, filtered manganese, nitrate nitrogen, total Kjeldahl nitrogen, total Nitrogen (a calculation), sulfate, and TDS. Reporting of groundwater depth and elevation is also recommended to continue. DEQ recommends that these field parameters continue to be recorded for each monitoring event in accordance with the facility's Quality Assurance Project Plan (QAPP).

D. Upgradient Well Evaluation

The current permit LA-000161-01 did not include monitoring of an up-gradient monitoring well. During the pre-application conference, DEQ requested that INL identify an up-gradient regional aquifer well that can be included in the new permit. The purpose of an up-gradient well is to document background concentrations at a wastewater reuse facility to evaluate changes and impacts to ground water quality from up- to down-gradient that are caused by the permitted reuse system. As stated earlier, impacts to ground water can be deemed significant and in violation of the Ground Water Quality Rule even if the elevated concentrations do not exceed the numerical standards specified in the rule. The permit application proposes monitoring well USGS-098 as the up-gradient well for the ATR Complex CWP reuse permit.

The well is located about 2.2 miles northeast (up-gradient) of the CWP and 2.3 miles southwest (down-gradient) of the Naval Reactors Facility. According to the permit application, USGS-098 was constructed in 1973 to a depth of 508 feet deep. It is screened with 4-inch stainless steel screen from 418-428 ft and again from 468-508 feet. The pump is currently set at 440 feet.

USGS-098 was previously used as a regional downgradient monitoring well for NRF. Historical data for this well showed little or no significant impact from NRF activities and USGS-098 was discontinued as an active downgradient CERCLA monitoring well (the monitoring frequency was lowered to once every other year) based on recommendations in the CERCLA 5-year review (NR IBO, 2012).

The well construction, screened intervals, and pump locations of USGS-098 appear to be similar to the down-gradient monitoring wells specified in this permit. The water chemistry appears to also be at 'background' levels that don't show any impacts from either NRF or ATR. Therefore, well USGS-098 seems appropriate for use as an up-gradient well for the ATR CWP wastewater reuse permit.

E. Wastewater and Ground Water Monitoring Summary

DEQ recommends monitoring the same parameters in the CWP effluent and ground water so one can effectively evaluate and possibly isolate any ground water impacts from the CWP as compared to the historical and other sources of contamination affecting the aquifer at this site. Table 4, below, summarizes the wastewater and ground water parameters monitored during the previous permit cycle, the average concentrations that were seen during the past 5 years, the ground water standards that apply (both primary and secondary), the parameters proposed for deletion in INL's permit renewal application, and finally, DEQ's recommendations for the new permit. The monitoring well network specified in the draft permit includes new wells USGS-098 (GW-016101) to serve as the regional up-gradient well for all parameters, and USGS-058 (GW-016107) as a local up-gradient well for sulfate and TDS only. Monitoring well TRA-07 has been removed from the draft permit since USGS-065 is located nearby and provides very similar water chemistry that is sufficient to evaluate permit compliance. The geochemical signature for perched water wells near the CWP is primarily new water from the CWP mixed with residual contamination from historical sources (INL, 2012b). DEQ concurs with INL's request to not monitor perched water because of the difficulty in distinguishing between existing contamination and contaminants recently discharged to the CWP.

Table 4. Monitoring parameter summary for new permit[1].

