



July 28, 2022

LS-2022-0014

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

La Crosse Boiling Water Reactor
Facility Operating License No. DPR-45
NRC Docket Nos. 50-409 and 72-046

Subject: Response to June 5, 2022 Request for Additional Information for Class 1 Survey Areas

Reference:

- 1) Marlayna Doell, U. S. Nuclear Regulatory Commission, E-mail to Gerard van Noordennen, EnergySolutions, "Questions for La Crosse Solutions - June 7, 2022 Call," dated June 7, 2022

As a follow-up action to a conference call held on June 7, 2022 with the NRC Staff, LaCrosseSolutions received a request for additional information (RAI) in Reference 1. The call was initiated to resolve any remaining questions on the NRC review of the Class 1 final status survey area reports for the La Crosse Boiling Water Reactor site.

The purpose of this letter is to provide the response to the RAI in the attachment. The enclosed CD contains the supplemental information discussed in the RAI response and requested by the NRC Staff.

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

Respectfully,

John Sauger
President Reactor D&D and Chief Nuclear Officer

Attachment: Responses to NRC Questions from June 7, 2022 Call
Enclosure: CD containing supplemental information

cc: Marlayna Doell, U.S. NRC Senior Project Manager (letter and enclosure)
Regional Administrator, U.S. NRC, Region III (letter and enclosure)
La Crosse Boiling Water Reactor Service List (letter only)

NMSS01
NMSS26

La Crosse Boiling Water Reactor Service List

cc:

Ken Robuck
President and CEO
EnergySolutions
299 South Main Street, Suite 1700
Salt Lake City, UT 84111

John Sauger
President and Chief Nuclear Officer
Reactor D&D
EnergySolutions
121 W. Trade Street, Suite 2700
Charlotte, NC 28202

Joseph Nowak
Project Manager
LaCrosseSolutions
S4601 State Highway 35
Genoa, WI 54632-8846

Russ Workman
General Counsel
EnergySolutions
299 South Main Street, Suite 1700
Salt Lake City, UT 84111

Jerome Pedretti, Clerk
Town of Genoa
E860 Mundsack Road
Genoa, WI 54632

Jeffery Kitsembel
Division of Energy Regulation
Wisconsin Public Service Commission
P.O. Box 7854
Madison, WI 53707-7854

Paul Schmidt, Manager
Radiation Protection Section
Bureau of Environmental and Occupational
Health Division of Public Health
Wisconsin Department of Health Services
P.O. Box 2659
Madison, WI 53701-2659

Brent Ridge
President and CEO
Dairyland Power Cooperative
3200 East Avenue South
La Crosse, WI 54602-0817

Cheryl Olson, ISFSI Manager
La Crosse Boiling Water Reactor
Dairyland Power Cooperative
S4601 State Highway 35
P.O. Box 817
Genoa, WI 54632-8846

John Henkelman
La Crosse Boiling Water Reactor
Dairyland Power Cooperative
S4601 State Highway 35
Genoa, WI 54632-8846

Andrew J. Parrish
Wheeler, Van Sickle & Anderson, S.C.
44 E. Mifflin Street, Suite 1000
Madison, WI 53703

ATTACHMENT

Responses to NRC Questions from June 7, 2022 Call

Responses to NRC Questions from June 7, 2022, Call

Question 1:

For survey units L1-010-101C (WTB) and L1-SUB-CDR, please provide the calculations for how the licensee derived the 22,140 cpm (which was the value added to background for the investigation level). The release record states that they used data from RS-TD-313196-006 and that 22,140 cpm is equivalent to 12 pCi/g Cs-137, but I am unable to reproduce that value).

LaCrosseSolutions Response:

The value of 22,140 is the level of background that would equate to a Scan MDC of 10.85 pCi/g utilizing the following factors:

Scan Speed – 0.5 m/sec

Index of Sensitivity – 1.38

Surveyor Efficiency – 0.5

Detector Response Factor – 940 cpm/ μ R/hr

Exposure Rate at 3" – 0.2206 μ R/hr/pCi/g

The statement in the release records that the background level of 22,140 cpm is equivalent to 12 pCi/g is an error. The correct value is 10.85, as calculated above.

Question 2:

Please confirm if you still have the three soil samples from the WTB excavation before backfill was placed. Please provide the gamma spec results for these samples, and please confirm if any were analyzed for HTDs (Sr-90, or insignificant radionuclides).

LaCrosseSolutions Response:

Samples L1-010-101-FR-GS-C01-SB, L1-010-101-FR-GS-C02-SB, and L1-010-101-FR-GS-C03-SB are not in the soil sample container inventory. The soil samples were not sent off-site for HTD analysis but were analyzed by the on-site gamma spectroscopy system. The gamma spectroscopy reports are provided with this response. The Sr-90 concentration can be inferred from the on-site Cs-137 results. The inferred Sr-90 results are listed below:

Sample ID	Cs-137 (pCi/g)	Inferred Sr-90 (pCi/g)
C-01	2.30E-01	1.15E-01
C-02	6.54E-02	3.28E-02
C-03	1.21E-01	6.07E-02

Question 3:

Please provide the original FSS scan data and FSS systematic soil samples (I believe this was collected September 13, 2017, prior to the additional remediation that occurred as a result of inspection). Please include a map of the scan grids overlaid on the systematic locations for the original FSS data.

LaCrosseSolutions Response:

The original FSS scan lanes are depicted by a solid red line in Figure 3 of these responses and by the hand-drawn lines depicted below in Figure 1. The latched scan readings and reading locations are shown on Figure 3 for each of the 21 scan lanes.

The results of the systematic soil samples obtained during the original FSS are within a spreadsheet provided with these responses. Note, the project could not locate the gamma spectroscopy reports from the on-site analysis.

A map, taken from the field logs, of the original scan grids overlaid on the original sample locations map is provided below as Figure 1. Figure 2, also taken from the field logs, depicts the locations of the systematic samples, judgmental samples, the excavation outline, and the composite samples collected at the edges of the excavation.

