HF Sinclair

April 18, 2024

Mr. Michael Buchanan, Environmental Specialist
State of New Mexico Energy, Minerals and Natural Resources Department
Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Re: Response to Notice of an Administratively Incomplete Stage 2 Abatement Plan for the Former Reverse Osmosis (RO) Reject Discharge Fields
HF Sinclair Navajo Refining LLC, Artesia Refinery
Eddy County, Artesia, New Mexico

Dear Mr. Buchanan:

HF Sinclair Navajo Refining LLC (HFSNR) is submitting this response to comments in the letter dated March 7, 2024 from the Oil Conservation Division (OCD) regarding the January 31, 2023 Stage 2 Abatement Plan (AP) for the former Reverse Osmosis (RO) reject discharge fields. The OCD comments from the letter are provided in italics below with HFSNR's response and additional information as requested.

Comment 1

In Transmittal of the Stage 2 Abatement Work Plan for the Former Reverse Osmosis (RO) Reject Discharge Fields dated October 19, 2022, page 3, HF had stated: "Thus, the COCs in groundwater that will be included in the future semiannual groundwater monitoring program for wells in the vicinity of the former RO reject discharge fields include: Arsenic, Boron, Iron, Manganese, Uranium, Chloride, Fluoride, Nitrate, Nitrite, Sulfate, TDS." In this version of the AP, HF removed Arsenic and Iron. Arsenic and Iron concentrations (total metal concentrations) in MW-29 have exceeded the WQCC standards as recently as October 2022 and thus OCD believes these should still be monitored as well. Please update the AP accordingly in sections 1.3, 2, and Appendix D.

Response

Arsenic and Iron will be included in the future monitoring program for the wells associated with the former RO reject discharge fields. Sections 1.3.3.3 and 2.1.3.2, and Appendix D have been revised accordingly in the April 2024 revision to the Stage 2 AP.

The following text has been added to Section 1.3.3.3:

— Dissolved Arsenic has been present at concentrations above the WQCC standard in MW-29 (upgradient of the South RO reject discharge field). Although concentrations of dissolved Arsenic do not exceed the WQCC standard in samples from the wells within the field, semiannual monitoring of dissolved Arsenic within and downgradient of the fields is recommended for a period of three (3) years to confirm natural attenuation of this COC.

— Dissolved Iron has been present at concentrations above the WQCC standard in MW-29 (upgradient of the South RO reject discharge field). Although concentrations of dissolved Iron do not exceed the WQCC standard in samples from the wells within the field, semiannual monitoring of dissolved Iron within and downgradient of the fields is recommended for a period of three (3) years to confirm natural attenuation of this COC.

Arsenic and Iron were added to the list of dissolved (field-filtered) metals to be analyzed by Method 6010 or 6020 in Section 2.1.3.2.

Appendix D has been modified to reflect inclusion of the additional COCs in the financial assurance.

Comment 2

In section 3.3, HF mentions using insecticides and herbicides, if needed. Many of these can leach harmful constituents into groundwater. Please suggest environmentally sound alternatives to these or options that will biodegrade.

Response

Selection of insecticides and herbicides will be very specific and will be based on the actual insect(s) or weed(s) that need to be controlled, if necessary. Instead of naming specific agents that will be used for a future unknown condition. Section 3.3 as been edited to address pest and weed control, as follows:

— Pest monitoring and weed control: Pests can decimate a crop, and weeds provide unnecessary competition for water and nutrients that are important for plant growth. In the event that insecticides or herbicides are required to control pests or weeds, HFSNR will select the most environmentally sound alternative for the specific need and request concurrence from the OCD prior to use. HFSNR will report the agent and quantity used to OCD in the quarterly status reports.

Comment 3

Also, in section 3.3, on page 14, it states, "At a minimum, fertilization will be performed annually." Application of fertilizer must be approved by OCD, please propose which fertilizer will be used and that of which is an environmentally safe alternative.

Response

Fertilizer will be selected based on soil conditions to be determined by the initial sampling and on the specific needs of the grasses to be planted. The final pilot study design will be submitted prior to implementation of the pilot study, as stated in Section 4.2, and will include recommended fertilization, as needed. HFSNR cannot propose any specific fertilizers at this time but will seek environmentally safe alternatives and application rates and will obtain OCD concurrence prior to implementation of the pilot study and any future fertilization plans. HFSNR will report the fertilizer and quantity used to OCD in the quarterly status reports.

Section 3.3 as been edited to address fertilization, as follows:

— — Periodic fertilization: Fertilizer selection, as needed, will be based on the results of the evaluation of current soil nutrient conditions conducted prior to the initial planting. The residual nutrients in soil and in the irrigation water will be accounted for when assessing fertility needs. Fertilizers may be applied either in liquid or granular form, depending on the fertilization requirements. Liquid fertilizer would be applied through a spraying system while granular fertilizer would be broadcast on the ground surface. Fertilizer will be applied at or slightly below agronomic rates to avoid the potential for additional leaching of COCs. HFSNR will seek concurrence from the OCD, prior to application, for fertilizer to be applied during the initial planting and during subsequent growing seasons. Subsequent fertilizer applications will be based on additional agronomic sampling results. HFSNR will report the fertilizer and quantity used to OCD in the quarterly status reports.

Comment 4

In section 5 Public Notification, please update 20.6.2.4108.B and 20.6.2.4108.C.

Response

Section 5 has been modified to reference the correct sections of the New Mexico Administrative Code (NMAC).

Comment 5

Please include a narrative and propose how harvested vegetation will be disposed and where it will be disposed (NMOCD approved facility) for both hazardous and non-hazardous vegetative waste.

Response

HFSNR has stated in Section 3.3 that harvested vegetation will be disposed of off-site; however, a disposal facility cannot be specified until the harvested vegetation has been sampled and characterized. HFSNR develops and maintains relationships with several disposal facilities to allow for flexibility and ensure adequate capacity for off-site disposal. A list of the preferred facilities that will be used for vegetation disposal, depending on the characterization of the waste and facility capacity and availability, has been added to the Stage 2 AP.

