

**TECHNICAL BRIEFING – DRAFT FINAL AREA C SEMIANNUAL  
GROUNDWATER REPORT, FALL 2011 – MAY 2012**

The document reviewed was a draft final report including an analysis of two years of groundwater monitoring for Area C. The report is entitled “Long Term Monitoring Report Round D Statistical Evaluation” and is dated May 2012. Area C groundwater is designated as PICA 206. A Record of Decision (ROD) was signed for the site on September 1, 2009. The remedies for the site include the following: land use controls (LUCs), a Classification Exception Area (CEA)/Well Restriction Area (WRA), long-term monitoring, an exit strategy, and 5-year reviews. There are five PICA sites within Area C as follows: Site 19 - Pyrotechnic Demonstration Area, Site 25/26 –Former Sanitary Landfill/Dredge Pile, Site 163 – Baseball Fields, and Site 180 – Waste Burial Area. Two other sites are within Area C but not part of the Area C groundwater unit; they are Site 34 – Burning Ground and the Former Skeet Range.

A total of 32 monitoring wells were included in the groundwater program (although at the time of sampling one well could not be located and was presumed to have been destroyed). Sixteen of the wells are within Area C and another 16 wells are along the downgradient southern boundary of Picatinny Arsenal (referred to as the Southern Boundary Area – SBA). The long-term groundwater monitoring plan called for semiannual sampling for the first two years based on a seasonal approach followed by statistical evaluation. Thusly monitoring began in 2010 with winter sampling (January/February) and summer sampling (July/August) followed by spring (April) and fall sampling (October/November) in 2011. Area C monitoring parameters included constituents that historically exceeded the groundwater LOCs. These analytes were one to four of the following: arsenic, beryllium, lead, volatile organic compounds (VOCs), and dioxins/furans. The SBA wells had a more extensive parameter list as those wells are to provide for an early warning if groundwater contaminants should migrate offsite. The SBA well analytes were as follows: VOCs, metals, explosives, anions, and perchlorate.

Generally the contaminants found within Area C groundwater consisted of a few VOCs and explosives that were found to be isolated and of limited extent. In contrast lead and arsenic were far more widespread but with no identifiable source. Still other metals seemed to be ubiquitous at Picatinny

Arsenal and have been attributed to be naturally occurring as a result of the local geology; they are iron, manganese, and aluminum.

Overall results were generally consistent with previous investigations with the exception of notable inconsistencies in detections of lead, chromium, and nickel in the summer 2010 round of sampling. Results are described briefly below.

#### VOCs

Tetrachloroethene (PCE) and vinyl chloride (VC) were the only VOCs detected at concentrations greater than the level of concern (LOC); the exceedance for each compound was in a single well.

#### Explosives

One compound, 1,3-dinitrobenzene, was detected in a single SBA well but the concentration (0.22 ug/L) was below the LOC (1 ug/L).

#### Metals

Fifteen metals were detected in one or more of the groundwater samples but in only six detections was the concentration greater than the LOC. Of the six, aluminum, iron, and manganese were found in the two upgradient wells and are attributed to natural conditions. Sodium was also found upgradient and is unrelated to Area C activities. The other two compounds were arsenic and lead for which no discrete source has been identified.

#### Dioxins/Furans

The compounds were not detected in samples from the two wells that were analyzed.

#### Anions

Eight anions were detected in SBA wells but only one detection, chloride, occurred at a concentration higher than the LOC.

The exit strategy prescribed three steps to follow to determine the necessity of program modifications (removal of a well from monitoring or reduction of sampling frequency).

STEP A – Identify analytes to remove from monitoring

If a constituent was detected at concentrations less than the Applicable or Relevant and Appropriate Requirement (ARAR) for four or more consecutive sampling events then the analyte would be

discontinued from the monitoring program. The following analytes were discontinued as a result of Step A:

**Dioxins/Furans** (all but one compound)

**VOCs**

Acetone	Chloromethane	Methylene chloride
Benzene	Dibromochloromethane	MIK
Bromdichloromethane	Dichlorodifluoromethane	MTBE
Bromoform	1,1-DCA	Styrene
Bromomethane	1,2-DCA	1,1,2,2-Tetrachoroethane
MEK	1,1-DCE	Toluene
Carbon disulfide	trans-1,2-DCE	1,1,2-TCA
Carbon tetrachloride	1,2-Dichloropropane	1,1,1-TCA
Chlorobenzene	cis-1,3-Dichloropropene	TCE
Chloroethane	trans-1,3-Dichloropropene	Trichlorofluoromethane
Chloroform	Ethylbenzene	Xylenes (m-, p-, and o-)
	2-Hexanone	

