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Quad Cities Tritium

Late in 2007, Quad began investigating slightly elevated tritium levels in wells associated with its Groundwater Protection Initiative (GPI). At the time of the initial GPI sampling, the licensee believed that the tritium levels were associated with historical leaks and spills that had residual tritium contamination. However, after additional wells were placed, the licensee clearly identified that tritium was entering the groundwater via an ongoing leak associated with the condensate storage tank (CST) or underground piping. Wells placed near that area yielded results in the millions of picocuries per liter (pCi/l). The licensee's samples have not identified any other isotopes (i.e., gamma emitting radionuclides) in the groundwater. Perimeter wells near the site boundary have not detected any radioactivity leaving the restricted area; however, the licensee will need to closely evaluate its well placement based on the current plume and potentials for channeling.

Recently, the licensee began excavating soil near the Reactor Building, where it suspected the leakage. The radiation protection (RP) staff was surveying the area, as the soil was removed (intermittent surveys based on excavation). The licensee was using a vehicle with a suction device and multiple filtration systems to capture the soil and sediment (see example picture below).



The licensee had three persons working the excavation. Two visitor-badged individuals (no TLD/ED) were using shovels to loosen the soil, and one badged (w/TLD) was manipulating the arm that has the suction end. All should be considered radiation workers, and the individuals were trained qualified during the most recent outage. The two were badged as visitors for security purposes only. The area was not a designated RCA or RMA, so no formal RP controls were in place. Essentially, the RP staff performed routine surveys as the excavation occurred and instructed the workers to stop work if they identified water or anything abnormal. The

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individuals were instructed to walk through the building to the RCA entrance and monitor through the PCMs at the end of the day.

On about May 27, the workers encountered water and debris near the line and stopped work (about 10 feet of depth). When they monitored via the PCMs, the licensee identified contamination on the workers' clothing. No contamination was on the skin. The levels were in the 10K ballpark. The licensee will be sending the TLD out for processing and has also collected a bioassay from the individual, who is suspected to be the maximally exposed. The other two workers were rotating in-and-out of the area with their shovels, while the individual with the TLD was constantly working with the suction end of the truck. Very preliminarily, the licensee has estimated the maximum, effective dose field to be about 40 mrem/hr, with a bounding exposure time of about 45 - 60 minutes. Consequently, the upper bound would be about 40 mrem. The licensee will contact Wayne Slawinski and/or Steve Orth with the TLD results later in the week.

The RP department surveyed the excavation area and identified very elevated levels of radiation, well beyond that seen anywhere else in the industry. The most recent survey documents external levels of up to 170 millirem per hour (mrem/hr) at contact and 140 mrem/hr at 30 cm. The RP staff is controlling and posting the area as a high radiation area. The area is tented off with plastic covering. The licensee is also posting the truck as a radiation area and will be bringing it into the building for evaluation and potential decontamination. The licensee performed surveys at the exhaust of the truck and verified that no contamination was present, validating that the filtration system was effectively containing the material.

Soil in the area has very significant dose rates (see survey). Most of the radiation is from a very small area of soil, but the licensee has to determine the full characteristics (including depth). A bucket of soil has dose rates of up to 70 mrem/hr on contact. The gamma spectroscopy results indicate very high levels of cobalt-60 ($2.7E-3$ microcuries per gram) and cesium-137 ($1.3E-2$ microcuries per gram). The licensee estimates that the leak must have been active for a number of years to accumulate that level of contamination, based on source term in the tank and the decay of the nuclides. The licensee has not had significant levels of those nuclides in the tank for at least 10 years. The licensee indicated that the material consists of very, very fine silt that appears to have provided very effective filtration of the leakage.

The licensee plans to continue work in the area under very rigorous RP controls. The tented area will have access from the Reactor Building airlock. The workers will be donning protective clothing and full dosimetry/RWP controls. The licensee plans to have air sampling within the tented area and outside to monitor for any potential airborne release (to workers or environment). Based on the weather, the work will begin in the next few days.

The licensee will be evaluating the cause of the line leakage and the extent of the condition. Very preliminary thoughts are that debris was left in the area while the High Radiation Sampling System building was installed post-TMI. The debris rubbed against the stainless steel piping from vibrations from the Turbine Building and mechanically damaged the piping. The licensee will be investigating further, and the Plant Support Team will be following closely.

Also, in 1999, the same area was excavated and
App R pipes transition were added and possibly
introducing more debris in the underground
area.