The final bullet of Section 3.3 has been modified to provide additional information and reads as follows:

— Evaluation of plant growth will be conducted to determine if or when the plants need to be harvested or cut back. Vegetation that is harvested or cut will be removed from the fields and contained by bailing, bagging, or placing into a rolloff bin. Representative samples will be collected for analysis of soil and groundwater COCs and any additional parameters required for waste characterization, as per the potential disposal facilities. The vegetation will be characterized as either hazardous or non-hazardous for offsite disposal at an approved facility and will not be used as food for humans or livestock. The actual disposal facility to be used for each disposal event will be determined by the waste characterization, facility capacity, and availability to receive wastes. Non-hazardous waste will likely be disposed at the Gandy Marley Inc. facility near Roswell, NM or the Eddy County Sandpoint Landfill in Carlsbad, NM. Hazardous waste will likely be disposed at the US Ecology Inc. facility in Robstown, TX or the Veolia North America facility near Arkadelphia, AR. Records of the source and volume of harvested vegetation, method of containment, analytical results, waste characterization determination, and copies of bills of lading or shipping manifests will be maintained at the Refinery and copies will be included in the final pilot study report and any future phytoremediation reports.

Comment 6

Potential Species, section 3.2.2 on page 12, suggests four candidates for use in the Phytoremediation Pilot; however, the deepest root zone, out of all four, can only capture a max penetration depth of 12 feet for Indian Grass. The other candidates are much shallower in root *zone for COC/heavy metal capture. Please propose either an alternative species of vegetation or propose how the remaining depth of the vadose zone will be remediated.*

Response

HFSNR believes the proposed species are appropriate based on the rationale described in the subsections below.

Selection Criteria
Selection criteria for species to be used in the phytoremediation study focused on the following:

- COC tolerance: Fluoride was determined to be the COC of most concern during the Stage 1 AP and, in some cases, it can be toxic to plants.
- Water consumption: candidate species should have natural water usage that exceeds the annual rainfall of the area in order to consume rainfall and takeup soil pore water.
- Drought tolerance: HFSNR is located in a semi-arid region, with an annual evapotranspiration greater than the annual rainfall rate.
- Effective growth: Species were identified that are either native to the area or have been shown to effectively grow in the area.

The selection of species also focused on grasses since the two former RO reject discharge fields are located within the boundary of the active Refinery and are reserved for future Refinery expansion.

The species selected for this phytoremediation study include grasses that are known to be somewhat tolerant to Fluoride and include two native species requested by OCD during previous reviews of the Stage 2 AP. Both Sudan Grass and Indian Grass are expected to develop a root structure that will extend between 9 to 12 feet deep. While the roots of the Western Wheatgrass and Tall Wheatgrass are typically shallower, these two species are known to uptake more water than the typical rainfall and are expected to grow well in the area.

Target Depth for Soil Remediation
Soil samples were collected from the ground surface to the total depth of each monitoring well installed within the two fields during the initial investigation of the former RO reject discharge fields in 2013. Soil samples were collected in 2019 from three intervals between 1 and 10 feet below ground surface (bgs) during the installation of the moisture probes. These soil samples were analyzed for the anticipated COCs and the analytical results were tabulated in the two investigation reports.

Attachment A to this response letter contains graphs of the vertical distribution of the primary soil COCs listed in Section 1.3.2 of the Stage 2 AP (Arsenic, Cobalt, Iron, Manganese, Fluoride, and Sulfate). As can be seen in these graphs, 1) the concentrations of soil COCs generally decrease with depth in the soil samples collected during the installation of the monitoring wells, and 2) at most well locations the concentrations from samples collected deeper than 10 feet bgs are lower than the concentrations from samples collected between the ground surface and 10 feet bgs.

The soil-leaching-to-groundwater soil screening level (Cw DAF20 SSL), if applicable and in range, is shown on the vertical profile graphs in **Attachment A**. The soil analytical data from depths greater than 10 feet bgs, collected during installation of monitoring wells within the former RO reject discharge fields, indicate that reported concentrations do not exceed the Cw DAF20 SSL for Cobalt, Manganese, and Fluoride. Only one sample collected from depths greater than 10 feet bgs exceed the Cw DAF20 SSL for Arsenic in each of the two former RO reject discharge fields (MW-116 in the South field and MW-117 in the North field). Several samples collected from depths greater than 10 feet bgs exceed the Cw DAF20 SSL for Iron; however, the concentrations of Iron in groundwater samples collected from wells located within the two former RO reject discharge fields do not exceed the WQCC standard, indicating that Iron is not leaching from the soil column within the fields at rates high enough to negatively impact the groundwater. There is no Cw DAF20 SSL established for Sulfate.

The soil analytical results indicate that the bulk of the soil COC loading is within the upper 10 feet of the soil column within the two former RO reject discharge fields. The vadose zone is believed to be limited to a range of less than 16 feet bgs based on semiannual groundwater level measurements following cessation of discharge, which range from 8 to 16 feet bgs (note that the total well depth is greater to ensure capture of groundwater during periods of fluctuation).

Species Selected for Study

A combination of grasses was selected that are tolerant to the COCs present, have higher water use than the typical evapotranspiration rate for the area, and are either native or known to grow in the area. Considering the bulk of the COC loading is in the shallowest portion of the vadose zone, the selected species will be effective in sequestering the COCs from the soil and pore water in the upper 12 feet and allow for natural attenuation of the COCs in the remaining portion (about 4 additional feet or to 16 feet bgs) of the vadose zone.

Alternative Species Considered

Certain tree species have been demonstrated to provide effective phytoremediation of deeper soil and groundwater impacts. However, the two former RO reject discharge fields are located within the boundary of the active Refinery and use of trees for phytoremediation is not suitable as the areas are reserved for future Refinery expansion. In addition, the North RO reject discharge field contains several overhead high voltage power lines and a sanitary sewer line crosses the field from west to east, both of which could be negatively impacted the use of trees for phytoremediation.

Section 1.3.2 of the Stage 2 AP has been updated to include a discussion of the vertical distribution of soil COCs within the former RO reject discharge fields. The graphs of the COC concentrations versus depth have been added as an Appendix to the Stage 2 AP.

Section 1.3.3.1 of the Stage 2 AP has been updated to include references to the 2022 and 2023 groundwater monitoring reports and a statement regarding the observed potentiometric surface depths following cessation of discharge has been added to this section.

Section 3.2.2 of the Stage 2 AP has been revised to more fully explain the species selection criteria and rationale as described in this response letter.

Comment 7

In Appendix C, please update the email address and contact info from Shelly Wells to Mike Buchanan michael.buchanan@emnrd.nm.gov, and to Dylan Fuge, Acting Director, instead of Adrienne Sandoval.

