# U.S. Department of Energy
# National Nuclear Security Administration
# Sandia Field Office

## Sandia National Laboratories/CA

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## Livermore, CA 94550

## WDID #2 01I002598

## June 2023

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# Exceedance Response Action (ERA)
# Level 2 Technical Report Update



Sandia National Laboratories
U.S. DEPARTMENT OF ENERGY NNSA
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# List of Acronyms and Abbreviations

| | |
|---|---|
| AA | Annual Average |
| BMP | Best Management Practice |
| DA-11 | Drainage Area 11 |
| DA-13 | Drainage Area 13 |
| ERA | Exceedance Response Action |
| IABMPD | Industrial Activity BMP Demonstration |
| IGP | General Permit for Discharges of Storm Water Associated with Industrial Activities |
| L | Liter |
| Mg | Milligram |
| NAL | Numeric Action Level |
| NoD | No Discharge |
| NTESS | National Technology and Engineering Solutions of Sandia LLC |
| O&G | Oil and Grease |
| QISP | Qualified Industrial Storm Water Practitioner |
| QSE | Qualified Storm Event |
| SWPPP | Storm Water Pollution Prevention Plan |
| TSDF | Treatment, Storage, and Disposal Facility (for Hazardous Waste) |
| TSS | Total Suspended Solids |

# Exceedance Response Action (ERA) Level 2 Technical Report

## 1.0 FACILITY BACKGROUND

The Sandia National Laboratories, California (SNL/CA) site comprises approximately 410 acres and is located in the eastern portion of Livermore, Alameda County, California. The property is owned by the United States Department of Energy/National Nuclear Security Administration (DOE/NNSA) and is being managed and operated by National Technology & Engineering Solutions of Sandia, LLC (NTESS).

Operations at the SNL/CA facility consist of DOE statutory responsibilities for nuclear weapon research and design, development of energy technologies, and basic scientific research. Specific industrial activities occur in discrete buildings and include electroplating or anodizing, machine shop, permitted hazardous waste treatment, storage and disposal facility (TSDF), and a scrap yard.

## 2.0 INTRODUCTION

This report provides an update to the ERA Level 2 Technical Report Update previously submitted in June 2022 (2022 ERA L2 Technical Report Update) for iron, aluminum, and pH. In accordance with the California's General Permit for Discharges of Storm Water Associated with Industrial Activities (IGP) Section XII.D.3.c, an ERA Level 2 Technical Report update is to be submitted with the annual report when a facility utilizing an Industrial Activity Best Management Practice (BMP) Demonstration (IABMPD) experiences additional exceedances of the numeric action levels.

### 2.1 Limitations/Disclaimers

This Level 2 Technical Report update was prepared by a Yorke QISP, in consultation with SNL/CA and was based on an evaluation of the facility which was performed within the limits of the established scope of work. As with any evaluation, there is a certain degree of dependence upon oral information provided by facility or site representatives, which is not readily verifiable through visual observations or supported by any available written documentation. Yorke shall not be held responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed by site representatives at the time this evaluation was performed.

It is the responsibility of the SNL/CA to upload this document under the ERA Level 2 reporting obligations to the Storm Water Multiple Application Report Tracking System (SMARTS) and perform the required certification. Execution of any actions described in this report are solely the responsibility of the SNL/CA, unless there is a specific contractual arrangement made for Yorke's participation. If changes to the Level 2 ERA Actions are required, it is the responsibility of the discharger to obtain the approval of the designated QISP. Any change made without the designated QISP's approval shall invalidate the QISP's designation.

## 3.0 QISP INFORMATION

Mr. Michael Dudasko of Yorke Engineering (QISP Certificate Number 00138) prepared this ERA Level 2 Technical Report Update.