Parameter	Monitoring in Current Permit		Average Historical Concentrations		GW STD	INL-Proposed Deletions		Draft Permit KEEPS		Reason for Keeping or Discontinuing parameter:
	WW	GW	WW	GW		WW	GW	WW	GW	
pH		x		8.1+	6.5-8.5			x	x	Keep - Baseline tracking. GW pH trends are occurring.
Aluminum		x	n/a	4.233	0.2		x	x	x(d)	Keep - GW impacts occurring.
Chloride	x	x	23.6	15.7	250			x	x	Keep - Major component in WW, contributes to GW TDS impacts
Chromium	x		0.006	0.1	0.1	x		x	x	Keep - Still present in WW, GW impacts are occurring.
Conductivity	x		859	430-600		x		x	x	Keep - Ionic activity and salinity affect soil permeability & infiltration.
Iron	x	x	0.0584	12.445	0.3	x	x	x	x(d)	Keep - GW impacts occurring.
Manganese	x	x	n/d	0.0848	0.05	x	x	x	x(d)	Keep - GW impacts occurring.
NNN	x	x	1.9	1.1	10			x	x	Keep - WW range is 2x greater than GW background (all NO3-N)
TKN	x	x	0.3	0.2				x	x	Keep - Used to calculate total WW N loads. Present in deep GW.
Total N	x	x	2.2	1.3				x	x	Keep - Simple calculation to determine total N.
Sulfate	x	x	282	>>87.6	250			x	x	Keep - Major component in WW, GW impacts occurring.
TDS	x	x	628	340	500			x	x	Keep - Major component in WW, GW impacts occurring.
Antimony		x	n/a	n/d	0.006		x			Remove - Non-detect in WW or GW
Arsenic	x	x	n/d	<0.001	0.05	x	x			Remove - Non-detect in WW or GW
Barium	x	x	0.097	0.094	2	x	x			Remove - 2-orders below GW MCL. Both at background levels
Cadmium	x	x	n/d	n/d	0.005	x	x			Remove - Non-detect in WW or GW
Cobalt	x	x	n/d	n/d		x	x			Remove - Non-detect in WW or GW
Copper	x	x	0.0025	0.0296	1.3	x	x			Remove - 2-orders below MCL.
Fluoride	x	x	0.3269	0.192	4	x	x			Remove - 2-orders below MCL.
Mercury	x	x	n/d	n/d	0.002	x	x			Remove - Non-detect in WW or GW
Selenium	x	x	0.0027	0.0013	0.05	x	x			Remove - 1-order below GW MCL. Both at background levels
Silver	x	x	n/d	n/d	0.1	x	x			Remove - Non-detect in WW or GW
TSS	x		n/d							Remove - Non-detect. Rules Changed - no longer required by rule

1. "x(d)" = sampling of dissolved (filtered) parameter is recommended.

VII. Site Operation and Maintenance

Although DEQ rules do not require certified operators at industrial wastewater reuse facilities, ATR has several operators that are currently certified for Class I Treatment.

The application states the Cold Waste Ponds are operated in accordance with the Plan of Operation approved by DEQ in 2009. Project-specific sampling and analysis plans and procedures have been created by INL's Monitoring Services personnel to govern sampling activities and quality control protocols (INL, 2012b). Review of the 2008-2011 annual reports and DEQ inspection reports do not reveal any specific operational deficiencies that need to be revised for the next permit cycle. INL's permit application does request permit-specific language to specify how INL staff should document flow rates when the flow monitoring equipment in TRA-764 are not functioning; however, staff believe this to be an operational topic that should be addressed by INL through revisions to their Plan of Operation. Flow meter calibration frequencies should also be addressed within the Quality Assurance Project Plan specified in Section 3 of the draft permit.

VIII. Compliance Activities

1. The current Plan of Operation for LA-000161-01 was approved by DEQ on June 18, 2009. A compliance activity has been added to the draft permit requiring submission of a revised Plan of Operation that incorporates the requirements of the new permit and incorporates the recent changes to the Plan of Operation requirements specified in Subsection 300.05 of the Recycled Water Rule, IDAPA 58.01.17. Staff recommend the revised Plan of Operation be submitted within 12 months of permit issuance in accordance with IDAPA 58.01.17.600.04.

2. A new standard requirement of all wastewater reuse permits is the creation and implementation of a Quality Assurance Project Plan (QAPP) to ensure accurate and valid data are collected and submitted to DEQ. A compliance activity has been added to the draft permit requiring creation of a QAPP following available guidance, and implementation of the QAPP within 90-days of permit issuance. A letter and copy of the QAPP must be submitted to notify DEQ that the permittee has created and implemented the QAPP. DEQ will not be performing a formal approval function, but will review and comment on the QAPP if necessary to address any deficiencies.