Figure 1 – Original FSS Scan Lanes and Systematic Soil Sample Locations

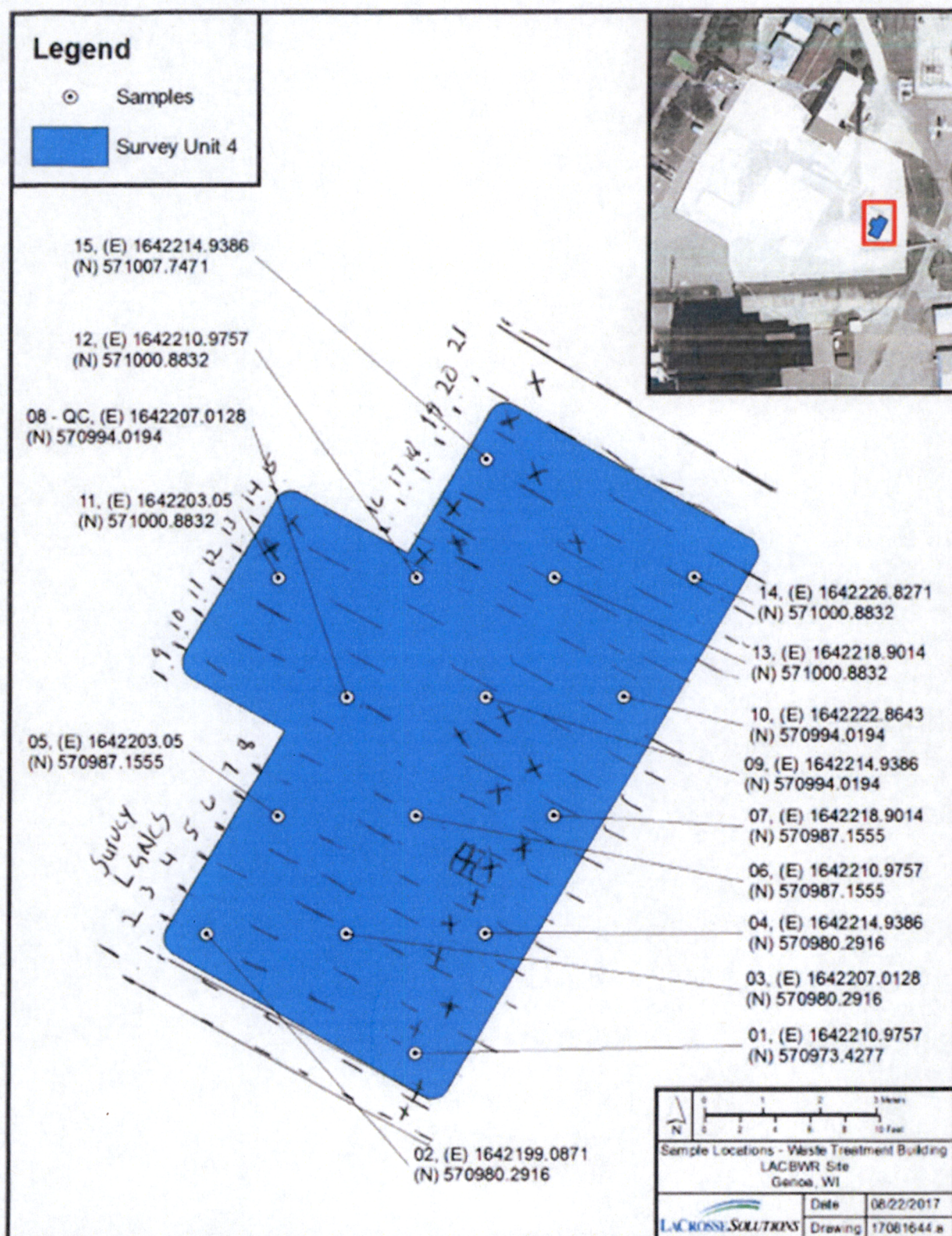
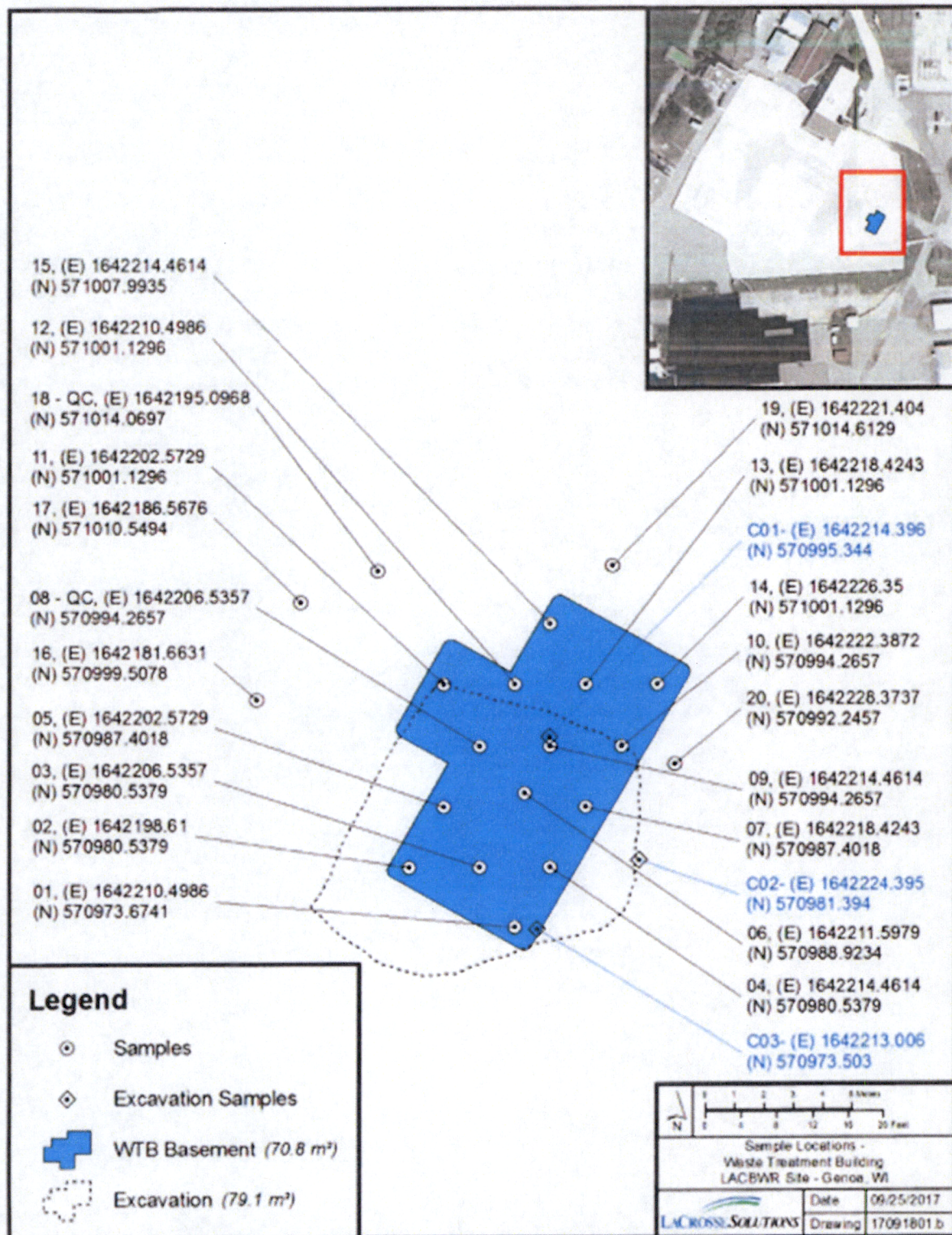