## 4.0 FACILITY BACKGROUND

As described in the facility SWPPP, the SNL/CA facility comprises approximately 410 acres and includes at least 50 buildings where various industrial activities take place. At all SNL/CA facilities, activities are primarily conducted within buildings or under roofs. Accordingly, there are very few areas of industrial activity on the site that are exposed to storm water. The site has previously sampled as many as five drainage areas where industrial activity was exposed to storm water. Efforts have been made over recent years to eliminate storm water exposure in some areas and the only areas where storm water is believed to currently be exposed to industrial activities are:

- Drainage Area 11 (DA-11) – Activities include auto repair, fueling, warehouse, machine shop, TSDF; and
- Drainage Area 13 (DA-13) – Activities include environmental test facilities, machine shops, scrap yard, explosives storage area, roads.

Accordingly, these are the only two locations where storm water samples are collected. A single discharge point has been identified for each drainage area.

SNL/CA entered ERA Level 2 on July 1, 2017, for iron and aluminum and ERA Level 2 for pH on July 1, 2020. This report includes the ERA Technical Report Update for iron/aluminum and for pH in separate sections below.

## 5.0 REVIEW OF STORM WATER ANALAYTICAL DATA – IRON AND ALUMINUM

Table 5-1 below summarizes the recent storm water NAL exceedances subject to ERA Level 2.

**Table 5-1: Summary of NAL Exceedances by Year**

| Reporting Year | Drainage Areas Sampled | Total Samples Collected | Iron Annual Average (mg/L) | Aluminum Annual Average (mg/L) |
|---|---|---|---|---|
| 2015-2016 | 5 | 10 | 2.431 | 1.918 |
| 2016-2017 | 5 | 20 | 1.309 | 0.988 |
| 2017-2018 | 3 | 14 | 1.078 | 0.745 |
| 2018-2019 | 2 | 5 (1) | 1.646 | 1.23 |
| 2019-2020 | 2 | 2 | 2.3 | 1.85 |
| 2020-2021 | 2 | 1 (2) | 0.91 | 0.92 |
| 2021-2022 | 2 | 4 | 2.58 (3) | 2.24 (4) |
| 2022-2023 | 2 | 5 | 1.50 | 1.57 |
| **Numeric Action Level (Annual Average)** | | | **1.0** | **0.75** |

Notes:

(1) 4 QSEs sampled for DA-11, 1 for DA-13
(2) No discharge from DA-13 for both QSEs; only DA-11 sampled.
(3) DA-11 alone average is 0.91 mg/L (lower than NAL) over 3 samples.
(4) DA-11 alone average is 0.76 mg/L compared to NAL of 0.75 mg/L over 3 samples.

Values less than annual average NAL

Because DA-11 and DA-13 are the only two drainage areas currently sampled, the table below summarizes the data for these two drainage areas.

**Table 5-2: Summary of NAL Exceedances by Year and Drainage Area**

| Reporting Year | DA-11 | | | DA-13 | | |
|---|---|---|---|---|---|---|
| | Iron Annual Average (mg/L) | Aluminum Annual Average (mg/L) | QSEs Sampled | Iron Annual Average (mg/L) | Aluminum Annual Average (mg/L) | QSEs Sampled |
| 2015-2016 | 1.35 | 1.1 | 2 | 7.85 | 6.4 | 2 |
| 2016-2017 | 0.564 | 0.424 | 5 | 2.165 | 1.6825 | 4 |
| 2017-2018 | 0.68 | 0.436 | 5 | 2.375 | 1.525 | 4 |
| 2018-2019 | 0.8075 | 0.5875 | 4 | 5 | 3.8 | 1 |
| 2019-2020 | 2.6 | 2.1 | 2 | 2 | 1.6 | 1 |
| 2020-2021 | 0.91 | 0.92 | 1 | N/A | N/A | N/A |
| 2021-2022 | 0.91 | 0.76 | 3 | 7.6 | 6.7 | 1 |
| 2022-2023 | 0.54 | 0.45 | 5 | 2.7 | 2.98 | 4 |
| **Numeric Action Level (Annual Average)** | **1.0** | **0.75** | **--** | **1.0** | **0.75** | **--** |

Notes:

N/A Not applicable (No samples collected)

Values less than annual average NAL

Table 5-2 demonstrates that DA-11 has met the NAL for iron in 6 out of 8 years and for aluminum in 4 out of 8 years. One of the years that did not meet the NAL for aluminum, the NAL was exceeded by less than 1%.