IX. Permit Duration

INL's permit application requests the new permit be issued for a 10-year duration in accordance with the recent rule revisions specified in IDAPA 58.01.17.600.02. The permit application does not discuss the projected loading rates or future operations of the facility for the next permit cycle, other than requesting the same loading limits as the current permit. It is our understanding that the current operator's contract will be expiring in September 2014. Our review of the permit application also indicates future loading rates could vary slightly from historical rates. A contractor change also has the potential to alter the facility's mission, use, and potential loading rates to the cold waste ponds. DEQ typically recommends that industrial reuse permits be issued on a 5-yr cycle because of the inherent variability in operational activities, production rates, and discharges to the waste systems. Because of the potential operational changes, and variable loading rates that could occur at the ATR CWP industrial facility in the future, staff recommend the next permit be issued for the standard 'industrial' term of 5 years instead of 10.

Recommendation

Staff recommend that the draft wastewater reuse permit be issued. The permit specifies hydraulic loading limits and establishes monitoring and reporting requirements to evaluate system performance and determine permit compliance.

References

DEQ, 2007, Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater, Idaho Department of Environmental Quality, September 2007.

INL, 2008, Plan of Operation for the Advanced Test Reactor Complex Cold Waste Pond, INL/EXT-08-14609, October 2008.

INL, 2009, 2008 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste Pond, INL/EXT-09-15246, February 2009.

INL, 2010, 2009 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste Pond, INL/EXT-10-17575, February 2010.

INL, 2011a, 2010 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste Pond, INL/EXT-11-20765, February 2011.

INL, 2011b, Revised Well TRA-08 Construction Information for the 2010 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste Pond, CCN 224211, May 23, 2011.

INL, 2012a, 2011 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste Pond, INL/EXT-12-24337, February 2012.

INL, 2012b, Industrial Wastewater Reuse Permit Renewal Application for the Advanced Test Reactor Complex Cold Waste Pond, INL/MIS-12-25957, August 2012.

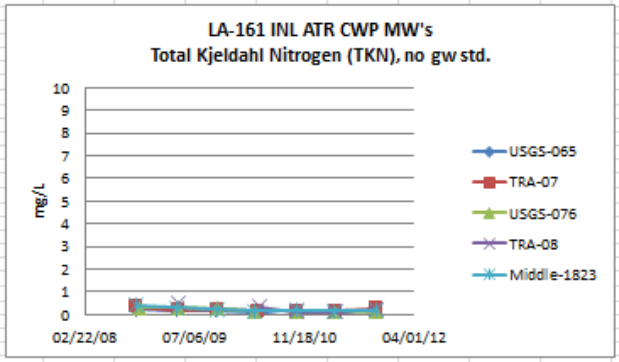
INL, 2012c, Annual Ground Water Monitoring Status Report for Waste Area Group 2 for Fiscal Year 2012, DOE/ID-11471 Revision 0, September 2012.

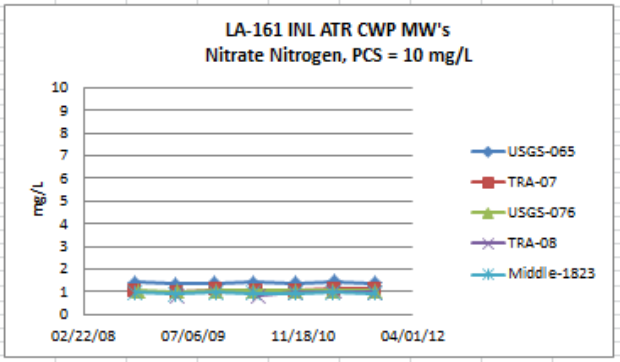
NR IBO, 2012, Final Five-Year Review of CERCLA Response Actions at the Naval Reactors Facility, February 2012.

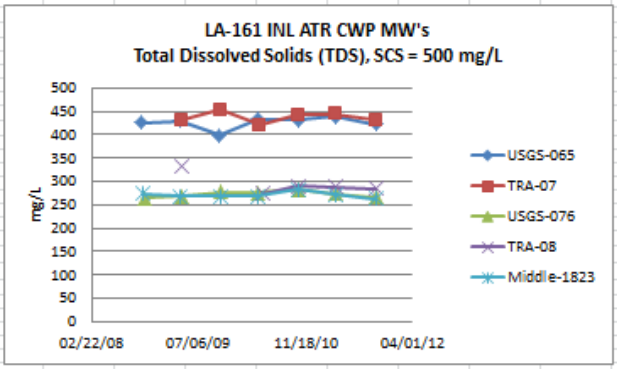
Rackow, 2009, Plan of Operation for the Advanced Test Reactor Complex Cold Waste Pond, Compliance Activity CA-161-012, Wastewater Reuse Permit LA-000161-01 (Modification B), June 18, 2009.