Response

Appendix C has been modified to the correct contact information.

Although not requested, HFSNR has updated the schedule presented in Section 4.1. Assuming the Stage 2 AP is approved no later than May 1, 2024, the schedule for implementation of the phytoremediation pilot study would be as follows:

- May 1, 2024: OCD approval of Stage 2 AP received assumed
- May 1 to June 15, 2024: collect soil and water samples for laboratory analyses; install monitoring wells and moisture probes
- May 1 to July 15, 2024: finalize pilot study design based on laboratory analytical results and prepare detailed implementation specifications to include irrigation system selection and maintenance guidelines
- June 15 to August 31, 2024: select implementation contractor, prepare fields including installation of moisture probes (as needed), confirm seed sources
- September 15 to October 15, 2024: plant pilot study species (excluding Sudan grass since it will not survive winter)
- September 15, 2024 to September 1, 2025: operate and maintain pilot study, plant Sudan grass in spring 2025
- September 1, 2025 to September 30, 2025: harvest / cut plants from both fields, plant winter crop on field where Sudan grass was tested
- October 1, 2025 to March 1, 2026: finalize full scale phytoremediation design, submit report to OCD with recommendations for full-scale implementation

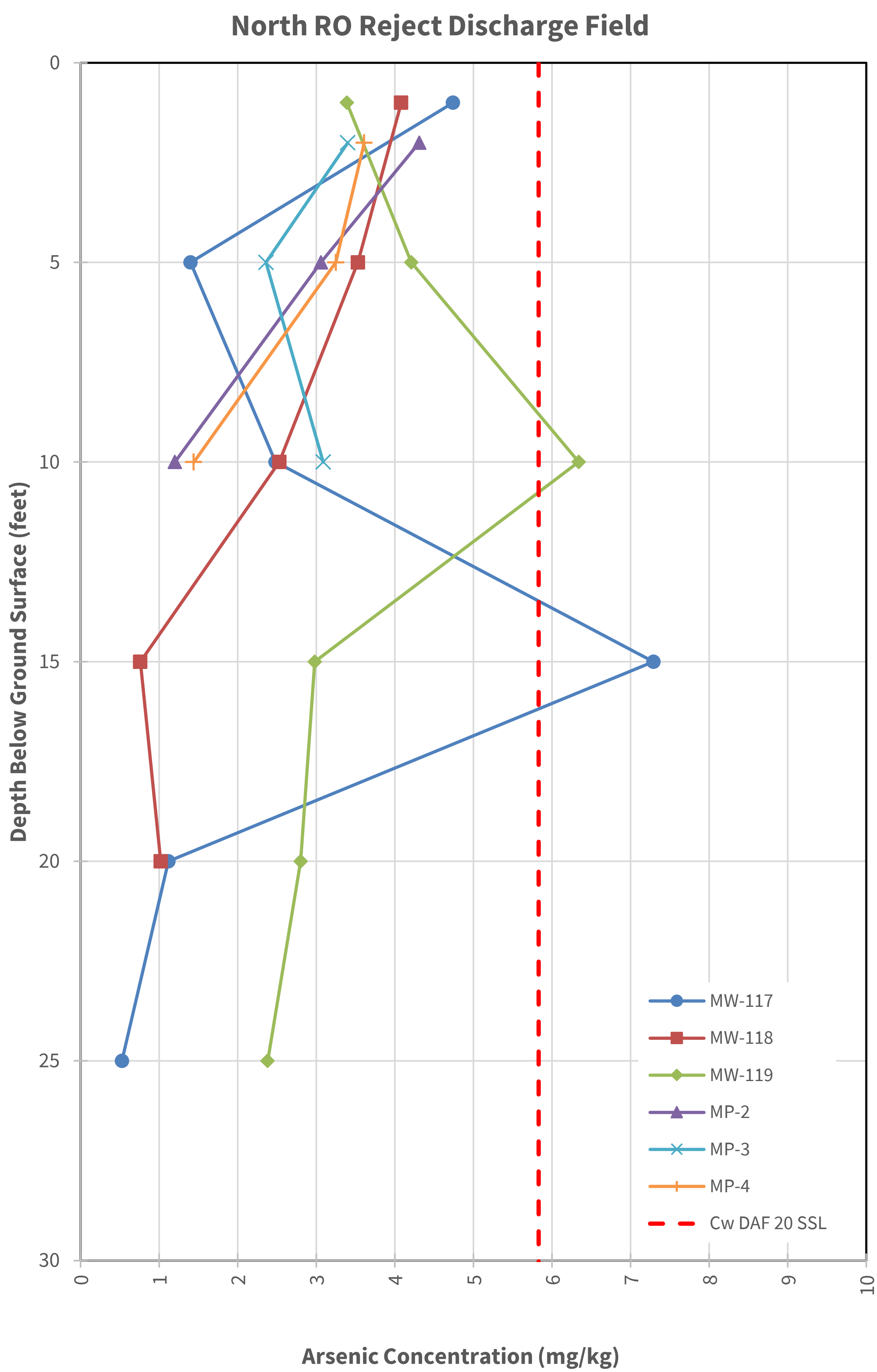
If you have any questions, please feel free to contact Teresa Alba at 575-746-5391 or Mike Holder at 575-308-1115.