DA-13 had no years where the annual average was below the NAL for either iron or aluminum and its results are consistently about 4 to 5 times higher in most years than DA-11. Thus, any efforts to reduce the storm water annual average for iron and aluminum to below the NAL should focus on DA-13.

## 6.0 ERA LEVEL 2 ACTION PLAN FOR IRON AND ALUMINUM

Both iron and aluminum will be evaluated together. The ERA L2 Technical Report Update for iron and aluminum was previously prepared and submitted on June 29, 2022.

**On-Site Industrial Sources**

As described in the 2018 ERA L2 Technical Report and the SWPPP, DA-11 and DA-13 contain likely industrial sources of iron and aluminum.

The DA-11 auto repair, fueling, warehouse, machine shop, and TSDF activities have minimal exposure to storm water. Fueling is done under a canopy, vehicles are primarily repaired indoors,

materials are warehoused under roof, and as required by hazardous waste regulations any materials stored in the TSDF area must be in containers that are maintained closed. The area utilizes several compost filter rolls placed perpendicular to the storm water flow near the final discharge point as an advanced BMP. The DA-13 Environmental Test facilities, machine shops, scrap yard, and Explosives Storage Area also have minimal exposure to storm water. Machining is performed under the roof, and raw metal inventory is primarily placed under tents. Materials in the scrap yard are primarily office type furniture, shelving units, and empty metal storage hoppers that are closed. Explosives are securely stored in covered and locked storage units. Two small retention basins were installed in this area as advanced BMPs. As a result, a rain event does not always result in a discharge, and thus Qualified Storm Events occur less frequently in DA-13 than DA-11, as shown in Table 5-2.

Ultratech Filter Socks with Heavy Metal Removal Media were installed in DA-11 and DA-13 in October 2021 before the rainy season commenced. These are shown in Figures 6-1 and 6-2 below. Also as shown in Figure 6-2, before the 2022-2023 Stormwater Year, Fabric was placed on the DA-13 impoundment walls to minimize soil erosion.

**Figure 6-1: DA-11 Sampling Area with Filter Socks Installed**

**Figure 6-2: DA-13 Sampling Area with Fabric and Filter Socks Installed**

**On-Site Non-Industrial Sources**

The 2018 ERA L2 Technical Report identifies that two soil samples collected from within Sandia contained 1 to 1.3% aluminum and 1.8 to 3.9% iron. Even higher soil concentrations of iron and aluminum have been recorded in an extensive study of over 200 soil core samples by Lawrence Livermore National Laboratory which occupies an adjacent site. This indicates that naturally occurring iron and aluminum in the soils may contribute to NAL exceedances. However, this may be mitigated with improved filtration and sampling to minimize carryover of solids. The one sample collected from DA-13 that resulted in readings of 7.6 and 6.7 mg/L for iron and aluminum respectively also had a total suspended solids (TSS) result of 110 mg/L. In general, metals concentrations in storm water are elevated when TSS is also elevated.

**Off-Site Sources**

The SNL/CA campus includes over 50 buildings on about 410 acres. The two industrial drainage areas are well away from the facility perimeter and there are likely no impacts from off-site sources.

## 6.1 Demonstrations Identification for Iron and Aluminum

Based on the information above, there is a potential to make a Natural Background Pollutant Source Demonstration (NBPSD) for iron and aluminum. However, this requires a rigorous demonstration as described by Section XII.D.2.c of the IGP. One requirement is to demonstrate

that the exceedance is attributable solely to the presence of the pollutant in the natural background soils which have not been disturbed by industrial sources and that industrial activities alone would not result in an NAL exceedance. DA-11, which transports storm water along significant lengths of an earthen channel, has met NALs in about half the years sampled. Therefore, a natural background demonstration is not being performed at this time.

