**Issue/Title:** Pilgrim Nuclear Power Station (PNPS): Tritium in Groundwater Monitoring Wells

**Topic:** PNPS Updates as of October 18, 2013

**Previous Plans:** Results from groundwater monitoring well samples collected during the weeks of August 26, 2013 and September 9, 2013 were reported by Entergy. Split sample results for the weeks of August 26, 2013 and September 9, 2013 were also reported by MERL.

**Current Status:**

Table 1[1]: Week of August 26th

| Location | Date | MERL pCi/L | GEL pCi/L |
|---|---|---|---|
| MW 201 | 08/26/2013 | NDA(300)* | NDA(381)* |
| MW 202 | 08/26/2013 | 429 | 393 |
| MW 202 I | 08/26/2013 | 615 | 474 |
| MW 203 | 08/26/2013 | - | - |
| MW 204 | 08/26/2013 | 614 | NDA(371)* |
| MW 205 | 08/26/2013 | 381 | NDA(384)* |
| MW 206 | 08/26/2013 | 308 | NDA(378)* |
| MW 207 | 08/26/2013 | 504 | NDA(384)* |
| MW 208-S | 08/26/2013 | 343 | NDA(369)* |
| MW 208-I | 08/26/2013 | 330 | NDA(369)* |
| MW 209 | 08/26/2013 | 1,035 | 470 |
| MW 210 | 08/26/2013 | 707 | 552 |
| MW 211 | 08/26/2013 | 1,307 | 1,090 |
| MW 212 | 08/26/2013 | 536 | NDA(376)* |
| MW 213 | 08/26/2013 | 322 | NDA(368)* |
| MW 214 | 08/26/2013 | NDA(300)* | NDA(370)* |
| MW 215 | 08/26/2013 | 1,045 | 998 |
| MW 216 | 08/26/2013 | 4,676 | 4,360 |
| MW 217 | 08/26/2013 | 548 | NDA(373)* |
| MW 3 | 08/26/2013 | 304 | NDA(369)* |
| MW 4 | 08/26/2013 | 832 | 762 |
| SW-boat ramp | 08/26/2013 | NDA(300)* | NDA(360)* |
| SW-intake | 08/26/2013 | NDA(300)* | NDA(384)* |

Table 2: Week of September 9th

| Location | Date | MERL pCi/L | GEL pCi/L |
|---|---|---|---|
| MW 201 | 09/09/2013 | 373 | NDA(368)* |
| MW 202 | 09/09/2013 | - | - |
| MW 202 I | 09/09/2013 | - | - |
| MW 203 | 09/09/2013 | - | - |
| MW 204 | 09/09/2013 | - | - |
| MW 205 | 09/09/2013 | 632 | NDA(376)* |
| MW 206 | 09/09/2013 | NDA(300)* | NDA(364)* |
| MW 207 | 09/09/2013 | - | - |
| MW 208-S | 09/09/2013 | - | - |
| MW 208-I | 09/09/2013 | - | - |
| MW 209 | 09/09/2013 | 874 | 797 |
| MW 210 | 09/09/2013 | - | - |
| MW 211 | 09/09/2013 | 1,188 | 1,350 |
| MW 212 | 09/09/2013 | - | - |
| MW 213 | 09/09/2013 | - | - |
| MW 214 | 09/09/2013 | - | - |
| MW 215 | 09/09/2013 | 1,134 | 1,130 |
| MW 216 | 09/09/2013 | 3,935 | 3,330 |
| MW 217 | 09/09/2013 | - | - |
| MW 3 | 09/09/2013 | - | - |
| MW 4 | 09/09/2013 | - | - |
| SW-boat ramp | 09/09/2013 | - | - |
| SW-intake | 09/09/2013 | NDA(300)* | ** |

*** NDA = not detected at less than activity value listed**

**** Analysis pending**

**- not analyzed this week**

[1] PNPS screening level for tritium in groundwater monitoring wells is 3,000 pCi/L, which is 1/10th of the NRC-approved Pilgrim Offsite Dose Calculation Manual standard for tritium in non-drinking water sources. The EPA drinking water standard is 20,000 pCi/L. The nearest drinking water wells are approximately 2.5 miles from the plant.

The groundwater monitoring results for MW205 reported by Entergy show no tritium was detected during the weeks of August 26th and September 9th (the previous result during the week of August 19th also indicated no detectible tritium). Entergy results show that for the weeks of August 26th and September 9th no tritium was detected in MW206 (the previous result during the week of August 19th also indicated no detectable tritium). Weekly sampling results for MW216, MW209, and MW211 are discussed below. Results for most other wells sampled during the weeks of August 26th and September 9th were within typical ranges detected since the groundwater monitoring for tritium began. It should be noted that the week of August 26th was a comprehensive sampling round that included all wells with the exception of MW203, which was inaccessible due to equipment blocking access to it. MERL split sample results for the weeks August 26th and September 9th were generally consistent with Entergy's results.