Figure 2 – Original FSS Systematic, Judgmental, and Composite Sample Locations



Question 4:

Please confirm which of the scan lanes are from the excavation after remediation but before backfill. (I think this is E, EX, and N).

LaCrosseSolutions Response:

The scan lanes from the excavation after remediation but before backfill are labeled "E," "EX," and "N." The scan areas labeled as "SP" in the release record are not scan lanes, rather they denote the 1 m² scan area around each sample location.

Question 5:

Please clarify this sentence in the release record: "Although not required, additional scanning was performed during the collection of the new soil samples; a 1 m² area at each sample location and, in some cases, scans of the actual samples in a low-background area, were scanned using the Ludlum 2350-1 paired with a Model 44-10 2"x 2" NaI detector." Please confirm which SP lanes are from the 1 m² of clean backfill around where the Geoprobe location was or if the scans are of actual Geoprobe samples.

LaCrosseSolutions Response:

Two different processes were used to assess the sample media after it was removed from the GeoProbe sleeve. For some samples, a 1-minute direct static measurement was acquired with the Ludlum Model 2350-1 / 44-10 after the sample media was taken out of the sleeve and placed into a bag. For other samples, a latched scan value was collected with the Ludlum Model 2350-1 / 44-10 immediately after the sleeve was cut open and before the soil was placed into a container. In some instances, where background was elevated during the 1 m² sample area scan, the sample was moved to a low-background area, and the 1-minute direct static measurement or sleeve scan was acquired there. As examples, the following are excerpts from the field logs that describe each process:

[Static Measurements]

Sample location 03 (L1-010-101-QR-GS-C03-SB) was scanned and latched an approximate 1 meter squared area on top side of the sample location at 11,910 cpm. (Background believed to be elevated due to the ramp being used to access the Rx Building).

One minute direct count performed on soil sample in a low-background area. Result was 8,978 cpm.

[Sleeve Scans]

Latched 13,845 cpm on a 1 meter squared area around the L1-010-101-FS-GS-C02-SB location. (Background believed to be elevated due to the ramp being used to access the Rx Building).

Direct push sample (of location 02) laid on table in low-background area and sleeve was cut open to access the soil. Scan latched on soil sample 7,676 cpm from the 12 ft depth which is where the color change (sand) was observed.

The scans labeled with "SP" in the release record denote the 1 m² scan area around each sample location and not the static or scan measurements collected after the sample was taken out of the

ground. The direct static measurements on the sample bags or sleeve scans mentioned above were not presented in the release record.

Question 6:

For Figure 16-1, please indicate which portion of the survey unit required additional remediation due to the NRC inspection verification survey. Please confirm that you are not able to recreate the scan grids on Figure 16-1.

LaCrosseSolutions Response:

Figure 3 below denotes the area (with the red dotted line) that was remediated via additional excavation due to the elevated findings during the NRC inspection verification survey. The map also shows the scan lanes (in solid green) that are labeled as "EX" in the release record. The "EX" scans were collected on September 14, 2017, and covered the entirety of the remediated portion of the excavation. The 21 scan lanes (identified by solid red lines) on the map below are the original scan lanes of the scan performed in the WTB excavation prior to remediation on September 12, 2017.

The scan lanes denoted as "E" and "N" in the release record in Figure 16.1 are not present on any known map, and no description of their exact locations exists. As such, the depiction of the "E" and "N" scan lanes cannot be reproduced on a map. However, a figure (provided below) from the field logs does depict the general location and orientation of the "E" and "N" scan lanes, but does not specifically show how each lane is demarcated.