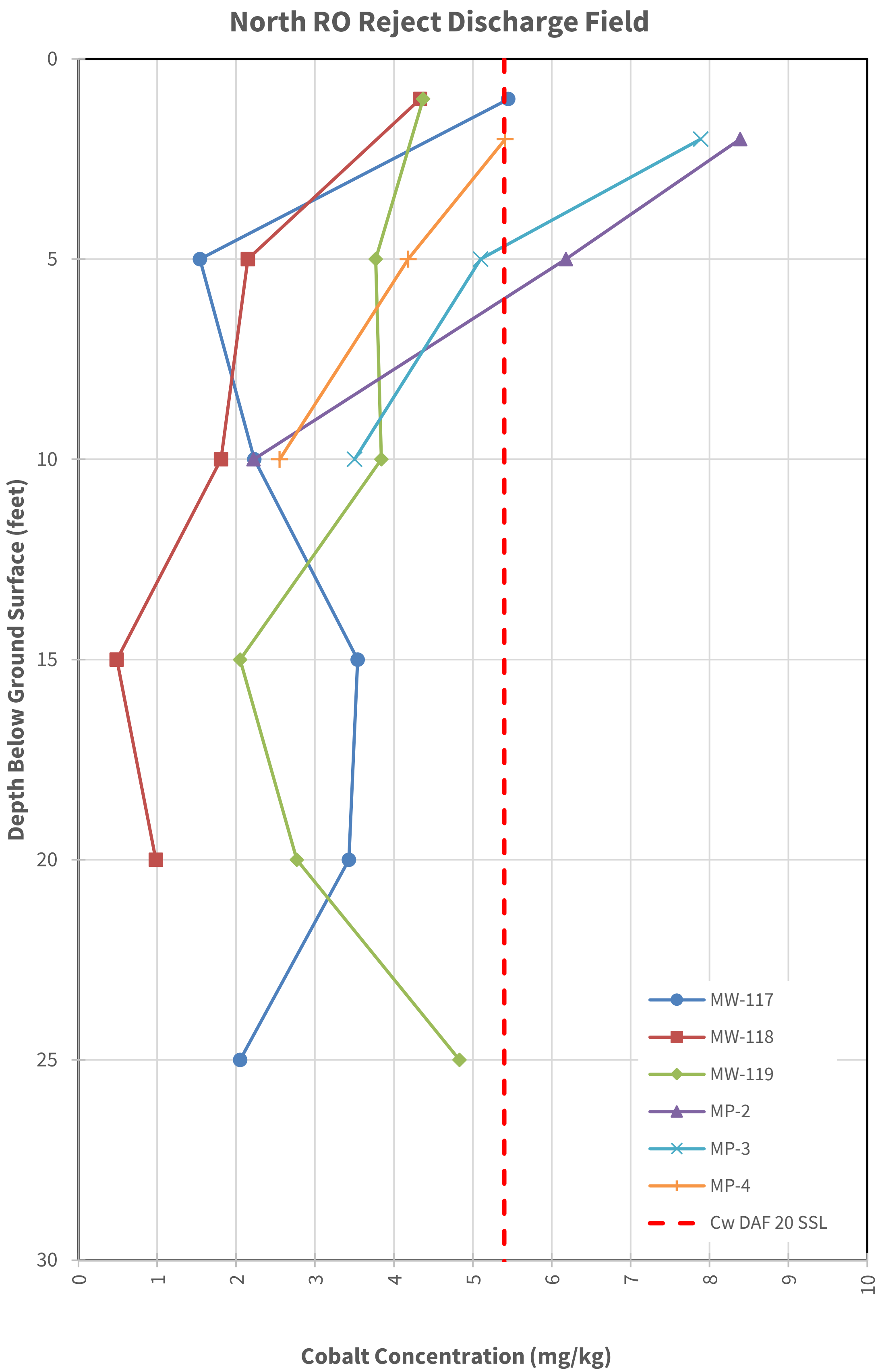
Sincerely,

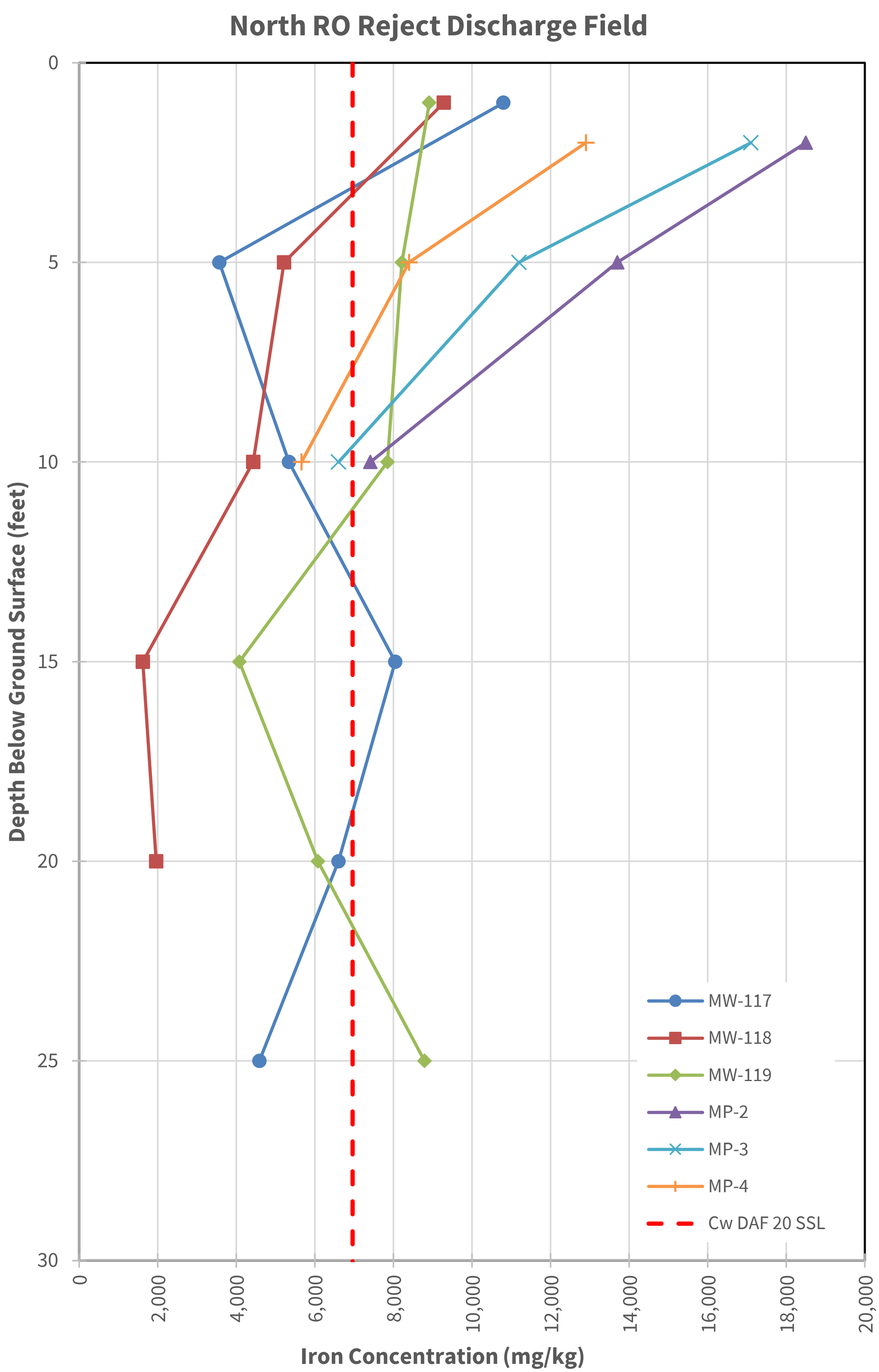
Case Hinkins
Environmental Manager
HF Sinclair Navajo Refining LLC