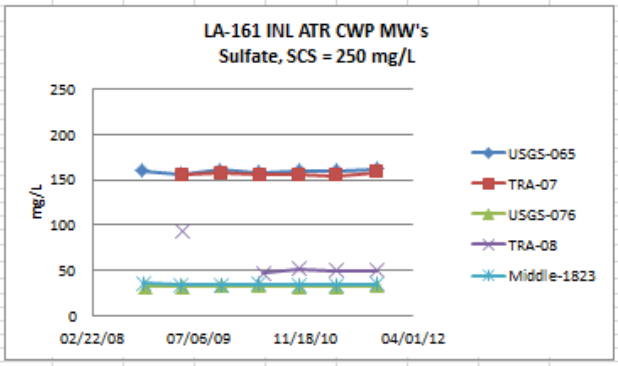
Rackow, 2012, DEQ Wastewater Reuse Inspection of the ATR Facility Located on the Idaho National Laboratory Site, Permit LA-000161-02, September 27, 2012.

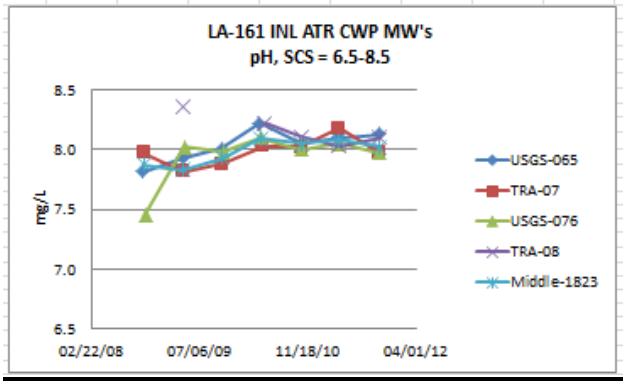
Attachment 1 – INL ATR CWP Ground Water Quality