Figure 3 – WTB Excavation

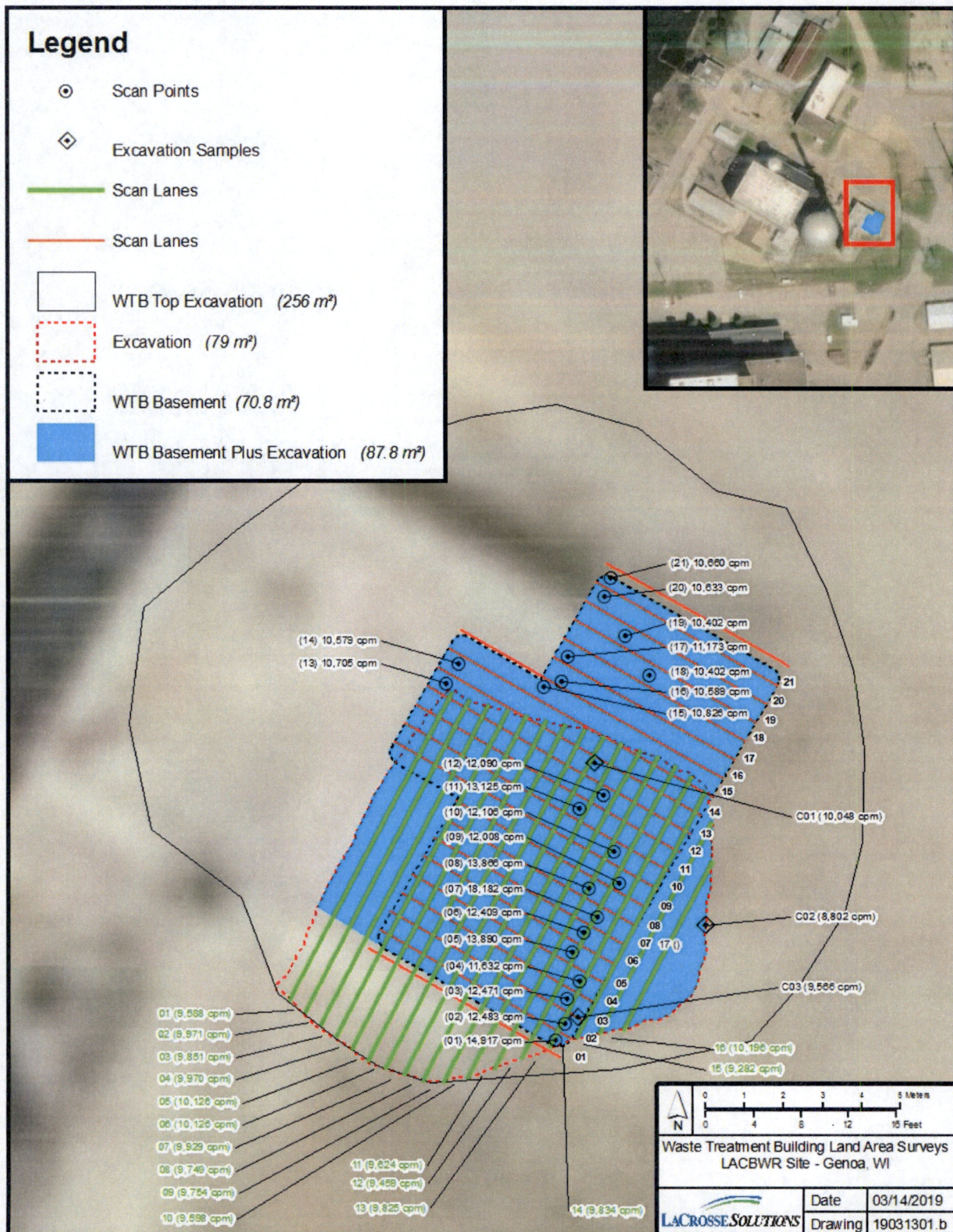
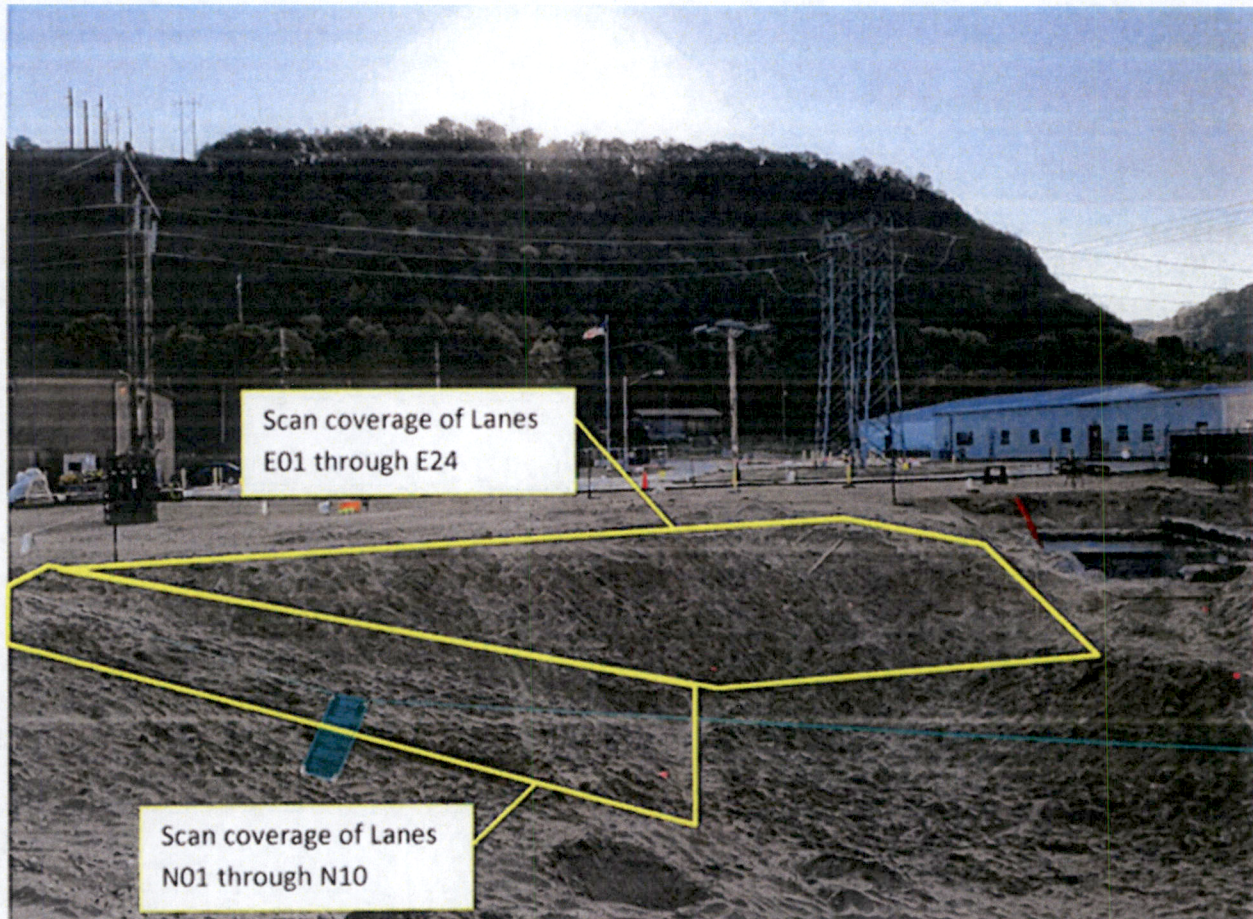