**Metals**

Antimony	Cobalt	Selenium
Barium	Copper	Silver
Beryllium	Magnesium	Vanadium
Cadmium	Mercury	Zinc
Calcium	Potassium	

**Explosives**

1,3,5-Trinitrobenzene	2-Amino-4,6-dinitrotoluene	4-Nitrotoluene
2,4,6 – Trinitrotoluene	2-Nitrotoluene	Nitrobenzene
1,3-Dinitrobenzene	3-Nitrotoluene	Tetryl
2,4-Dinitrotoluene	4-amino-2,6-dinitrotoluene	HMX
2,6-Dinitrotoluene		

## **Anions**

Fluoride

Ammonia

Perchlorate

Nitrite

Sulfide

Sulfate

Nitrate

In addition to the metals listed previously the following metals will also be discontinued from the monitoring program: aluminum, iron, manganese, sodium, and chloride. These elements are being removed because they are naturally occurring in high concentrations or they are unrelated to Area C activities. Sodium and chloride are suspected to result from road salting.

### STEP B – Determine frequency of sampling for remaining analytes

The remaining analytes were as follows:

- cis-1,2-DCE
- PCE
- VC
- Arsenic
- Chromium
- Lead
- Nickel
- Thallium
- RDX

The step consists of the following sub-steps:

B1 – Determine if analyte concentrations are increasing or decreasing. If the analyte concentrations are decreasing, the frequency of sample collection and analysis can be reduced to annual. The report notes the following: “If all results for an analyte in a well during the LTM were ND or below LOCs, the data were considered to be not increasing/consistent and no further evaluation was conducted.” If not then additional evaluation (below) was required.

B2 – Determine if concentrations are consistent with historical data.

If at least one detection for an analyte was above the LOC, the Mann-Whitney U test was performed. Based on results of the value of U the null hypothesis was either rejected (with at least 90 percent confidence it is concluded that contaminant concentration has decreased) or accepted (cannot be

concluded that concentration has decreased) and still further evaluation required. There were not sufficient results for analytes at some wells to complete the statistical analysis; the analysis will be completed at a future date.

The final evaluation involved examining the consistency of the average concentration of the four recent consecutive sampling data by comparing that average to the 95 percent (%) confidence window of the historical data. To do the data distribution for the historic data set had to be determined along with the confidence limits. A USEPA-approved statistical software program was used to calculate the 95 % upper confidence limits (UCLs). The 95% UCL was compared to the mean or maximum (in the case where the UCL exceeded the range of detected concentrations, or data set did not have sufficient number of observation, then the default maximum value was used). If the recent data set had at least two ND values then the maximum was compared to the 95% UCL instead of the mean. The report notes that: "Most of the historical data sets were small and did not yield any meaningful UCL statistics. Therefore, the concentration range of the historical data was used to compare to with the mean of the most recent data." Of the 25 well-analyte pairs that were tested, sampling frequency was reduced from semiannual to annual for five pairs. The remaining 20 pairs had the frequency continue on a semiannual basis. Of the 20 remaining pairs, two were subjected to further evaluation as part of Step C.

#### STEP C – Determine if analytes are present above trigger levels

Step C kicks in when (1) the average concentrations of an analyte in a well are above trigger levels and (2) the concentrations at that sampling point have shown a statistically significant increase over the span of the LTM program. Only two analyte-well pairs met that criteria. The trigger levels (except for lead and perchlorate) were based on the maximum concentration of the analyte detected during previous sampling events. For lead, the maximum detected concentration was 320 ug/L which is 60 times the ARAR; the trigger value was adjusted to 10 times the ARAR or 50 ug/L. Perchlorate was not previously detected in any of the monitored wells so the trigger level was set at twice the LOC or 10 ug/L. Neither of the analyte-well pairs failed the test and were thus retained for semiannual sampling.

Based on the analyses the following conclusions were drawn in the report:

- The major of the analyte concentrations in Area C wells are either decreasing or are consistent with previous data.

- There does not appear to be significant off-site migration of contaminants.