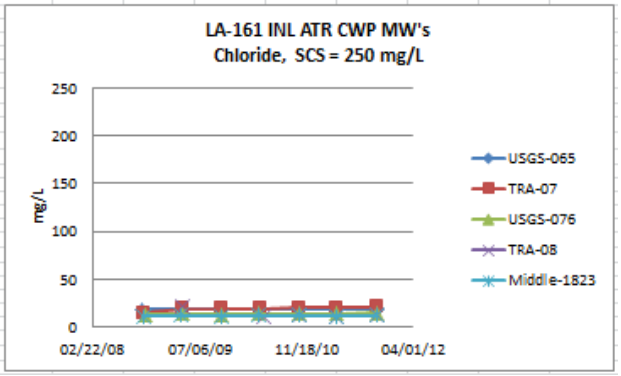


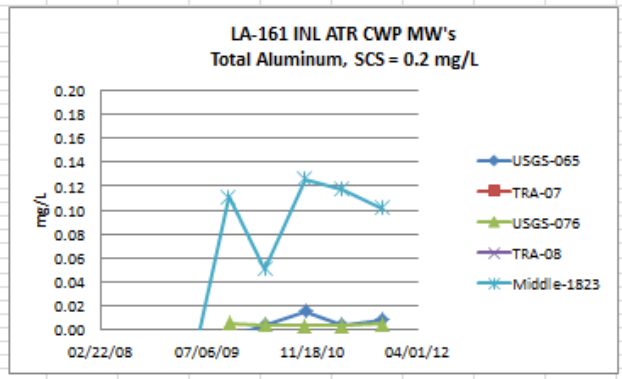


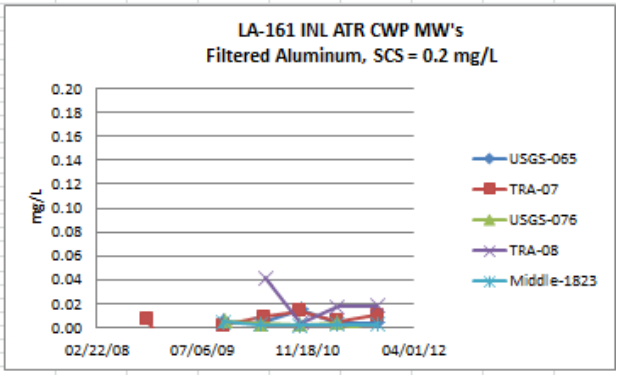









LA-161 INL ATR CWP MW's
Total Aluminum, SCS = 0.2 mg/L
mg/L
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823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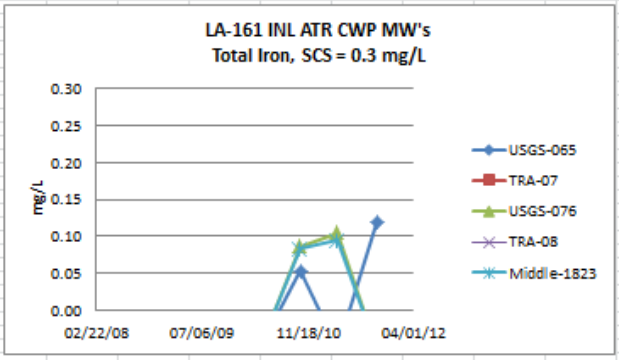
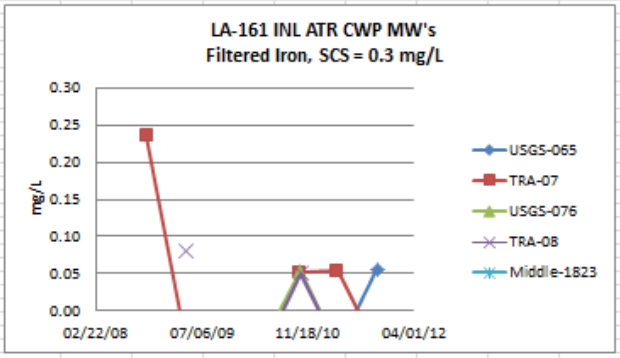
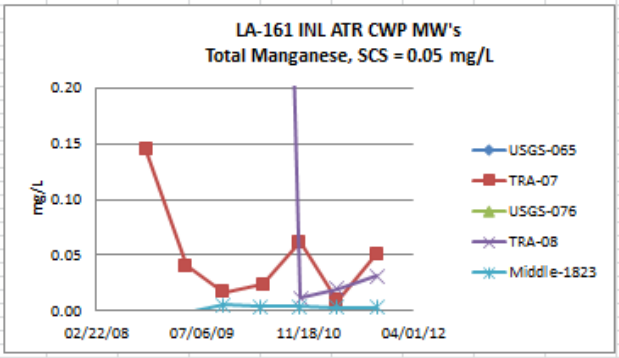
Filtered Aluminum, SCS = 0.2 mg/L
mg/L
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823


LA-161 INL ATR CWP MW's
Total Iron, SCS = 0.3 mg/L
mg/L
0.30
0.25
0.20
0.15
0.10
0.05
0.00
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823


LA-161 INL ATR CWP MW's
Filtered Iron, SCS = 0.3 mg/L
mg/L
0.30
0.25
0.20
0.15
0.10
0.05
0.00
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823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Total Manganese, SCS = 0.05 mg/L
mg/L
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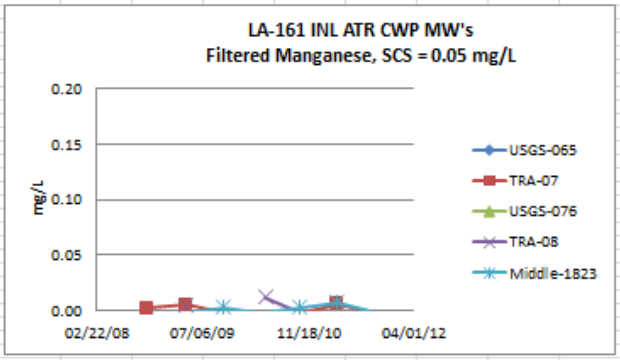
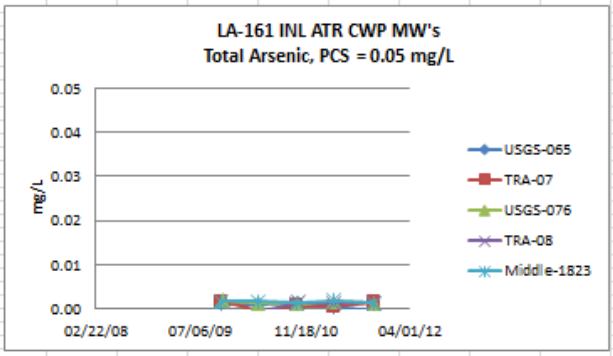
0.15
0.10
0.05
0.00
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823