Figure 4 – E and N Scan Lane Coverage



Note: The view in this figure is facing to the east.

Question 7:

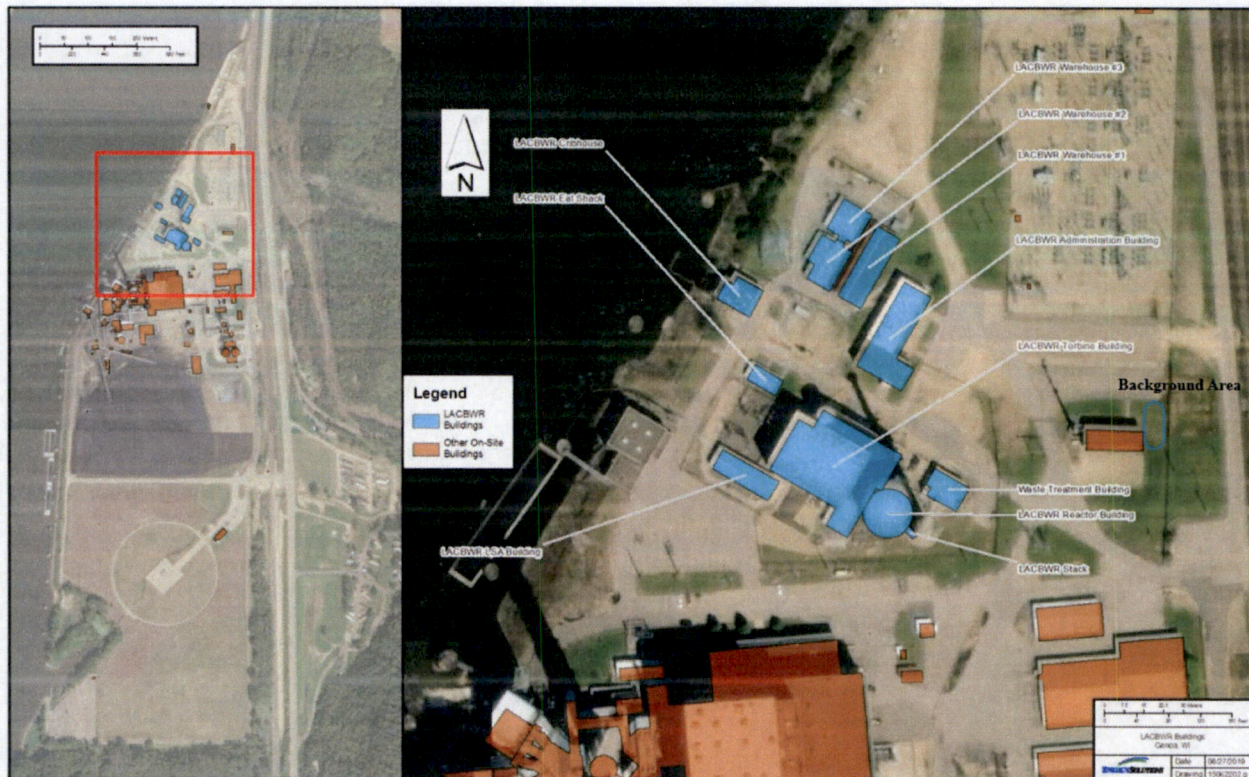
Regarding background for scan data – please describe in more detail why there are two sets of background described in the release record. The first set is the 5,004 cpm - 5,095 cpm (lab background) and the second is the 6,129 cpm - 7,385 cpm (for the SP data points stated to be taken from a nearby field). Please indicate the location of the nearby field. Please state why this is considered more representative of background than the environmental lab value. Please include any procedures used for gathering background values for excavation or land survey areas.

LaCrosseSolutions Response:

The first set of backgrounds were collected indoors in the portion of the Administration Building utilized as an environmental laboratory. The second set was obtained in a soil and grass area adjacent to the Back-Up Control Center Building, which is the area referred to as a nearby field. Figure 5 below highlights the background area. The values obtained adjacent to the Back-Up Control Center are considered more representative of background due to the material

composition (grass and soil) and the increased exposure to cosmic radiation. The gathering of background values for land areas is not proceduralized and is part of on-the-job training.

Figure 5 – Background Area Location



Question 8:

The RAI response states that only 2 scan lanes would have alarmed using the corrected scan action levels and background. Only 2 of the E, EX, and N scan lanes would have alarmed but several of the SP locations would have also alarmed using the revised background of 6,824 cpm. Please explain how the investigation process applies or does not apply to this scan data (dependent on what the scan was of).

LaCrosseSolutions Response:

The investigation process does not apply to the “SP” scan locations, because these scans were purely informational and do not represent data of the end-state, subsurface soil in survey unit L1-010-101C. The samples collected at the locations are part of the FSS results.

