Wastewater Land Application Permit Ground Water Monitoring

Results for 2002

The following ground water results represent only those monitoring activities conducted to demonstrate compliance with INEEL Wastewater Land Application Permits. Groundwater monitoring is conducted at the following Wastewater Land Application Permitted locations:

- INTEC - existing percolation ponds
- INTEC - new percolation ponds
- INTEC - sewage treatment plant
- Test Area North - Technical Support Facility sewage treatment plant.

The INTEC existing percolation ponds were sampled through October 31, 2002. On August 26, 2002, discharge of wastewater ceased to the INTEC existing percolation ponds and was transferred to the new percolation ponds. Because the existing percolation ponds were no longer in use, a request was made to the Department of Environmental Quality to cancel the permit. The Department of Environmental Quality cancelled the permit on November 4, 2002.

The sampling locations, frequency, and analyses to be performed were negotiated with the State of Idaho during approval of the respective Wastewater Land Application Permit.

Locations
Sampling locations (i.e., monitoring wells) were selected based on the hydrogeology of the area to best determine the impact to the subsurface and the Snake River Plain Aquifer by liquid effluent discharges to the percolation ponds and trenches. The individual Wastewater Land Application Permits identify specific monitoring wells as compliance points and specific wells to monitor background aquifer and perched water constituent concentrations.

Frequency
Sampling occurs semiannually, in April and October as required by the permits. The Department of Environmental Quality granted approval to sample the existing percolation pond wells in September 2002.

Analytical Parameters
Analytical parameters were chosen to match the constituents commonly found in the liquid effluent discharge to the respective ponds and trenches. The Wastewater Land Application Permits list specific required parameters to monitor for in each of these wells. The compliance point monitoring wells are required to meet the primary and secondary constituent standards (IDAPA 58.01.11, “Groundwater Quality Rule”) for applicable parameters. A variance for these standards has been granted by the Idaho Department of Environmental Quality for total dissolved solids and chloride levels in the Wastewater Land Application Permit at the INTEC existing percolation ponds.

QUICK FACTS

- 17 Wastewater Land Application Permit groundwater wells monitored
- 4 Wastewater Land Application Permits require groundwater sampling

DEFINITIONS

Aquifer
A layer of water-saturated rock or soil through which water flows in a quantity useful to people. The rate of flow depends upon porosity and permeability, and the slope of the water table. Groundwater in aquifers usually flows very slowly, only a few inches to a few feet per day.

Groundwater
Water that soaks into the ground and percolates downward through rock or soil pores until it is stopped by an impermeable layer. Natural sources are rainfall, snowmelt and water that seeps into the ground beneath streams, rivers and lakes. Other sources can include irrigated fields, canals, wastewater drainfields, injection wells, leaking pipes and industrial cooling ponds.

Perched Water
Groundwater that collects above a layer of relatively impermeable material, such as clay, and then slowly moves downward to the aquifer. Perched water zones are often present beneath reservoirs and industrial facilities, but disappear when the surface water source is eliminated.

FOR MORE INFORMATION

Visit our website at:
http://cleanup.inel.gov/monitoring

Read the 2002 Annual Report or the 2002 Wastewater Land Application Site Performance Reports for the INEEL available in DOE Public Reading Rooms or at our website.

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RESULTS SUMMARY

Idaho Nuclear Technology and Engineering Center Existing Percolation Ponds

Iron concentration in one (USGS-112) of the two compliance wells exceeded the permit level (secondary constituent standard, 0.30 mg/L) in both the April (1.4 mg/L) and September (1.8 mg/L) samples. The increased iron concentrations are not believed to be the result of percolation ponds operation because the effluent discharged to the ponds has been well below the secondary constituent standard. It is expected that corrosion of the carbon steel casing and galvanized riser pipe in the well contributed to the high iron concentrations.

The chloride, total dissolved solids, and sodium concentrations remained elevated downgradient of the percolation ponds, and concentrations were nondetectable for most of the remaining primary constituents.