LA-161 INL ATR CWP MW's
Filtered Manganese, SCS = 0.05 mg/L
mg/L
0.20
0.15
0.10
0.05
0.00
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823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Total Arsenic, PCS = 0.05 mg/L
mg/L
0.05
0.04
0.03
0.02
0.01
0.00
02/22/08
07/06/09
11/18/10
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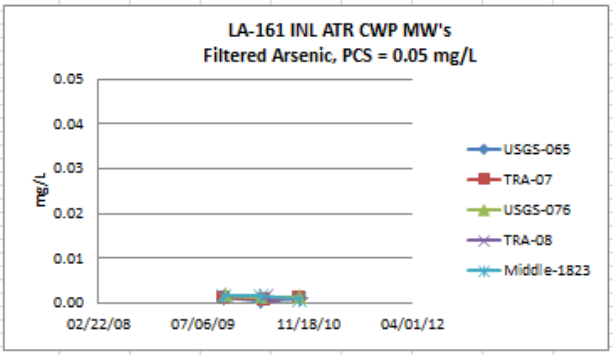
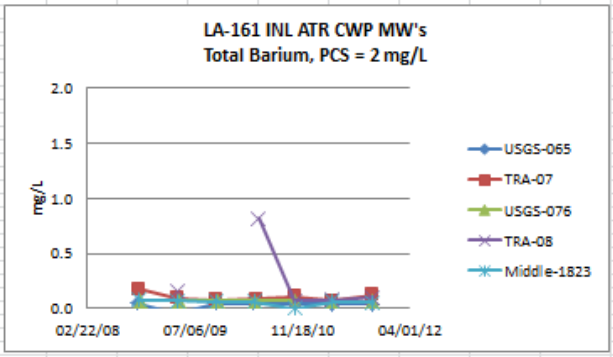
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823


LA-161 INL ATR CWP MW's
Filtered Arsenic, PCS = 0.05 mg/L
mg/L
0.05
0.04
0.03
0.02
0.01
0.00
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823


LA-161 INL ATR CWP MW's
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mg/L
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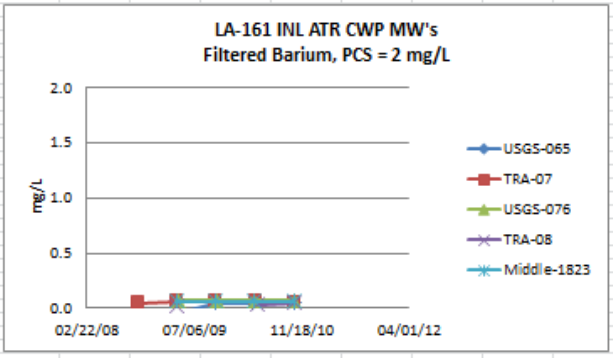
1.5
1.0
0.5
0.0
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823