Question 9:

Condition Report (CR), ES-LCR-CR-2017-0073 (Reference 12 to the FSSR for L1-010-101C), was issued on October 9, 2017. The Condition Report states that two procedures were revised (LC-FS-PR-008; Final Radiation Survey Data Assessment and LC-FS-PR-010; Isolation and Control for Final Status Survey) as part of the corrective actions. I have Rev 4 of LC FS PR-008. For both these procedures please provide the revision before this corrective action and the

revision directly after this corrective action so that I can identify what was changed in these procedures due to this corrective action.

LaCrosseSolutions Response:

Revisions 0 and 1 of LC-FS-PR-008, "Final Status Survey Data Assessment" and revisions 1 and 2 of LC-FS-PR-010, "Isolation and Control for Final Status Survey" are provided with these responses. Revision 1 of LC-FS-PR-008 and revision 2 of LC-FS-PR-010 provide the corrective measures put in place following the issuance of ES-LCR-CR-2017-0073.

Question 10:

The FSS for the WTB and L1-SUB-CDR were initially completed in September 2017, then next survey unit was the Turbine Building in January 2018. The corrective actions were implemented prior to the FSS for the Turbine Building. However, the Turbine Building scan still had a high Action Level due to 31,800 cpm anticipated background. Please describe whether the Corrective Actions for the WTB resulted in any adjustments in the way the Scan Action Levels were set, and the approach for background measurement values for the FSS scan in the Turbine Building.

LaCrosseSolutions Response:

The corrective actions did not affect the action level for the Turbine Building. The action level for the Turbine Building survey unit did include a requirement to notify the FSS Supervisor when readings exceeded one half the average background for further investigation. The approach to background measurements was to enter the area to be surveyed and obtain five one-minute measurements at various locations within the area at a detector height of six inches.

Question 11:

Please describe why you believe the original FSS of the WTB did not indicate that there were still high levels of contamination remaining under the surface. Please include your assessment of how the contamination had become buried and which corrective actions focused on preventing contamination from becoming buried in other survey units.

LaCrosseSolutions Response:

The 2x2 NaI detectors used during the FSS of the WTB excavation were not sensitive enough to detect contamination located greater than 15 cm below the soil surface. Not until some soil was removed at the behest of the NRC inspector, were increased count rates above the alarm setpoint realized.

The contaminated concrete was buried beneath the surface of the excavation floor primarily by two methods. First, during the demolition and excavation of the WTB concrete, a corner of the foundation became tilted and eventually became buried within the excavation. This was not noticed because the equipment operator was inattentive, and there was a general lack of oversight. Secondly, the excavator hammer used to demolish the WTB concrete foundation had a pin approximately three feet in length. This hammer/pin drove residual pieces of concrete into the soil to the depth of the pin.

Work packages were revised to require the measurement and documentation of the depths of excavations. A requirement was added to dig out/sift at a minimum of three feet below the bottom of the concrete slab being removed.

Question 12:

Please point to which corrective actions focused on preventing this same error from occurring in other survey units (i.e., FSS data not appropriately indicating that additional remediation was required).

LaCrosseSolutions Response:

The primary corrective actions were changes to the work packages as identified in the response to question no. 11. Additionally, FSS technicians were instructed to slow scan speeds and remove soil, as necessary, when investigating increased count rates. Two procedures were also revised as part of the corrective action process; LC-FS-PR-008 was revised to specify additional requirements for resurvey if remediation is performed post-FSS, and LC-FS-PR-010 was revised to add a requirement to notify the RP/FSS Manager any time the physical or radiological configuration changed in a survey area where FSS activities are ongoing or have been completed. A requirement was added to dig out/sift at a minimum of three feet below the bottom of the concrete slab being removed.

Question 13:

Please indicate if there were reasons why the survey unit was backfilled quickly (e.g., was there a documented occupational safety concern)?

LaCrosseSolutions Response:

The excavation was backfilled after on-site discussions with the NRC Region III Inspector. Backfill of the excavation supported continuing work on the Reactor Building exterior.

Question 14:

For Survey Unit L1-SUB-CDR, Stack, Pipe Tunnel, and Reactor Plant Generator Plant Area (RPGPA) Excavation, regarding the revised release record and the revised background values versus the environmental lab values, please explain why the previous values were erroneous, and why earlier in the release record it seems to indicate that these are background values that were from the survey unit. Specifically, the release record states, "the background was established as the average of five 1-minute static measurements, while maintaining the detector 6" from the soil. In survey unit L1 SUB CDR, background ranged from 4,995 cpm up to 5,641 cpm."

LaCrosseSolutions Response:

The background values for the FSS of L1-SUB-CDR were erroneous because they were collected in the environmental lab rather than in the survey unit. The statement in the release record that background measurements were conducted while maintaining the detector 6 inches from the soil is an error. Background measurements with the 44-10 are typically collected at a height of 6 inches from the media being assessed, but in the case of collecting background measurements in the environmental lab, the media was not soil.

Question 15:

Regarding background for L1-SUB-CDR, why do you believe the background ranged from 4,529 cpm to 48,247 cpm. Please explain why the value of 17,440 cpm is representative of background.

LaCrosseSolutions Response:

The release record does not state that background ranged from 4,529 cpm to 48,247, but rather that the actual scan measurements were within that range. Background measurements for L1-SUB-CDR were collected in the environmental lab and ranged from 4,995 cpm to 5,641 cpm. Because true background was unknown in the survey unit and in order to perform the assessment of the number of alarms that may have occurred had the correct alarm set-points been utilized, the average of the scan measurement results (17,440 cpm) was used as a representative background value, assuming the bulk of the scan measurements were near background level.

The release record states that if the 17,440 cpm background was applied to the scan grids and the scan data was evaluated against the current action levels based on the Operational DCGLs, only the same eight alarms that were originally produced during the FSS would be reproduced.