Idaho Nuclear Technology and Engineering Center New Percolation Ponds

Aquifer wells ICPP-MON-A-165 and ICPP-MON-A-166, and perched water wells ICPP-MON-V-200 and ICPP-MON-V-212 are the permit compliance points. Because the new percolation ponds were placed into service on August 26, 2002, samples from the compliance wells (except ICPP-MON-V-212) were only collected in October of 2002. Because of insufficient volume of perched water in well ICPP-MON-V-212, this well was not sampled in October 2002.

Concentrations of the following exceeded permit limits (secondary constituent standards) in well ICPP-MON-A-166:

Parameter	Concentration	Secondary Constituent Standards
Aluminum	0.366 mg/L	0.2 mg/L
Iron	0.409 mg/L	0.3 mg/L
Manganese	0.0947 mg/L	0.05 mg/L

The concentrations of these parameters also exceeded the secondary constituent standards in samples taken from the background aquifer well (ICPP-MON-A-167) located upgradient from the new percolation ponds. All of the wells associated with monitoring the groundwater near the new percolation ponds are new wells. One possible explanation for the elevated levels of aluminum, iron, and manganese may be that these wells were insufficiently developed during the construction activities. Another possible explanation is that the annular seals were placed incorrectly, thus allowing bentonite slurry to affect the water quality.

No primary or secondary constituent standards were exceeded in any of the other compliance wells sampled.

Idaho Nuclear Technology Engineering Center Sewage Treatment Plant

No permit levels were exceeded at the compliance well. Similar to previous years, chloride, total dissolved solids, and nitrate concentrations were only slightly elevated in the compliance well as compared to the background upgradient well, and concentrations were largely nondetectable for the remaining analytical parameters. The perched water well is used as an indicator of soil treatment efficiency rather than as a point of compliance. Total dissolved solids and chloride in the perched water approximate that of the sewage treatment plant effluent stream, while total coliform and total nitrogen concentrations are less than the effluent. This reduction in total nitrogen may be partly due to the increased trench rotation frequency that was implemented in March 1997. This increased trench rotation frequency will continue, and constituent trends in the perched water and aquifer will be observed and tracked.

Test Area North/Technical Support Facility Sewage Treatment Plant

Per the Wastewater Land Application Permit, three monitoring wells are used as points of compliance for the Test Area North/Technical Support Facility Sewage Treatment Plant: TANT-MON-A-002, TAN-10A, and TAN-13A. Permit exceedences (above the primary or secondary constituent standards) are summarized in the following table.

CONTAMINANT	COMPLIANCE MONITORING WELL	OCCURRENCE
Total dissolved solids	TAN-10A	April and October
Iron	TAN-13A TAN-10A	April April and October
Total coliform	TANT-MON-A-002	October

The concentration of iron in the background well (TANT-MON-A-001) also exceeded the primary constituent standard in the October sample. Elevated concentrations of iron historically have been detected in the TAN groundwater wells associated with the sewage treatment plant. The elevated iron concentration in well TAN-13A in April is believed to be the result of residual galvanic corrosion of the well riser pipe. The riser pipe was replaced with stainless steel in August 2001, and the iron concentration in the well has decreased since then to undetected in the October 2002 sample. For TAN-10A, although the galvanized riser pipe was replaced with stainless steel during the same period it was replaced in well TAN-13A, the iron concentration increased in TAN-10A during 2002. The condition of the corroded well casing, coupled with the residual effects relating to the replacement of the riser pipe, may have resulted in the increased iron concentration in TAN-10A and also to the increased total dissolved solids in the well.

Because total coliform was also present in the October 2002 sample from the background well (TANT-MON-A-001), and TANT-MON-A-002 is located northwest of the disposal pond, it is unlikely that the coliform detected in the two wells is influenced by the disposal pond.

Of the three compliance monitoring wells, in general, TAN-10A had the highest constituent concentrations compared to the upgradient background monitoring well. It is difficult to establish a strong relationship between the water quality in TAN-10A and the disposal pond. First, injectate from a former injection well (located close to TAN-10A and used for disposal of numerous waste streams) is still present in the groundwater and continues to substantially impact groundwater quality. Second, groundwater remediation now underway near the former injection well significantly influences local hydraulic gradients and constituent concentrations.