

April 2, 2021

ZS-2021-0010

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Zion Nuclear Power Station, Units 1 and 2  
Facility Operating License Nos. DPR-39 and DPR-48  
NRC Docket Nos. 50-295 and 50-304

**Subject: Supplement to Revised Response to Request for Additional Information Related to Final Status Survey Final Reports**

**References:**

- 1) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Final Status Survey Final Report - Phase 2, Part 1," dated March 11, 2019
- 2) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Revised Final Status Survey Report- Phase 2," dated September 30, 2019
- 3) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Revised Final Status Survey Report- Phase 2 Part 2," dated November 25, 2019
- 4) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Revised Final Status Survey Final Reports and Related Release Records as Referenced in the Response to the Request for Additional Information for the Final Status Survey Final Reports for Phases 2a, 2b, and 3," dated June 4, 2020
- 5) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Final Status Survey Report- Phase 3," dated December 30, 2019
- 6) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Revised Final Status Survey Release Records for Four Phase 3 Survey Units," dated April 30, 2020
- 7) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Final Status Survey Report- Phase 4," dated May 1, 2020
- 8) John B. Hickman, U.S. Nuclear Regulatory Commission, Letter to John Sauger, *ZionSolutions*, "Zion Nuclear Power Station Units 1 and 2 - Request for Additional Information Related to Final Status Survey Reports Phase 2A, 2B, and 3," dated April 20, 2020
- 9) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information Related to the Final Status Survey Final Reports for Phases 2a, 2b, and 3," dated May 15, 2020
- 10) John B. Hickman, U.S. Nuclear Regulatory Commission, Letter to John Sauger, *ZionSolutions*, "Zion Nuclear Power Station Units 1 and 2 - Request for Additional Information Related to Final Status Survey Reports," dated November 4, 2020
- 11) Gerard van Noordennen, *ZionSolutions*, Letter to U.S. Nuclear Regulatory Commission, "Response to Request for Supplemental Information and Request for Additional Information Related to Final Status Survey Final Reports," dated November 11, 2020

- 12) John B. Hickman, U.S. Nuclear Regulatory Commission, Letter to John Sauger, ZionSolutions, "Zion Nuclear Power Station Units 1 and 2 – Request for Additional Information Related to Final Status Survey Reports," dated December 17, 2020
- 13) Gerard van Noordennen, ZionSolutions, Letter to U.S. Nuclear Regulatory Commission, "Revised Response to Request for Supplemental Information and Request for Additional Information Related to Final Status Survey Final Reports," dated February 10, 2021

The Zion Station Restoration Project (ZSRP) License Termination Plan (LTP), Section 5.11, states that the Final Status Survey (FSS) Final Report will be provided to the NRC in phases as remediation and FSS are completed with related portions of the site. The FSS Final Report and Revised FSS Final Reports for Phase 2, Parts 1 and 2, were submitted for NRC review, as documented in References 1, 2, 3, and 4. The FSS Final Report and Revised FSS Final Report for Phase 3 were submitted to the NRC for review as documented in References 5 and 6. The FSS Final Report for Phase 4 was submitted to the NRC for review as documented in Reference 7.

The NRC staff began its review of FSS Final Reports for Phases 2a, 2b, and 3 and determined that additional information was required to complete its review. ZionSolutions received a Request for Additional Information (RAI) from the staff on April 20, 2020 (Reference 8). On May 15, 2020, ZionSolutions responded to the RAI as documented in Reference 9.

The NRC staff later determined that additional information was required to complete its review of the FSS Final Reports. On October 1, 2020, during a project status call and on October 8, 2020, during a follow-up clarification call, the staff verbally communicated the informal request for supplemental information. In addition, ZionSolutions received a formal Request for Additional Information (RAI) from the staff on November 4, 2020 (Reference 10). On November 11, 2020, ZionSolutions responded to the RAI as documented in Reference 11. The NRC staff performed an acceptance review and determined a revision to the response was required to complete its review. ZionSolutions received a request for additional information on December 17, 2020 as documented in Reference 12. On February 10, 2021, ZionSolutions responded by providing revised responses to the requested supplemental information and the RAI as documented in Reference 13.