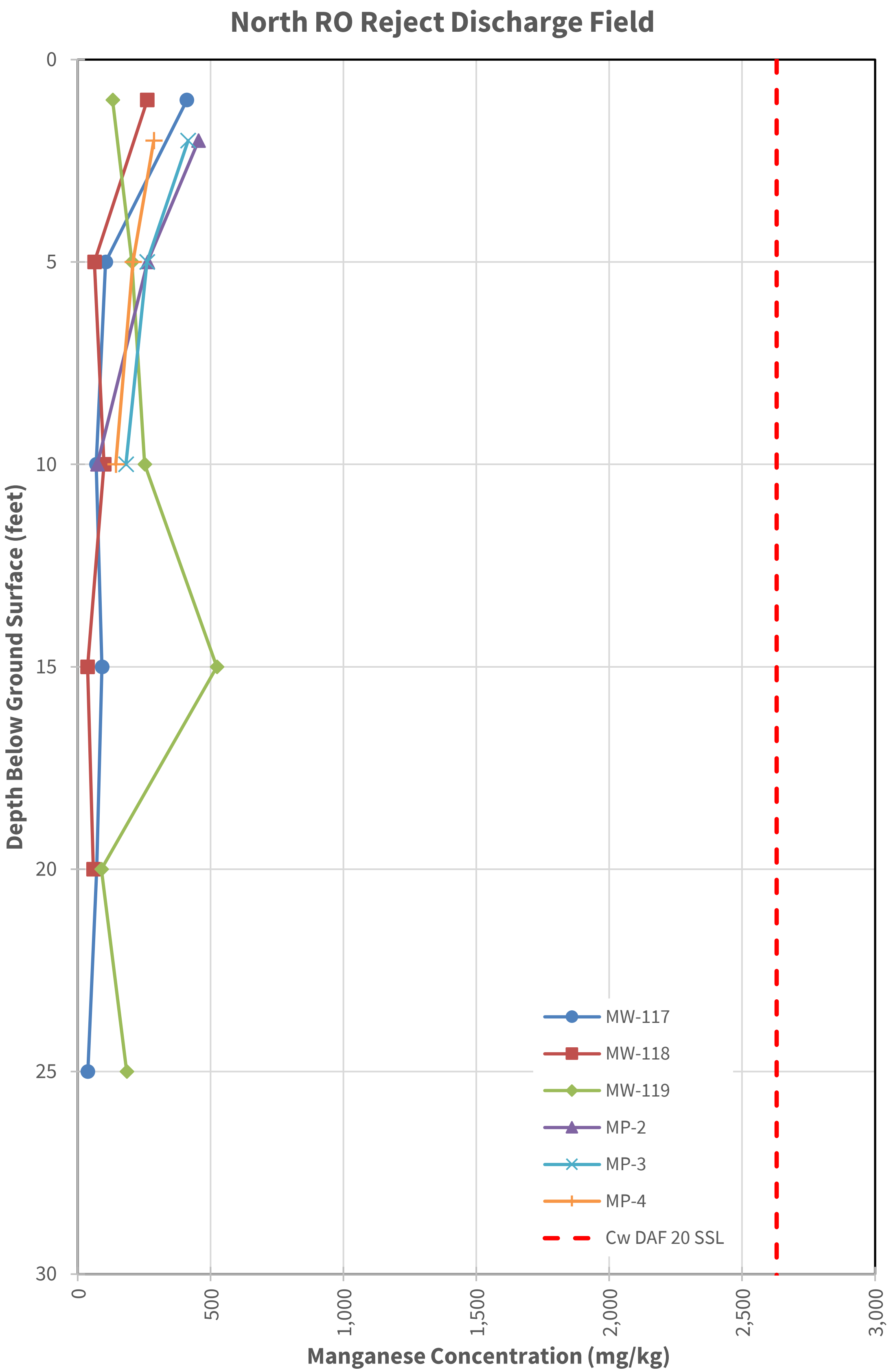
c: OCD: L. Barr
NMED: M. Suzuki, L. Tsinnajinnie, N. Dhawan
HFSNR: M. Holder, T. Alba