Therefore, the site will review current BMP implementation and identify additional BMPs in an effort towards an Industrial Activity BMP Demonstration (IABMPD) for DA-11 and DA-13.

## 6.2 Previous BMP Action Items

In the June 2022 Level 2 ERA Technical Report Update for the IABMPD, the status of action items identified in the 2021 Technical Report were discussed. The status of each of the new action items identified in the June 2022 Level 2 ERA Technical Report Update is provided in Table 6-1.

**Table 6-1: Status of New BMPs for Iron and Aluminum in 2022 Technical Report Update**

| Activity Category | Description | Proposed Implementation Date and Actual Date |
|---|---|---|
| Maintenance of existing BMPs | Inspect Ultratech Filter Socks with Heavy Metal Removal Media in DA-11 and DA-13 and replace with same or improved media. | Before October 1 of every year<br>**Actual: Completed** |
| Optimization of existing BMPs | Add Ultratech Filter Socks with Heavy Metal Removal Media at the top of the two overflow channels in DA-13 to ensure all storm water is filtered. | By October 1, 2022<br>**Actual: Completed** |
| Maintenance of existing BMPs | Determine if sampling results or other factors indicate that the Ultratech Filter Socks with Heavy Metal Removal Media should be replaced during the storm water year. | By February 1, 2023<br>**Actual: Completed based on monthly visual inspections of filters** |
| Enhanced Sampling Techniques | Improve storm water sampling techniques in DA-11 by using a vault box as depicted in the California Water Board Industrial Storm Water Sampling Video to create a location that will allow for more consistent sampling, instead of being dependent on discharge volumes to build enough depth to sample off of the ground surface. Place sampling point downstream of the Ultratech Filter Socks with Heavy Metal Removal Media and as close to the industrial area as possible. | By December 31, 2022<br>**Actual: Completed** |
| Additional BMP | Add a Filtrexx Stormexx in-drain filter to DA-13 storm drain that will allow sampling after filtering. | By February 1, 2023<br>**Actual: This measure was attempted but has been found impractical. The depth of the catch basin is too shallow for filters.** |

| Activity Category | Description | Proposed Implementation Date and Actual Date |
|---|---|---|
| Enhanced Sampling Techniques | Determine if storm water sampling can be improved in DA-13 by sampling from the catch basin. Install a weir as depicted in the California Water Board Industrial Storm Water Sampling Video to ensure that there will be adequate height to collect the storm water samples in the sampling bottles. | By December 31, 2022<br>**Actual: Completed** |

### 6.3 IABMPD Tasks and Schedule of BMPs to be Implemented.

Table 6-2 below presents the timeline of the additional BMPs and additional investigative storm water sampling and testing to be implemented during the 2023-24 storm water year for iron and aluminum.

**Table 6-2: Task Schedule for New 2023 BMPs – Iron and Aluminum**

| Activity Category | Description and Rationale | Proposed Implementation Schedule/Date |
|---|---|---|
| Evaluate Type of Metal Contamination | Collect extra metal sample in non-acidified jar and instruct lab to filter solids to compare dissolved metals to total metals.<br>Rationale: As part of the IABMPD, determine if significant amount of the iron and aluminum are present in dissolved form, which the filter socks do not remove as efficiently. | Through 2023-24 storm water year |
| Additional Metal Absorbing Media | Add More Ultra-Filter Socks with Heavy Metal Remover (or equivalent) around DA-13 such as where storm water exits the paved scrap yard and where storm water enters the impoundment.<br>Rationale: As part of the IABMPD, provide more metal-removing filtration capacity by forcing storm water to flow through several rolls of filter media. | By December 31, 2023 |
| Evaluate Each Pond | In addition to sampling the discharge at DA-13, collect samples from each separate retention basin or directly as water flows out of scrap yard into the north pond.<br>Rationale: As part of the IABMPD, assess if one impoundment or another is contributing more contaminants (iron and aluminum) into the final discharge. | Through 2023-24 storm water year as conditions allow |
| Enhanced Housekeeping BMPs | Enhance sweeping of the scrap yard of small debris such as shavings, chips, etc. to minimize exposure of these scrap items to storm water.<br>Rationale: As part of the IABMPD, minimize contact of potential storm water contaminants. | By October 1, and at least monthly through April |