CURRENT DATE: 27-MAY-2008 17:25:23.94
STATION NAME: QUAD-CITIES

SAND FROM TRITIUM LEAK

Water

SPECTRUM FILE.....: SYSSYSDEVICE:[CRU.SAMP]DTP787_SAMP_763.CNF;1
NUCLIDE LIBRARY.....: GENLIQ
PEAK SEARCH SENSITIVITY..: 4.66000
SAMPLE DATE AND TIME....: 27-MAY-2008 13:30:00.00
ACQUISITION DATE/TIME...: 27-MAY-2008 16:28:03.97
ELAPSED LIVE TIME.....: 0 00:10:00.00
ELAPSED REAL TIME.....: 0 00:57:12.67
DURATION OF DECAY: 0 02:58:03.97
% DEAD TIME.....: 82.521
SAMPLE VOLUME/MASS.....: 4.90000E+02 gm
BKGD SUB PERFORMED.....: NO
BKGD SUBTRACTION FILE.....

footprint
Compare with CCST
historical isotopic data

ANALYST'S INITIALS.....: MJH COLLECTOR'S INITIALS....: MS
DETECTOR SERIAL NUMBER..: DTP787 GEOMETRY.....: XXMAR250
ENERGY CALIB GAIN.....: 4.99904E-01 ENERGY CALIB OFFSET.....: 4.86560E-01
EFFICIENCY PARAMETER 1...: 9.62049E+02 EFFICIENCY PARAMETER 2...: -3.97559E+00
EFFICIENCY PARAMETER 3...: 9.83220E-01 EFFICIENCY PARAMETER 4...: -2.09274E-01
EFFICIENCY PARAMETER 5...: -3.33778E-01 EFFICIENCY PARAMETER 6...: 4.10867E-01
EFFICIENCY PARAMETER 7...: -1.15125E-01

REMARK.....:

Analyst Review: *MJH* Date: 5.27.08
Chemist Review: *MS* Date: 5/28/08

Summary of Nuclide Activity

Total number of lines in spectrum 15
Number of unidentified lines 8
Number of lines tentatively identified by NID 7 46.67%

Nuclide Type : AP

Nuclide	Hlife	Decay	Wtd Mean Uncorrected UCI/gm	Wtd Mean Decay Corr UCI/gm	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
MN-54	312.14D	1.00	5.865E-06	5.867E-06	2.137E-06	36.42	
CO-60	5.27Y	1.00	2.681E-03	2.681E-03	0.151E-03	5.62	
CO-60	12.70H	1.21	5.464E-03	6.593E-03	1.108E-03	16.80	
ZN-65	243.90D	1.00	2.222E-05	2.222E-05	0.601E-05	27.04	
Total Activity :			3.173E-03	9.302E-03			

deleted after reviewing spectrum

Nuclide Type : FP

Nuclide	Hlife	Decay	Wtd Mean Uncorrected UCI/gm	Wtd Mean Decay Corr UCI/gm	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
CS-137	30.00Y	1.00	1.331E-02	1.331E-02	0.079E-02	5.90	
Total Activity :			1.331E-02	1.331E-02			

Grand Total Activity : 2.149E-02 2.252E-02

CURRENT DATE: 28-MAY-2008 12:06:39.11
STATION NAME: QUAD-CITIES

TRITIUM PIT AIR SAMPLE

SPECTRUM FILE.....: SYSSYSDEVICE: [CRU.SAMP]DTP787_SAMP_812.CNF;3
NUCLIDE LIBRARY.....: PARTICULATE
PEAK SEARCH SENSITIVITY..: 4.66000
ACQUISITION DATE/TIME....: 28-MAY-2008 11:56:08.74 -
ELAPSED LIVE TIME.....: 0 00:10:00.00 -
ELAPSED REAL TIME.....: 0 00:10:01.95 -
DURATION OF DECAY.....: 0 02:36:08.74 -
% DEAD TIME.....: 0.32395
SAMPLE VOLUME/MASS.....: 5.44990E+06 cc -
SAMPLE FLOW ON.....: 2.8300 -
SAMPLE FLOW OFF.....: 2.8300 -
SAMPLE TIME ON.....: 28-MAY-2008 08:12:00.00 -
SAMPLE TIME OFF.....: 28-MAY-2008 09:20:00.00 -
ANALYST'S INITIALS.....: PD - COLLECTOR'S INITIALS.....: CE -
DETECTOR SERIAL NUMBER...: DTP787 - GEOMETRY.....: 03POINT -
ENERGY CALIB GAIN.....: 4.99806E-01 - ENERGY CALIB OFFSET.....: 5.00664E-01
EFFICIENCY PARAMETER 1...: 9.47800E+02 EFFICIENCY PARAMETER 2...: -4.66160E+00
EFFICIENCY PARAMETER 3...: 7.99261E-01 EFFICIENCY PARAMETER 4...: 4.00788E-03
EFFICIENCY PARAMETER 5...: 3.49018E-02 EFFICIENCY PARAMETER 6...: -3.74472E-04
EFFICIENCY PARAMETER 7...: -1.44708E-02

REMARK.....:

Analyst Review: _____ Date: 5-28-8
Chemist Review: _____ Date: 5-29-08

Summary of Nuclide Activity

**** There are no nuclides meeting summary criteria ****

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Post-NID Peak Search Report
***** No peaks found *****

Meets RET'S LLD'S.
