

**Request for Additional Information regarding the Humboldt Bay April 1, 2020, submittal of “Final Status Survey Report for the Humboldt Bay Power Plant Reactor Caisson Survey Unit”**

**RAI-1)** The licensee should provide final concentration information for residual radioactivity in the groundwater media.

**Basis:** In the LTP, the licensee identifies the average member of the critical group as a “resident farmer who lives on the Humboldt Bay site following decommissioning, grows all or a portion of his/her diet onsite, and uses the water from a groundwater source on the site for drinking water and irrigation.” Section 2.2.2 of the LTP states that “based on the state of decommissioning, isolation of the Caisson and removal of the source term from plant support structures, there is little potential for ground water to become contaminated during these final stages of decommissioning. Ground water monitoring wells that are identified in this procedure are being phased out as decommissioning progresses.” However, as noted in the licensee’s submittal, the NE Well was a source of residual radioactivity to the surrounding gravel pack and likely to the groundwater as well. For this reason, staff are requesting additional information with regards to the contaminant levels found or expected to be found in groundwater. This information is needed to determine compliance with 10 CFR 20.1402.

**Path forward:** While the DCGLs were developed considering the groundwater pathway, the assessment provided ignores any potential residual radioactivity in the ground water media. If only negligible levels of residual radioactivity are present, this is acceptable but needs to be shown or discussed. The licensee should provide final concentration information regarding the groundwater media.

**RAI-2)** The licensee should provide summary information for all Radionuclides of Concern for each of the various media evaluated to assess potential exposure considered in this submittal and/or clarification that the deselected radionuclides in Table 2.7 should be applied to the other elements in the submittal, as needed.

**Basis:** Staff noted that, of the Radionuclides of Concern (ROCs) identified in the LTP Table 6-4, the licensee often disregards reporting of many ROCs when summarizing survey data in the submittal. Specifically, in Tables 3.1, 3.3, and 1.1 of the submittal, many ROCs are not tabulated nor discussed. This information is also lacking in the NE Well dose evaluation document (NX-503, Rev 0). Many of the “missing” ROCs (but not all) were selectively disregarded as noted in text and in Table 2.7 of the submittal and were then accounted for as a separate item when assessing survey unit NOL01-09-FSR. NRC staff are now requesting the additional missing information regarding the ROCs. This information is needed to determine compliance with 10 CFR 20.1402.

**Path Forward:** Staff presume that the licensee intended for the radionuclides disregarded in Table 2.7 of the submittal to be similarly considered for the other separately assessed media addressed in this submittal when no data was summarized for those specific radionuclides. While Staff understand the desire to disregard radionuclides which do not exceed the MDC in samples, Staff note in this case that the MDC required of samples analyzed by the licensee was maximally 10% of the DCGL values as per Section 5.4.4.4.6 of the LTP. This means that multiple unreported radionuclides could combine to significantly impact the dose evaluation of the survey unit and should be considered even if results are less than the MDC values which is

consistent with MARSSIM. A spreadsheet is attached which highlights the data gaps in Tables 3.1, 3.3, and 1.1 of the submittal as well as in the Results table of NOX-503, Rev O.

**RAI-3)** The licensee should provide justification for why it disregards anomalies within the survey unit such as the 0.03 uCi “anomaly” it removed from the investigative sample split with ORISE.

**Basis:** This information is needed to determine compliance with 10 CFR 20.1402.

**Path Forward:** When analyzing investigative samples, the licensee noted it removed an anomaly of ~0.03 uCi prior to analyzing the sample. The licensee should explain their justification for not analyzing the sample as collected. Also, the licensee should provide its justification for disregarding anomalies such as this in their assessment of potential exposure in a survey unit.

**RAI-4)** The licensee should provide data that addresses the bulk of the backfill material for the Caisson excavation and demonstrate that the reuse material, on average, is less than the DCGLs.

**Basis:** Staff have noted that the submittal lacks data for the bulk of the reuse/backfill material used to fill the excavation for the Reactor Caisson and which originated from Class 1 areas of the site. The summary for survey unit NOL01-09 contains data for the bottom of the excavation while the summary for survey unit NOL01-09-FSR has data for the top 6” of backfill material. This leaves almost 75’ of backfill material within the caisson excavation somewhat unaddressed and the material originated in Class 1 areas. The licensee has discussed the Guardian system and its use as a scanning equivalence for the bulk of the material but has also acknowledged that the system, which is effectively a bulk measurement system, has in the past missed significant spots of elevated residual radioactivity within the trucks of material being assessed. The licensee has also claimed that the material is well mixed due to the process of collection/storage/and placement such that surface samples are representative of all the backfill materials. Unfortunately, staff cannot resolve the logic in that case because of the significant quantity of material and the fact the licensee did not perform representative sampling which would have occurred randomly throughout the volume of the backfilled material instead of just the surface of the material after placement). This information is needed to determine compliance with 10 CFR 20.1402.

**Path Forward:** Data to show the backfill material meets DCGLs could originate from samples of borings into the backfill, from remediation support sampling as the backfill material was being collected, or some other source unknown to Staff but which is applicable to this backfill material in general. The data summary should include average, median, range, and standard deviation. The licensee should provide a description of the survey process and quality controls to determine the average residual radioactivity in the backfill soil and materials. The licensee should seek NRC staff concurrence for the methods or data which it plans to obtain/generate/use to avoid unnecessary work.