On February 17<sup>th</sup>, during a follow-up call, the staff requested supplemental radiation protection data. On March 18, 2021 and March 25, 2021, during project status calls, the staff verbally communicated the request for supplemental information. On March 30, 2021, the Project Manager sent a request for supplemental information via email. The purpose of this letter is to provide the supplemental information to support the staff's review of the FSS Final Reports. Responses to the information requests are provided in the attachment to this letter. Supporting documents, referenced in the responses, are provided on the enclosed CD.

There are no regulatory commitments made in this submittal. If you should have any questions regarding this submittal, please contact me at (860) 462-9707.

Respectfully,

*Gerard P. Van Noordennen*

Gerard P. Van Noordennen  
Apr 2 2021 4:54 AM

Gerard van Noordennen  
Senior Vice President Regulatory Affairs

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**Attachment: Supplemental Information Related to the Final Status Survey Final Reports**

**Enclosure: CD Containing Supporting Documents for Supplement to Revised Response to Request for Additional Information Related to Final Status Survey Final Reports**

**cc: John Hickman, U.S. NRC Senior Project Manager  
Regional Administrator, U.S. NRC, Region III  
Zion Nuclear Power Station, Units 1 and 2 Service List**

## Zion Nuclear Power Station, Units 1 and 2 Service List

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**Zion Nuclear Power Station, Units 1 and 2**

**Supplemental Information Related to the  
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Supplement to Revised Response to Request for Additional Information Related to Final Status Survey Final Reports

### **February 17<sup>th</sup> Call**

**NRC Request 1:** Provide additional radiation protection data, including RRA Surveys (2017-2019), ODCM Environmental Monitoring Program TLD locations, 2019 and 2020 Environmental Reports, and SWYD maintenance data.

**ZionSolutions Response:** Requested information is provided on the enclosed CD (i.e., 2017 ENV TLDs, 2018 ENV TLDs, SWYD Main, RRA Surveys, and TLD Data).

### **March 18<sup>th</sup> Status Call**

**NRC Request 2:** Provide additional information and photographs concerning the DRPs and their source in survey units 10214E and 10214F.

**ZionSolutions Response:** Two condition reports (CRs), ES-ZION-CR-2019-0030 and ES-ZION-CR-2019-0166, documenting the identification of discrete radioactive particles (DRPs) in Class 2 survey units 10214D (subsequently Class 1 survey unit 10214E) and 10214C (subsequently Class 1 survey unit 10214F), are provided to the NRC on the enclosed CD (i.e., Response to Request 2 SU10214). Additionally, the Classification Worksheet and Classification Summary forms that document the creation of Class 1 survey units 10214E and 10214F have been provided on the enclosed CD (i.e., Response to Request 2 SU10214).

In March and November of 2019, the DRPs were discovered while performing radiological assessments in the site parking lot (10214). The response to NRC Question #7 on Attachment 1 of ZS-2021-0001 attributes the source of the particles to the events in 2014 and 2015 (documented in CR-2014-001074 and CR-2015-000324). The DRPs were spread throughout the site by water and heavy equipment. ZionSolutions contends that particles from these events migrated to the drainage ditch in survey unit 10212D by means of water and, in turn, after the flooding of the drainage ditch in late 2018, spread to areas of survey units 10212, 10213, and 10214. In this case, two particles from the flooding event settled in survey unit 10214. The timeline of every significant event in survey units 10212, 10213, and 10214 was provided in "Drainage Ditch Flood Timeline" on the enclosure to ZS-2021-0001.

The NRC reviewers requested that, if possible, a map be provided that traced the routes of vehicles moving to and from the Radiologically Restricted Area (RRA). ZionSolutions cannot provide the requested map, as vehicles were not tracked outside of the RRA. However, all vehicles exiting the RRA were required to successfully go through the truck monitor, and the probability of particles leaving the RRA in any method other than described above is very low.

**NRC Request 3:** Provide information on the location of investigational samples in Survey Unit 10223

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**ZionSolutions Response:** A map that depicts the two investigational samples in Survey Unit 10223 is provided on the enclosed CD. A more recent aerial photo was not available. Instead, we have provided a few drone photos of the survey unit from October 2019 when the samples were collected. The photos clearly show that the survey unit was largely inaccessible due to the rise of the lake level. Sample 16 on the map is as close to FSS Sample 5 that it can be. Sample 15, on the other hand, was taken as an attempt to gather the same media (sand) as Sample 5. Even though Sample 15 is not necessarily close to Sample 5, it was the only sand media accessible. The map and photos are on the enclosed CD (i.e., Response to Request 3 SU10223).