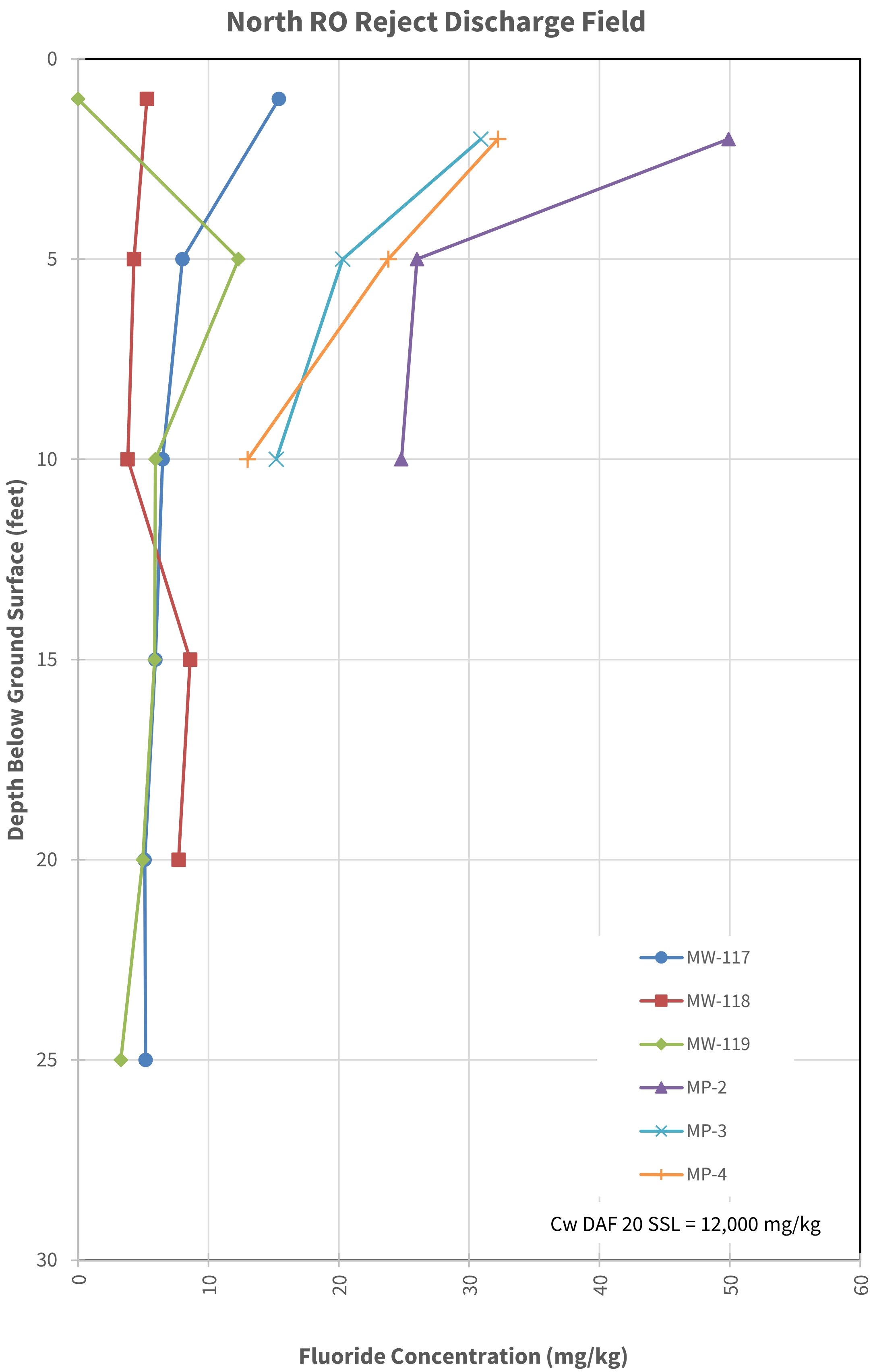
Attachment A – Vertical Soil Profiles

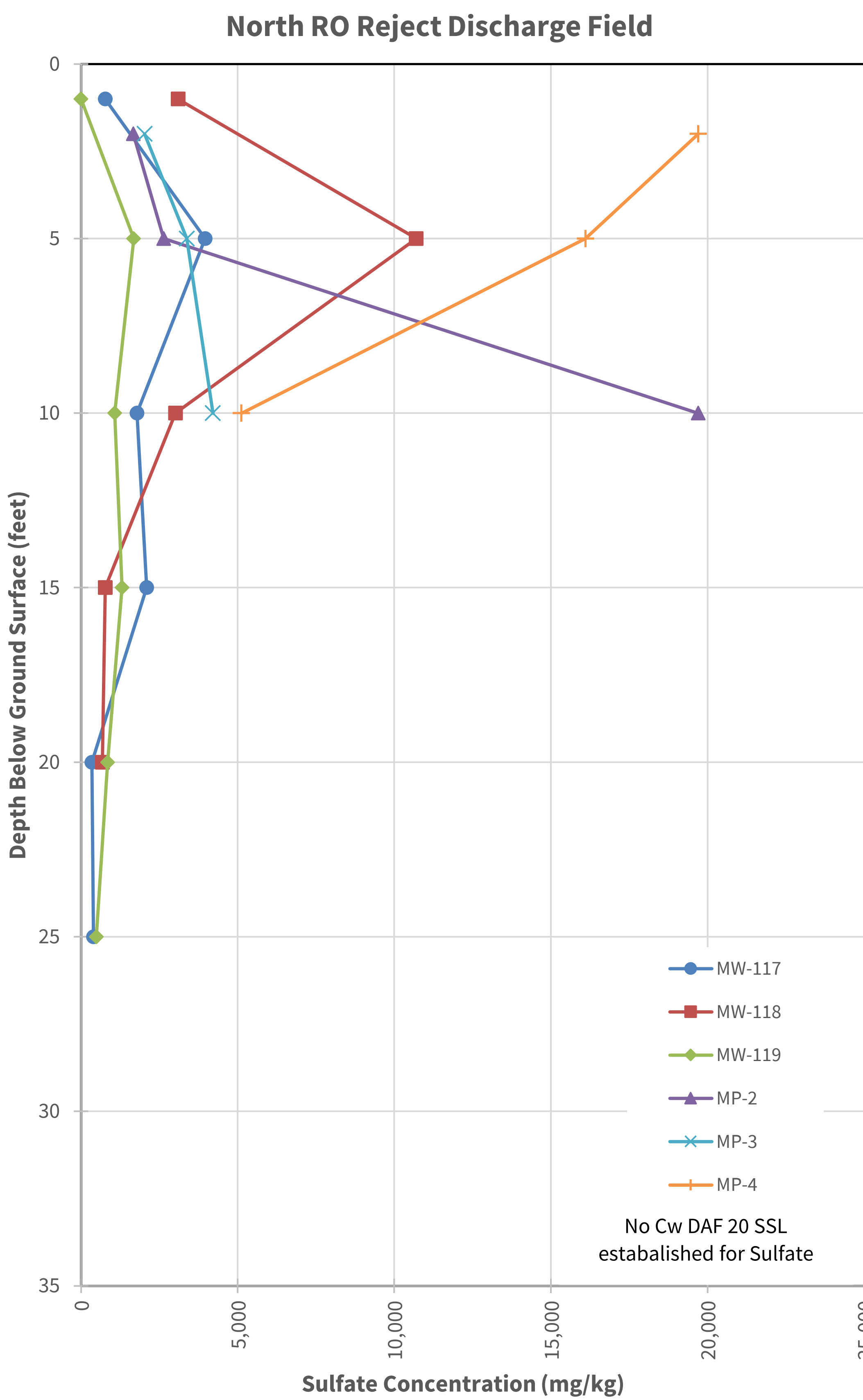

North RO Reject Discharge Field
Depth Below Ground Surface (feet)
0
5
10
15
20
25
30
0
1
2
3
4
5
6
7
8
9
10
Arsenic Concentration (mg/kg)
MW-117
MW-118
MW-119
MP-2
MP-3
MP-4
Cw DAF 20 SSL