| Activity Category | Description and Rationale | Proposed Implementation Schedule/Date |
|---|---|---|
| Exposure Minimization BMPs | During monthly visual inspections, inspect scrap yard to identify those items with highest potential to contribute storm water contaminants and move under cover or under temporary covers or awnings. | By October 1, and at least monthly through April |

## 7.0 REVIEW OF STORM WATER ANALAYTICAL DATA – pH

Table 7-1 below summarizes the recent storm water NAL exceedances subject to ERA Level 2.

**Table 7-1: Summary of NAL Exceedances - pH**

| Reporting Year | Sample Date | pH | |
|---|---|---|---|
| | | DA-11 | DA-13 |
| 2018-19 | 11/29/2018 | **5.62** | NoD |
| | 1/16/2019 | 7.68 | NoD |
| | 2/13/2019 | **5.86** | 6.22 |
| | 3/20/2019 | 7.7 | NoD |
| 2019-20 | 1/16/2020 | **5.62** | **5.2** |
| 2020-21 | 12/17/2020 | 7.25 | NoD |
| 2021-22 | 12/13/2021 | 6.97 | NoD |
| | 12/23/2021 | 6.35 | 6.55 |
| | 4/21/2022 | **5.71** | NoD |
| 2022-23 | 11/8/2022 | **5.5** | **5.83** |
| | 12/1/2022 | **5.71** | 7.36 |
| | 2/3/2023 | 6.13 | NoD |
| | 2/24/2023 | 6.25 | 6.78 |
| | 3/9/2023 | 6.39 | 6.85 |
| **Numeric Action Level (Instantaneous)** | | **<6 or >9** | |

Notes: NoD- No Discharge

Exceedances of NALs are shown in **Red.**

Prior to the 2018-19 storm water year, SNL/CA was baseline for pH. After the 2018-19 storm water where DA-11 recorded two pH values less than 6, the facility became ERA Level 1 for pH on July 1, 2019. After the January 16, 2020, storm event, both drainage areas 11 and 13 recorded pH values less than 6. Therefore, on July 1, 2020, SNL/CA became ERA Level 2 for pH. Despite rigid protocols on calibrating the pH meter both before and after testing, low pH values have been recorded. The pH readings of less than 6 occur more frequently in DA-11 and DA-11 generally sees pH readings lower than DA-13.

# 8.0 ERA LEVEL 2 ACTION PLAN FOR PH

The ERA Level 1 and ERA Level 2 Action Plan primarily consisted of BMP recommendations related to preparing calibration instructions for the pH meter and performing a post calibration check of the meter after recording the pH to ensure any results recorded are accurate. These were implemented under the premise that the pH measurement was faulty. Recent experience indicates that pH exceedances have continued.

**On-Site Industrial Sources**

As described in the ERA Level 1 evaluation, there are no obvious industrial sources of acidic materials at the site that would lower the pH.

The DA-11 auto repair, fueling, warehouse, machine shop, and TSDF areas have minimized the exposure of activities to storm water. Fueling is done under a canopy; vehicles are primarily repaired indoors; materials are warehoused under roof; and any materials stored in the TSDF area must be in containers that are maintained closed. None of the materials involved in these industrial activities would be expected to lower pH.