**RAI-5)** The basis for the use of the results from Sediment Sample 2018-0370 to calculate the dose from the residual radioactivity in the gravel pack is needed.

**Basis:** For the NE Well dose estimate (NX-503, Rev 0), the licensee used the results from Sediment Sample 2018-0370 to calculate the dose from the residual radioactivity in the gravel pack vs Sediment Sample 2018-0373. However, the basis for choosing that sample (i.e., why is this sample thought to be the most representative of the material in the gravel pack) was not provided in writing to the NRC. The use of data from a different sample, Sediment Sample 2018-0373, could result in a higher estimated potential exposure from residual radioactivity in the well. For this reason, the licensee should provide a written basis for why sample 2018-0370 was chosen as the basis for the evaluation instead.

This information is needed to verify compliance with 10 CFR 20.1402.

**Path Forward:** For the NE Well dose estimate (NX-503, Rev 0), the licensee should provide the basis for using the results from Sample 2018-0370 to calculate the dose from the residual radioactivity in the gravel pack vs Sample 2018-0373 (i.e., why is this sample thought to be the most representative of the material in the gravel pack). As part of this basis, the licensee should address the depth at which the samples were taken in the well vs where the gamma measurements were highest, the operational history of the well, and any other factor that was considered when selecting this sample for the dose calculation.

**RAI-6)** For the NE Well dose estimate (NX-503, Rev 0), the licensee should provide the basis for assuming that the concentration in the gravel pack is equal to 19% of the amount in the sample.

**Basis:** The calculation of the potential dose from residual radioactivity remaining in the NE Well was based on the activity of residual radioactivity in the gravel pack in the well being equal to 19% of the activity in a sample taken from the well. Staff note that this 19% value was generated by comparing the modeled dose rate from the sample to the measured dose rate in the well. It is theoretically possible that the measured dose could be lower than the projected dose due to heterogeneous distributions of the material in the gravel pack and shielding from the gravel. Staff further note that gravel is not normally considered “soil” when collecting environmental samples for final status surveys and the licensee’s evaluation did not address uncertainties such as this that may affect their measurements. A written basis for the assumption that the concentration of residual radioactivity in the gravel pack would not exceed 19% was not explicitly provided in the licensee’s submittals.

This information is needed to determine compliance with 10 CFR 20.1402.

**Path Forward:** A written basis for the assumption that the concentration in the gravel pack would not exceed 19% of the concentration in the sample should be provided. Information such as the physical process that could result in the concentrations being less in the gravel pack than in the sample from the well would help staff consider the licensee’s evaluation. Additionally, provide information on whether or not higher concentrations of material could exist in the gravel pack and the basis for this conclusion (e.g., considering the measurement uncertainties, operating history of the well, the nature of the residual radioactivity, and flow conditions observed in the well, gravel pack, and surrounding area).

**RAI-7)** Given the adjustments previously discussed with respect to the NE Well dose estimate, the licensee should provide a revised dose for the survey unit and a revised version of any calculations done to generate this dose.

**Basis:** In the email sent in after the May 1<sup>st</sup> call, it was stated that there was an error in the value reported for the NE well dose and a new dose was reported. The licensee should submit the revised total survey unit dose, the revised NE Well dose, and any calculations used to generate this dose on the docket. The licensee should provide clarification of the previously stated “31% of the DCGL<sub>emc</sub>” for the NE Well and how that value was considered in the survey unit dose. Also, the calculation in NX-503 appears to only have a result in terms of the sum of fractions and not a dose result; it would be clearer to have the steps of the dose calculation written out. Several times in the submittal (e.g., Sections 1.3.3 and 1.3.4 of the submittal), the licensee states the wells were “excluded” from survey unit NOL01-09. Please clarify how the well dose was considered in the survey unit.

This information is needed to determine compliance with 10 CFR 20.1402.

**Path Forward:** Provide the revised total survey unit dose, the revised NE Well dose, and any calculations used to generate this dose. Provide clarification of the submittal statement of “31% of the DCGL<sub>emc</sub>” for the NE Well and how that value was considered in the survey unit dose. Provide details on how the sum of fractions result in the calculation in NX-503 was used to generate the dose result.

**FYI)** For informational purposes only: It appears when assessing the various element’s dose contributions, that the licensee included negative analytical results in determining the dose (e.g., when determining a sum of fractions which is a comparison to dose based DCGLs). This does not appear suitably conservative nor consistent with what a negative analytical result should imply when assessing potential exposures (negatives values should correspond to no increased exposure as opposed to a decrease of exposure). While the difference is small and relatively inconsequential in this case, it is an inappropriate practice. NRC staff acknowledge that negative analytical values may be used to generate summary statistics (or for statistical tests) for contaminant concentrations in a survey unit consistent with MARSSIM; however, use of negative values when determining a SOF from average contaminant concentration is inappropriate (i.e., averages that are derived to be less than 0 should be set to 0). Regardless, the impact should be relatively minor as any negative “averages” should have a value relatively close to zero. NRC staff anticipate a need, in this case, to quantify the bias this practice introduces to explain why it has only minor impact and adjust applicable guidance to clarify why this practice is inappropriate in the future.