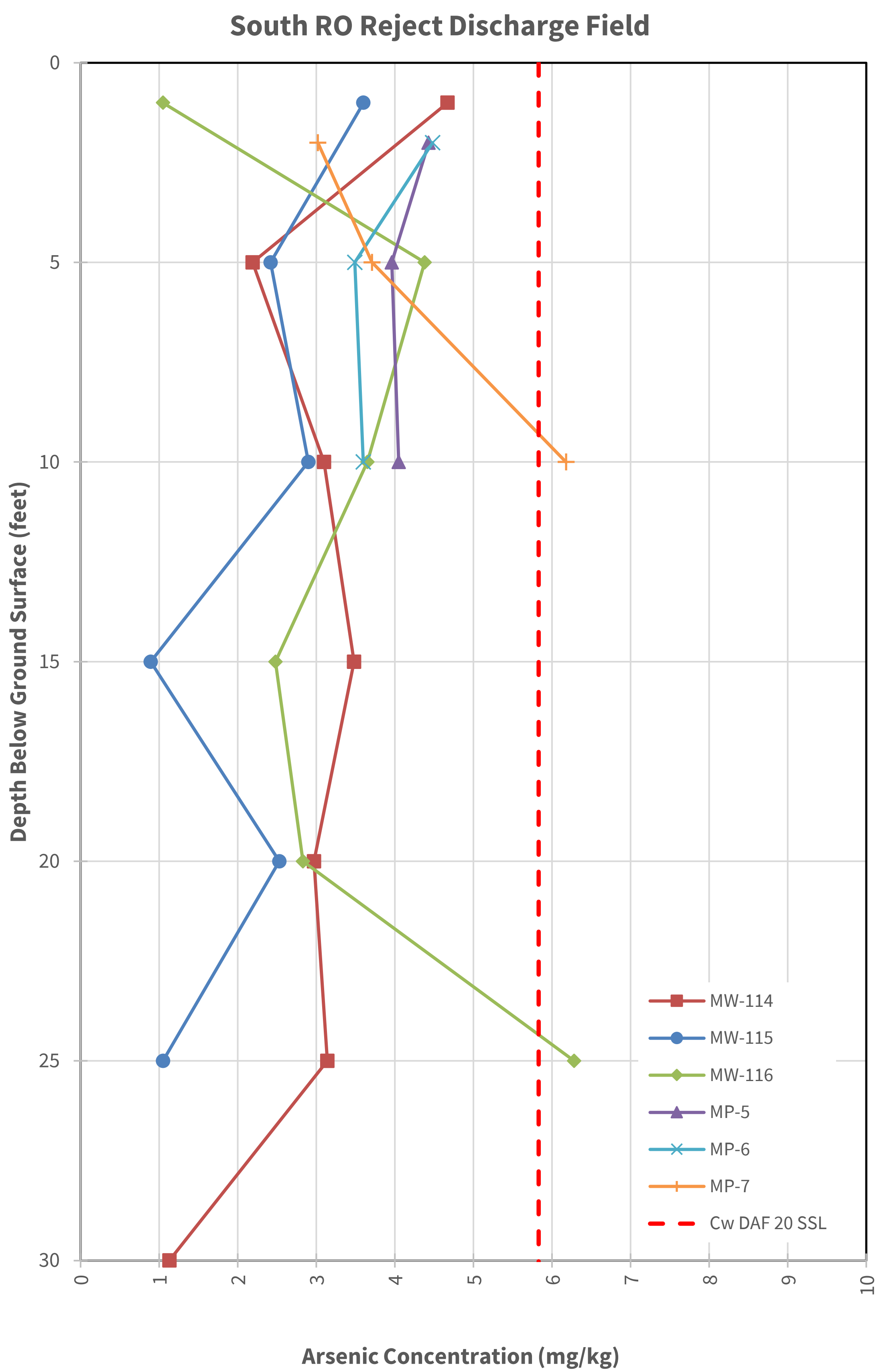

North RO Reject Discharge Field
Depth Below Ground Surface (feet)
Cobalt Concentration (mg/kg)
0
5
10
15
20
25
30
0
1
2
3
4
5
6
7
8
9
10
MW-117
MW-118
MW-119
MP-2
MP-3
MP-4
Cw DAF 20 SSL