**NRC Request 4:** Provide information on Post-CCDD Surveillances.

**ZionSolutions Response:** Surveillance summaries and gamma spectroscopy reports are provided for four Post-CCDD surveillances on the enclosed CD (i.e., CCDD Special Surveillances). In addition, the Excel spreadsheet, previously provided to the staff, regarding the surveillances was updated to include a data assessment; the spreadsheet is provided on the enclosed CD (i.e., Post-CCDD Surveillance Summary).

**NRC Request 5:** Provide a map depicting the Part 20, Part 50, and Part 72 areas/boundaries.

**ZionSolutions Response:** The attachment to ZionSolutions Letter ZS-2020-0011, *Supporting Information for the Phased Release of Land from the 10 CFR Part 50 License*, has been revised to include an updated map. Revision 3 of the Attachment to ZS-2020-0011 is provided on the enclosed CD (i.e., ZS-2020-0011 Attachment Rev 3).

### **March 25<sup>th</sup> Status Call**

**NRC Request 6:** Provide information on cutting tools used on reactor internals.

**ZionSolutions Response:** Information on cutting tools used on the reactor vessel internals is provided on the enclosed CD (i.e., Cutting Tools 1 thru 4). Documents include information on the Volume Reduction Station, Circumferential Hydraulically Operated Cutting Equipment, the Bolt Milling Tool, and the FaST Tools.

**NRC Request 7:** As a follow-up to a previous RAI Question 11, provide the spreadsheet used to determine the average activity of those DRPs identified on-site was approximately 0.21  $\mu\text{Ci}$  of Co-60.

**ZionSolutions Response:** The spreadsheet used to develop the estimate of 0.21  $\mu\text{Ci}$  is provided on the enclosed CD (i.e., DRP Location Data).

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**NRC Request 8:** Based on knowledge of onsite activities, describe how DRPs may have migrated (e.g., if cutting was done underwater, how did particles spread from the reactor vessel internals segmentation activities to other spaces)?

**ZionSolutions Response:**

DRP type material generated during reactor internals cutting was identified during mock-up training. The material was observed to move around in the bulk fluid randomly with most particles settling out on the floor; some particles were identified to become suspended on the surface of the water, most likely becoming trapped by the surface tension of the water surface. Underwater filtration was utilized over the course of the Reactor Internals Segmentation Project. Additional water filtration was designed and implemented mid-way through the Reactor Internals Segmentation Project. Trinuke filtration with skimmers were used intermittently to filter the surface of the water. Water purification was not adequate throughout the project to capture and remove particles generated during underwater cutting. Significant vacuuming of the cavity floor was required during both unit campaigns. Due to inadequate water filtration/purification, DRPs were made available to move around in the bulk fluid and also become suspended on the surface of the water. DRPs on the surface of the water were then available to migrate from the water to surrounding areas through evaporation, through air motion over the top of the water surface, or on equipment removed from the water that possessed areas not readily available to reach through rinsing/washing prior to removal, etc. An Issue Review (IR) that addresses some concerns with DRPs and the lack of decontamination and survey protocols for out of the water is enclosed (i.e., IR 2013-000764).

**March 30<sup>th</sup> Correspondence**

**NRC Request 9:** The Issue Review for CR-2013-000764 contains the results of a dose calculation for a 1.56 microcurie particle on an individual's cheek. The exposure duration is assumed to be from the time of entry to and exit from U2 containment RCA. The assigned dose was 1.98 mrem SDE, 17.4 mrem LDE, and 27.4 mrem DDE. Please provide the assumptions that were used for that calculation, such as the radionuclides contained in the particle, the exposure time, the particle size and geometry, and other parameters used in the calculation.

**ZionSolutions Response:** Enclosed is a copy of the Personnel Contamination Event Report (i.e., PCE 2013-061). With respect to geometry, there were no physical dimensions measured. The DRP was assumed to be a point source on the skin for dose modeling purposes. Co-60 was the only dose contributor assumed in the calculations. The DRP was assumed to have originated from the reactor internals cutting processes. Other radionuclides present would have been the same as those discussed in the WMG activation analysis report. As they are minor dose contributors, they were not included in the dose analysis.