Since its installation in September 2012, MW216 has been sampled weekly. MW216 continues to trend higher than most other groundwater monitoring wells on site. The most recent Entergy results for MW216 indicated 3,330 pCi/L of tritium detected the week of September 9, 2013 and 5,720 pCi/L of tritium detected the week of September 16, 2013. MERL split sample results for MW216 for the week of September 9, 2013 were generally consistent with Entergy results and MERL split sample results for the week of September 16, 2013 are currently being analyzed by MERL. As previously noted, potential sources of tritium in groundwater in the area of MW216 include roof drain run off, the radwaste discharge line, the residual effects of a historical spill in the area (that Entergy reported was remediated at the time of the spill), or a possible connection to the neutralization sump discharge line (which was confirmed to be separated) on the other side of the reactor building via a duct bank. Entergy is working with their hydrogeology contractor to identify additional investigation plans to further evaluate possible sources of tritium detected in MW216. For example, Entergy reported that dissolved oxygen and conductivity levels routinely measured in all groundwater monitoring wells differ for MW216 and is working with their contractor to better understand what this may mean in terms of identifying a potential source.

Weekly sampling results for MW209 and MW211 continue to indicate that tritium levels appear to be trending slightly with MW216. The most recent Entergy results for MW209 indicated 797 pCi/L of tritium detected the week of September 9, 2013. The most recent Entergy results for MW211 indicated 1,350 pCi/L of tritium detected the week of September 9, 2013. Entergy samples for MW209 and MW211 for the prior week of September 2, 2013 are still being analyzed by their contract lab. MERL split sample results for MW209 and MW211 for the week of September 2, 2013 indicated 834 pCi/L and 1,207 pCi/L of tritium detected, respectively. MERL split sample results for MW209 and MW211 for the week September 9, 2013 were generally consistent with Entergy results.

Entergy surface water sampling results for the intake canal downstream of MW205 for the week of August 26th indicated no detectable tritium and the Entergy surface water sample for the intake canal downstream of MW205 for the week of September 9th is currently being analyzed by their contract lab. Entergy sample results for the quarterly surface water sample location in the boat ramp area for the week of August 26th also indicated no detectable tritium. MERL split sample results for the week of August 26th indicated no detectible tritium at both surface water locations and the MERL split surface water sample results for the intake canal downstream of MW205 for the weeks of September 9th also indicated no detectable tritium.

Final results of soil samples collected as part of the neutralization sump discharge line investigation are still pending from Entergy. Soil samples were collected the week of July 15th from excavations down to the pipe in three locations along the discharge line (i.e. at the separation, approximately 10 feet from catch basin 10 [CB10], and at CB10). The soil samples have been shipped to Entergy's lab to be analyzed for gamma radionuclides (i.e. in pCi/kg), for tritium, and for hard-to-detects (e.g., strontium-90). Split soil samples have been received by MERL for analysis (gamma only). Entergy has reported that preliminary analyses indicate the presence of tritium in soil at the separation excavation, but quantitative analyses have not yet been completed. Gamma analyses of split soil samples conducted by MERL indicated the presence of cobalt-60

and cesium-137 above typical background levels in soil. Cobalt-60 (maximum 1,150 pCi/kg at a depth of 6.5 feet vs. non-detect in typical background soil) and cesium-137 (maximum 2,490 pCi/kg at a depth of 6.5 feet vs. 10 to 1000 pCi/kg in soils nationwide due to historical fallout from atomic bomb testing) were present in subsurface soil samples collected at 3, 5, and 6.5 feet below ground surface from the separation excavation. Gamma results from MERL split soil samples from the other two locations were either non-detect or at background levels. Since the other soil sample locations less than 50 feet away downgradient from the separation point indicated cobalt-60 and cesium-137 levels that were not above background and comprehensive groundwater samples that were analyzed for a full suite of contaminants (i.e. gamma and hard-to-detects) available to date from all monitoring wells were non-detect for cobalt-60 and cesium-137, it is unlikely that these contaminants have migrated beyond the general area of the break. However, the presence of cobalt-60 and cesium-137 from the neutralization sump discharge line separation excavation location indicates the need for further investigation or remediation of the potential source(s) given that the neutralization sump discharge line had previously been reported to contain only tritiated water.

As previously reported, the ongoing investigation of the neutralization sump discharge line includes plans to install two new groundwater monitoring wells, one near the area of the separation to be installed between MW211 and the reactor building auxiliary bay, and another near catch basin 10 (CB-10). Transducers are also being considered for these wells and for some existing wells when the new wells are installed. Also, Entergy will be replacing MW4 with a deeper well which will make it more consistent with the other groundwater monitoring wells on site. Installation of these wells is planned to begin the week of November 4$^{th}$. At MDPH's suggestion, the installation of a deeper intermediate well to characterize the lower water table in the area of the neutralization sump discharge line is also being considered. Additional ground-penetrating radar will be required prior to installation of the deeper well so that an appropriate location can be identified. Soil samples will be collected from the well excavation sites concurrently with well installation. Also, Entergy plans additional soil samples from the area of the

neutralization sump discharge line break to better characterize any potential soil and/or groundwater contamination.  A representative from MDPH will be present to observe well installation and soil sampling activities.

**Looking Forward:**

MDPH will continue to closely follow all investigational activities that are currently underway at PNPS, notably any developments concerning the neutralization sump discharge line, MW216, the planned installation of new wells, and planned additional soil sampling.