A further assessment has been performed using a background value of 15,963 cpm to see what alarms may have been produced with more accurate action levels. This background value was calculated as the median of the logged measurement values with the original alarming values (outliers) removed from the data set. Adding this average background to the Operational DCGL equivalent value of 3,525 cpm, an action level of 19,488 cpm is created. With this action level, a total of 28 alarms would have been produced.

The conclusion to the background problem and additional assessment presented in the release records for survey units L1-010-101C and L1-SUB-CDR is:

Because 100% of the soil in the survey unit was scanned and no soil samples collected for FSS resulted in ROC concentrations above the Operational DCGLs, the probability of discovering an elevated soil sample is very low, even had additional investigational samples been collected.

This conclusion still holds for L1-SUB-CDR after performing the additional assessment with the 15,963 cpm background value. Although 28 alarms would have been produced, which is more than the original 8, the fact that the most-elevated areas in the survey unit were investigated and the soil samples from those areas did not produce results that exceeded the Operational DCGLs provides reasonable assurance that the less-elevated areas would produce even less activity within the soil samples. Thus, the final result of the FSS would remain unchanged: no measurements exceed a sum of fractions of one, and the survey unit is suitable for unrestricted release.

Question 16:

Please provide a procedure for how you established background values for scans for excavations or land survey areas.

LaCrosseSolutions Response:

The process for acquiring background measurements for scanning of excavations or open land areas was not procedurally established at LACBWR. Rather, background measurement collection requirements were denoted in the instructions of each FSS sample plan, with more detailed instruction provided through technician training and field supervisor instruction.

Question 17:

I'm trying to understand the basis for the values going into the relative shift calculation. For the LBGR – this is set to 0.5 in most cases. The standard deviation varies and doesn't always match up with the characterization data set. For survey units L1-SUB-DRS, L1-SUB-TDS, L1-SUB-LES, L1-010-101C, and L1-SUB-CDR, the data set used for survey design as described in the FSS report is from the characterization of the Class 1 land survey unit prior to when the buildings were removed. These data sets had very low standard deviations, but they don't match.

MARSSIM recommends that for survey units that have been remediated, the site specific parameters used during FSS planning (e.g., standard deviation of the radionuclide concentration, and expected median concentration) should be reestablished following remediation. The LTP describes that after remediation is completed, a "turnover assessment" will be performed to collect additional survey data prior to conducting the FSS. One objective of the turnover assessment is to ensure appropriate sample collection and analysis to determine spatial variability and variability in radionuclide ratios. For two survey units (TDS A and TDS B), the RA dataset was used to inform the median and standard deviation. Could you please describe why the turnover assessment data doesn't seem to be used to inform the relative shift calculation, and where the values for the assumed standard deviation in the calculation of the relative shift come from in the other survey units?

LaCrosseSolutions Response:

L1-010-101C and L1-SUB-CDR

The relative shifts for the FSSs of survey units L1-010-101C and L1-SUB-CDR were calculated using subsurface soil data (Cs-137 and Co-60) from the characterization of the top-side soil survey unit.

Turnover surveys (in the form of a radiological assessment (RA) or a remedial action support survey (RASS)) were not performed prior to FSS, which is why the relative shift was calculated using characterization data.

L1-SUB-DRS, L1-SUB-LES, and L1-SUB-TDS

The relative shifts for the FSSs of survey units L1-SUB-DRS, L1-SUB-LES, and L1-SUB-TDS were calculated using subsurface soil data (Cs-137 and Co-60) from the characterization of the top-side soil survey unit.

A review of the records for these particular survey units shows that RASSs were performed as part of the turnover process. The relative shifts for these survey units should have been calculated using the RASS datasets. As such, an assessment was performed to calculate relative shifts for L1-SUB-DRS, L1-SUB-LES, and L1-SUB-TDS to ensure that the correct sample size was used during FSS. In all cases, the survey units had the appropriate sample sizes in accordance with MARSSIM. The results of the assessment, which used Cs-137 values from the RASSs, are presented below:

L1-SUB-DRS

Cs-137 mean: 0.287 (LBGR)

Cs-137 standard deviation: 0.632

$$\text{Relative Shift} = \frac{UBGR - LBGR}{\sigma}$$

$$\text{Relative Shift} = \frac{17.4 - 0.287}{0.632} = 27$$

This relative shift equates to a sample size of 14 in accordance with MARSSIM.

L1-SUB-LES

Cs-137 mean: 0.318 (LBGR)

Cs-137 standard deviation: 0.479

$$\text{Relative Shift} = \frac{17.4 - 0.318}{0.479} = 35.6$$

This relative shift equates to a sample size of 14 in accordance with MARSSIM.

L1-SUB-TDS

Cs-137 mean: 0.274 (LBGR)

Cs-137 standard deviation: 0.262

$$\text{Relative Shift} = \frac{17.4 - 0.274}{0.262} = 65.3$$

This relative shift equates to a sample size of 14 in accordance with MARSSIM.

Additional Question 1:

Discuss the boundaries of L1-SUB-CDR, L1-SUB-TDS-A, and L1-SUB-TDS-B and how they potentially overlap. Additionally, discuss the timeline of excavation and fill for these survey units.

LaCrosseSolutions Response:

L1-SUB-CDR consisted of 2 structures, the Pipe Tunnel / RPGPA and the Stack.

Excavation and demolition of the structures was completed in August to September 2017. Building debris and over burden / soil were packaged into intermodal containers and dispositioned as radioactive waste. Backfill of the structures was completed between 09/20/2017 and 09/26/2017, except for the RPGPA / Sump area, which was backfilled 04/18/2019.

Figure 6 below shows L1-SUB-TDS-A, L1-SUB-TDS-B, and L1-SUB-CDR imposed over the site while L1-SUB-TDS-A, L1-SUB-TDS-B were in process. Please note that the dimensions are not 100% accurate and are for illustration purposes only.