LA-161 INL ATR CWP MW's
Filtered Barium, PCS = 2 mg/L
mg/L
2.0
1.5
1.0
0.5
0.0
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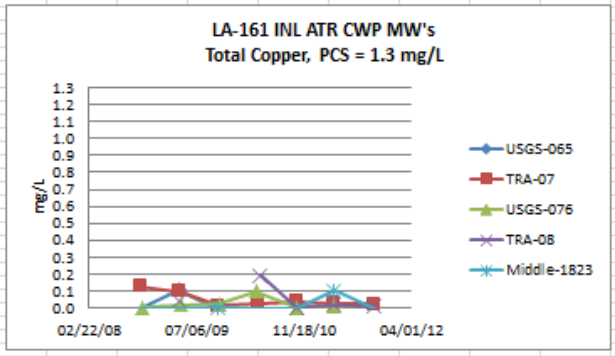
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823


LA-161 INL ATR CWP MW's
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mg/L
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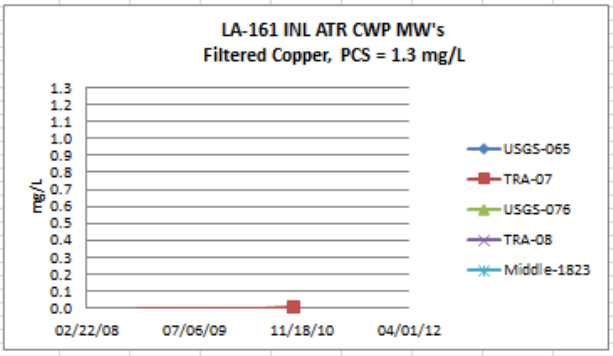
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
02/22/08
07/06/09
11/18/10
04/01/12
USGS-065
TRA-07
USGS-076
TRA-08
Middle-1823


LA-161 INL ATR CWP MW's
Filtered Copper, PCS = 1.3 mg/L
mg/L
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
02/22/08
07/06/09
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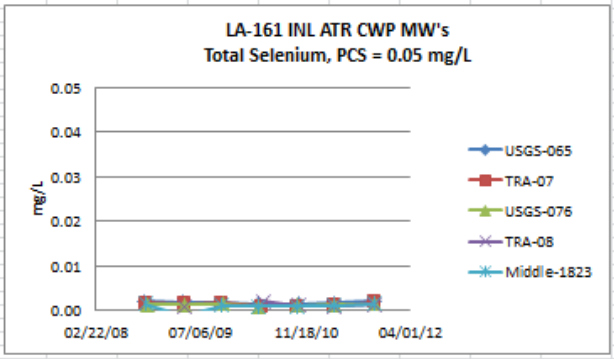
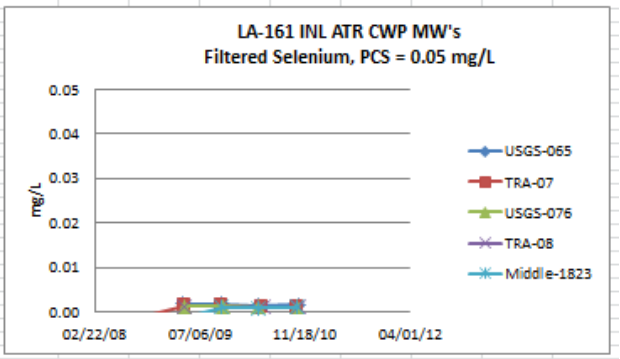
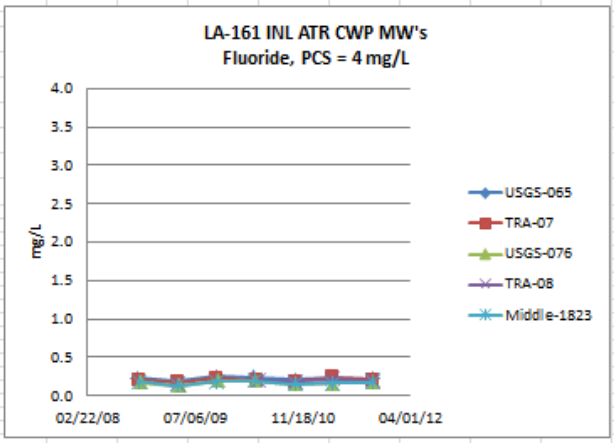
TRA-08
Middle-1823







Groundwater data are all non-detect for:

Antimony (Total and Filtered)
Cadmium (Total and Filtered)
Cobalt (Total and Filtered)
Mercury (Total and Filtered)
Silver (Total and Filtered)