The DA-13 Environmental Test facilities, machine shops, scrap yard, and Explosives Storage Area have minimal exposure to storm water. Machining is performed within buildings or under roof structures, and raw metal inventory is primarily placed under tents. Materials in the scrap yard were primarily office type furniture, shelving units, and empty metal storage hoppers that are closed. Explosives are securely stored in covered and locked storage units. None of the materials involved in these industrial activities would be expected to lower pH.

**On-Site Non-Industrial Sources**

There are no known on-site non-industrial sources of acidic materials that would lower pH.

**Off-Site Sources**

SNL/CA campus includes over 50 buildings on about 410 acres. The two industrial drainage areas are well away from the facility perimeter and there are likely no impacts from off-site surficial sources. However, during the 2022-23 storm water direct samples of rainwater were collected before it hit the ground on three occasions. That data is presented below in Table 8-1.

**Table 8-1: pH Readings of Rain**

| Sample Date | pH of Rainfall |
|---|---|
| 12/1/2022 | 5.12 |
| 2/9/2023 | 4.57 |
| 2/27/2023 | 4.84 |

The data indicates that the rainwater itself may potentially be contributing to low pH. Some additional studies are described below to validate this.

## 8.1 Demonstration Identification for pH

Based on the information above, the site will be implementing BMPs and collecting data to support an Industrial Activity BMP Demonstration (IABMPD) for DA-11 and DA-13.

## 8.2 Previous BMP Action Items

In the June 2022 Level 2 ERA Technical Report Update for the IABMPD, the status of action items identified in the 2021 Technical Report were discussed. The status of each of the additional action items identified in the June 2022 Level 2 ERA Technical Report Update is provided below in Table 8-2.

**Table 8-2: Status of New BMPs for pH in 2022 Technical Report Update**

| Activity Category | Description | Proposed Implementation Schedule/Date |
|---|---|---|
| Enhanced Sampling Techniques | Improve storm water sampling techniques in DA-11 by using a vault box as depicted in the California Water Board Industrial Storm Water Sampling Video to create a location that will allow for consistent sampling. Place sampling point downstream of the Ultratech Filter Socks with Heavy Metal Removal Media and as close to the industrial area as possible. | By December 31, 2022<br>**Actual: Completed** |
| Enhanced Sampling Techniques | Improve storm water sampling techniques in DA-13 by sampling from the catch basin under the storm drain grate. Install a weir as depicted in the California Water Board Industrial Storm Water Sampling Video to ensure that there will be adequate height to collect the storm water samples in the sampling bottles. | By December 31, 2022<br>**Actual: Completed** |
| Additional Investigative Sampling | If a low pH reading is observed, collect a sample of rainwater before it hits the ground and measure the pH and record the value on the sampling observation form. | Each QSE or least each QSE when a value is recorded that has a pH outside of 6-9<br>**Actual: Completed for one QSE; two additional samples were collected from storm events when drainage area samples that were not collected.** |

## 8.3 Demonstration Tasks and Schedule of BMPs to be Implemented

Table 8-3 below presents the timeline of the additional BMPs to be implemented during the 2022-23 storm water year.

**Table 8-3: Task Schedule for New 2023 BMPs – pH**

| Activity Category | Description | Proposed Implementation Schedule/Date |
|---|---|---|
| Additional Investigative Sampling | Establish a standard practice for efficiently collecting samples of rainwater before ground contact and measuring pH within 15 minutes. Identify sample collection points that will at least sample rain on the outer upwind perimeter of the site and within the core site. Rationale: Gathering data to determine if site activities may be contributing to pH issues or if low rainwater pH is a natural occurrence, and how often it occurs and whether data is sufficient to provide a non-industrial source demonstration. | Through 2023-24 storm water year as conditions allow |
| Potential BMP enhancement | In DA-11, add filter socks with limestone, marble, dolomite or equivalence.<br>Rationale: These natural materials will tend to increase pH and can buffer the effects of naturally occurring acidic rainfall. | By December 31, 2023 |