The FSS (Geoprobe) of L1-SUB-TDS-B was performed 05/14/2019 through 05/22/2019. L1-SUB-TDS-B also included portions of L1-SUB-CDR as shown in the Figure 6 below.

Portions of L1-SUB-TDS-A were excavated for proper sloping by FSS Technicians as demonstrated by the darker fill material but never reached the extent of where L1-SUB-CDR was excavated to. The FSS of L1-SUB-TDS-A was performed 06/26/2019 through 07/12/2019. As shown in the Figure 7 below, L1-SUB-TDS-A is at different elevations than L1-SUB-TDS-B, the majority of which is higher than L1-SUB-TDS-A.

Figure 6 – L1-SUB-TDS-A, L1-SUB-TDS-B, L1-SUB-CDR Overview

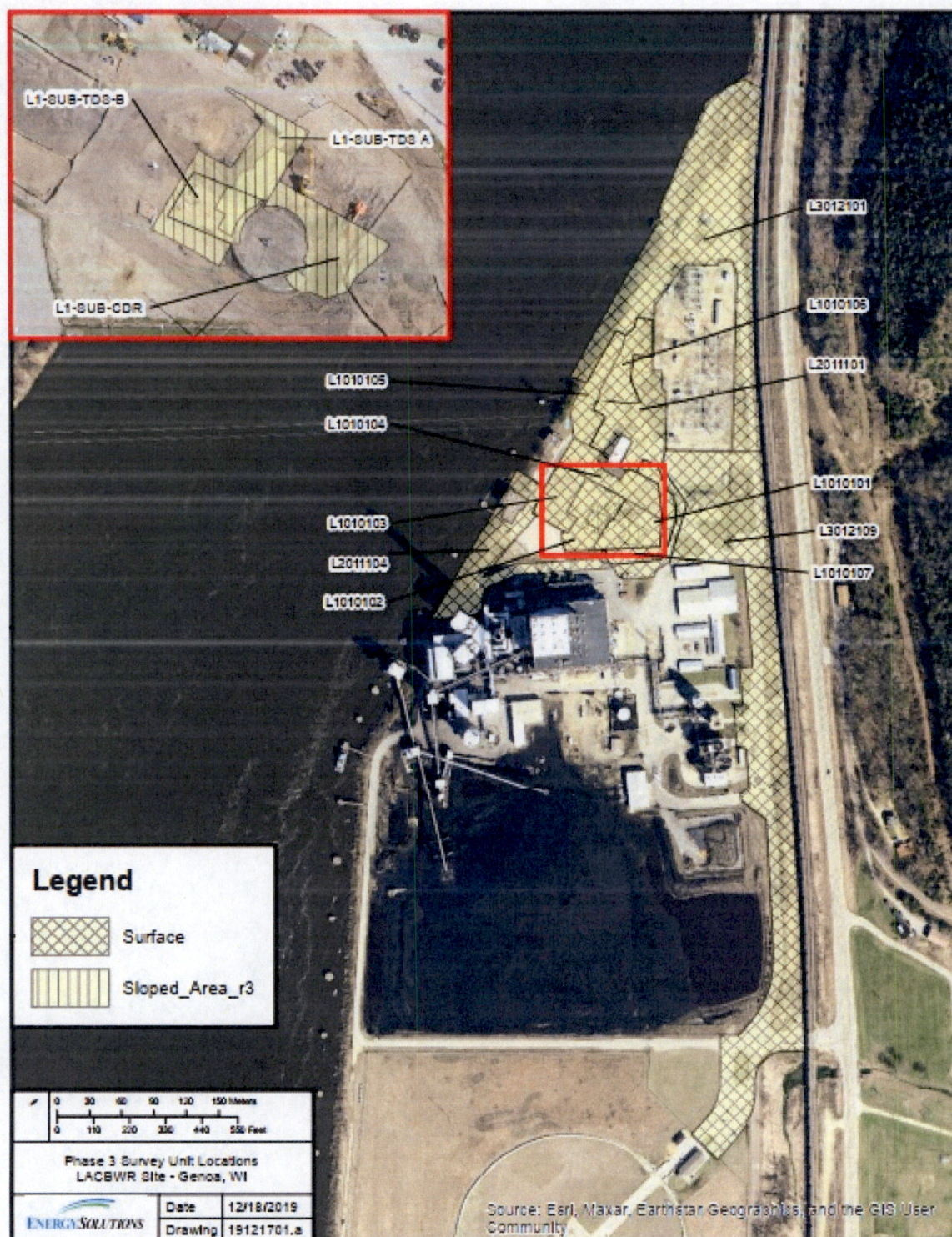


Figure 7 – L1-SUB-TDS-B (RPGPA Geoprobe)



ENCLOSURE

CD Containing the following supplemental information:

1. LC-2017-0090 LACBWR Action Plan
2. LC-FS-PR-008, Rev 0, Data Assessment
3. LC-FS-PR-008, Rev. 1, Data Assessment
4. LC-FS-PR-010, Rev. 1, Isolation and Control
5. LC-FS-PR-010, Rev. 2, Isolation and Control
6. ES-LCR-CR-2017-0073, Survey Unit 010-101-C WTB Sub-foundation
7. LC-RS-PN-164017-001, Rev. 0, LACBWR Radiological Characterization Survey Report for June through August 2015 Field Work, Genoa, Wisconsin
8. FSS Plan 101C IIII WTB Analysis
9. GG-EO-313196-RS-RP-001, LACBWR Radiological Characterization Survey Report for October and November 2014 Field Work, Genoa, Wisconsin
10. L1-010-101-FR-GS-CO1-SB WTB Excavation, Gamma Spectrum Analysis
11. L1-010-101-FR-GS-CO2-SB WTB Excavation, Gamma Spectrum Analysis
12. L1-010-101-FR-GS-CO3-SB WTB Excavation, Gamma Spectrum Analysis