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**NRC Request 10:** For response to RAI 11b, please provide the GPS coordinates for the discrete radioactive particles identified on the map “Particle Identification Overview,” which is on page 77 in ZionSolutions letter dated February 10, 2021. This map is for the surveys conducted in 2015. Please provide the GPS format of the coordination system, such as the Illinois State Plane.

**ZionSolutions Response:**

There are 77 discrete radioactive particles identified on the map, “Particle Identification Overview.” The map has been revised by labeling each DRP sequentially from no. 1 to no. 77. Additionally, a table has been created to provide the GPS coordinates for each of the DRPs. The activity for each DRP has been included in the table. Note, the Illinois State Plane coordination system was used for the GPS format. The map and table are provided on the enclosed CD (i.e., Response to Request 10 GPS).

**NRC Request 11:** Please clarify whether discrete radioactive particles were released to the environment during the performance of decommissioning activities before 2014, for example in 2012, as described in the response to RAI-11b in ZionSolutions letter dated November 11, 2020. Please include information on the location of discrete radioactive particles and include it in the map requested in item 4 below.

**ZionSolutions Response:** All of the DRPs identified outside over the course of the project have been included in the map and in the latest correspondences. The specific event communicated, occurring in 2014 and documented in CR-2014-001074, was related to the 8-120 liner activities in the south yard. CR-2015-000324 describes the identification and location of DRPs around the Reactor Buildings. It is these DRPs in which a specific spread of contamination event could not be identified. As the sources of these DRPs were assumed to be from the reactor internals segmentation processes in both Unit 1 and Unit 2 Reactor Buildings, the spread of contamination to areas outside of the Reactor Buildings could have occurred as early as 2012 once underwater reactor internals segmentation activities commenced in Unit 2. CR-2013-000764 describes the lack of contamination control within the Reactor Buildings during reactor internals segmentation activities. In late 2013, modifications were made within the RP Program to enhance the identification and decontamination of DRPs within the Reactor Buildings. These enhancements were continued throughout the rest of D&D. The deficiency associated with Reactor Building ventilation and the construction opening in each Reactor Building was not identified until 2019 timeframe as described in RAI 11 response. The potential for migration of DRPs from the Reactor Buildings to outside areas, as described in the RAI 11 response, was present from approximately 2012 to late 2016. To narrow down this window, the potential for migration of DRPs outside of the Reactor Buildings was greater between 2012 and 2014 as there was a much higher potential for DRPs to be present within the Reactor Buildings during this time frame.

**NRC Request 12:** Please provide a map showing discrete radioactive particle locations for all of the release events described in response to RAI-11b in ZionSolutions letters dated February 10,

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2021 and November 11, 2020. If possible, the GPS coordinates for the discrete radioactive particle locations should be provided also.

**ZionSolutions Response:**

A map that shows the locations where each DRP was identified cannot be created because a GPS reading was not always obtained when a DRP was found. However, a map was previously provided to the NRC that highlights each survey unit in which a DRP was identified (i.e., "Zion Survey Unit Particle Identification Map," provided February 2021).

**NRC Request 13:** Please clarify whether collimators were removed from portable survey instrument detectors, such as the Ludlum 44-10, for follow-up surveys conducted after a discrete radioactive particle is identified. This clarification is for a response to RAI 11b, which references use of Job Aid ZS-RP-JA-011 "Use of the M3-44-10 Gamma Detector for Discrete Radioactive Particles," which states in section 3.5.1 that a follow-up survey can be performed in the area without a collimator.

**ZionSolutions Response:** In reference to Job Aid ZS-RP-JA-011, Step 3.5.1: When collimators were used with portable survey instrument detectors, such as the Ludlum 44-10, during initial surveys, they were not removed when conducting follow-up surveys. Per Step 3.5.2, performance of Step 3.5.1 would be performed under direction of the RP Manager. The RP Manager was consulted; he confirmed he did not provide direction to remove the collimator for follow-up surveys.

***ZionSolutions***

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**Enclosure**

**Zion Nuclear Power Station, Units 1 and 2**

**CD Containing**

**Supporting Documents for Supplement to Revised Response to Request for  
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**Zion Solutions**

**ZS-2021-0010**

**Enclosure**

**Zion Nuclear Power Station, Units 1 and 2**

**CD Containing**

**Supporting Documents for Supplement to Revised Response to Request for  
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