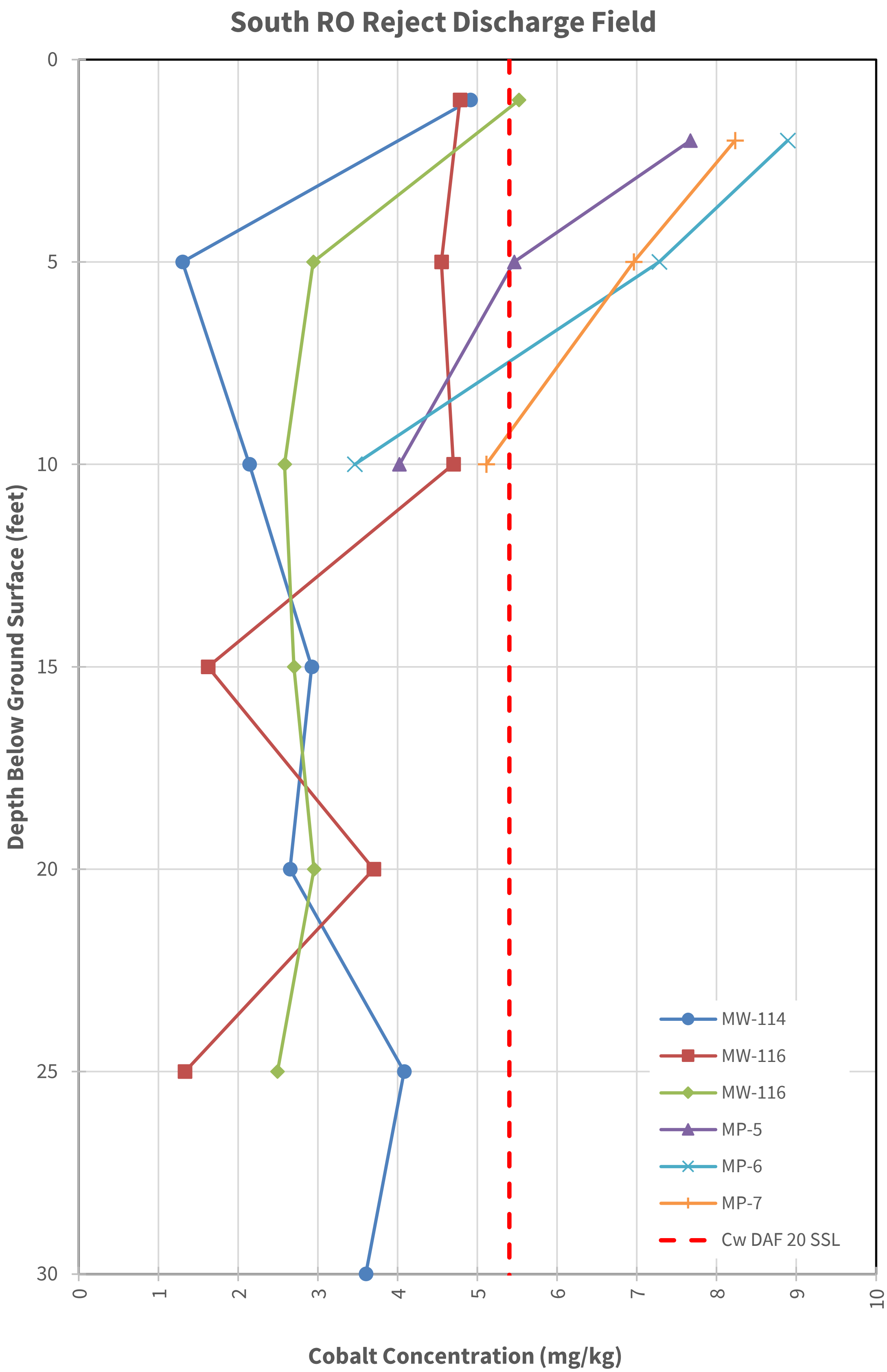

North RO Reject Discharge Field
Depth Below Ground Surface (feet)
0
5
10
15
20
25
30
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
Iron Concentration (mg/kg)
MW-117
MW-118
MW-119
MP-2
MP-3
MP-4
Cw DAF 20 SSL

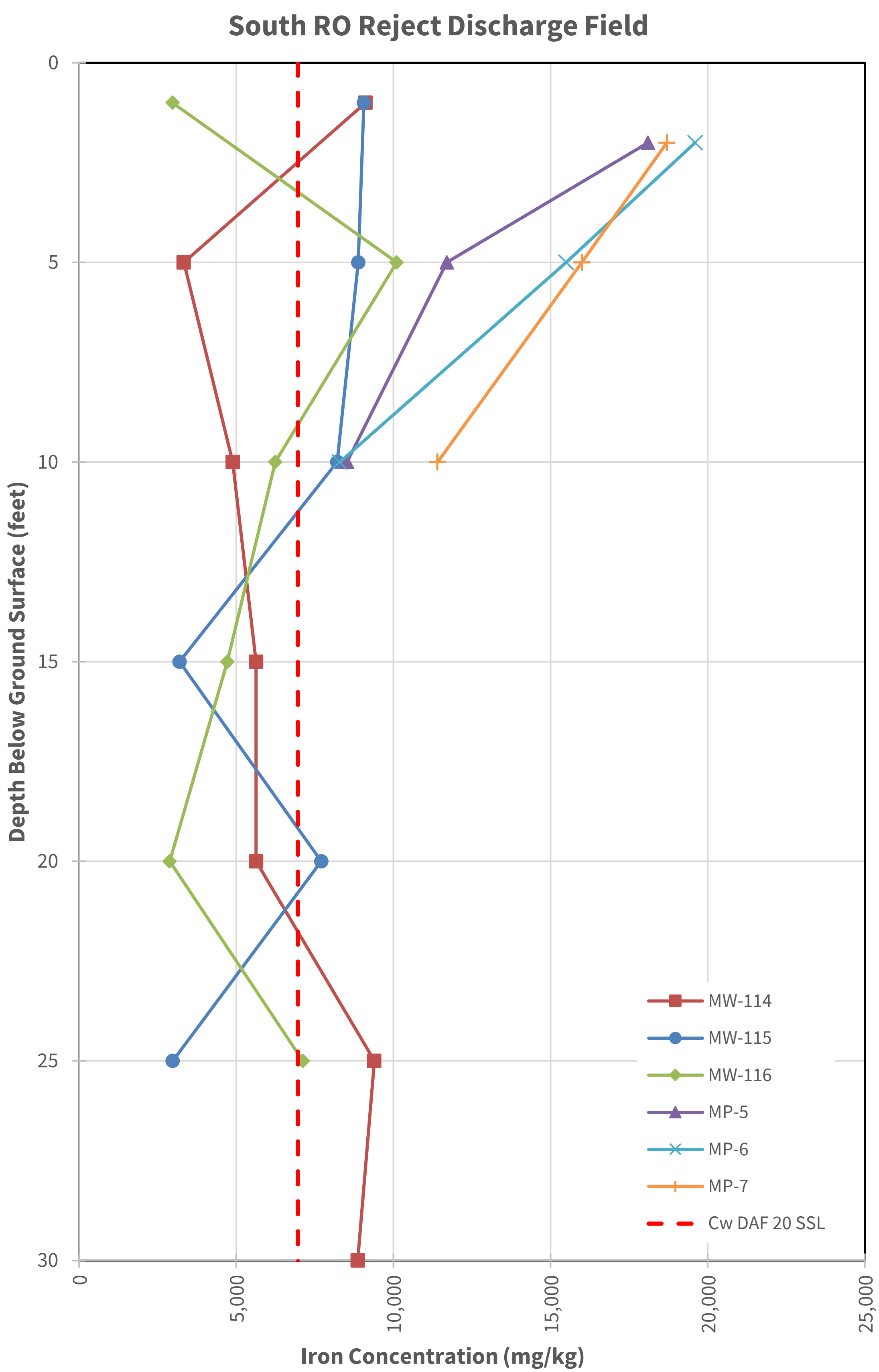

North RO Reject Discharge Field
Depth Below Ground Surface (feet)
0
5
10
15
20
25
30
0
500
1,000
1,500
2,000
2,500
3,000
Manganese Concentration (mg/kg)
MW-117
MW-118
MW-119
MP-2
MP-3
MP-4
Cw DAF 20 SSL

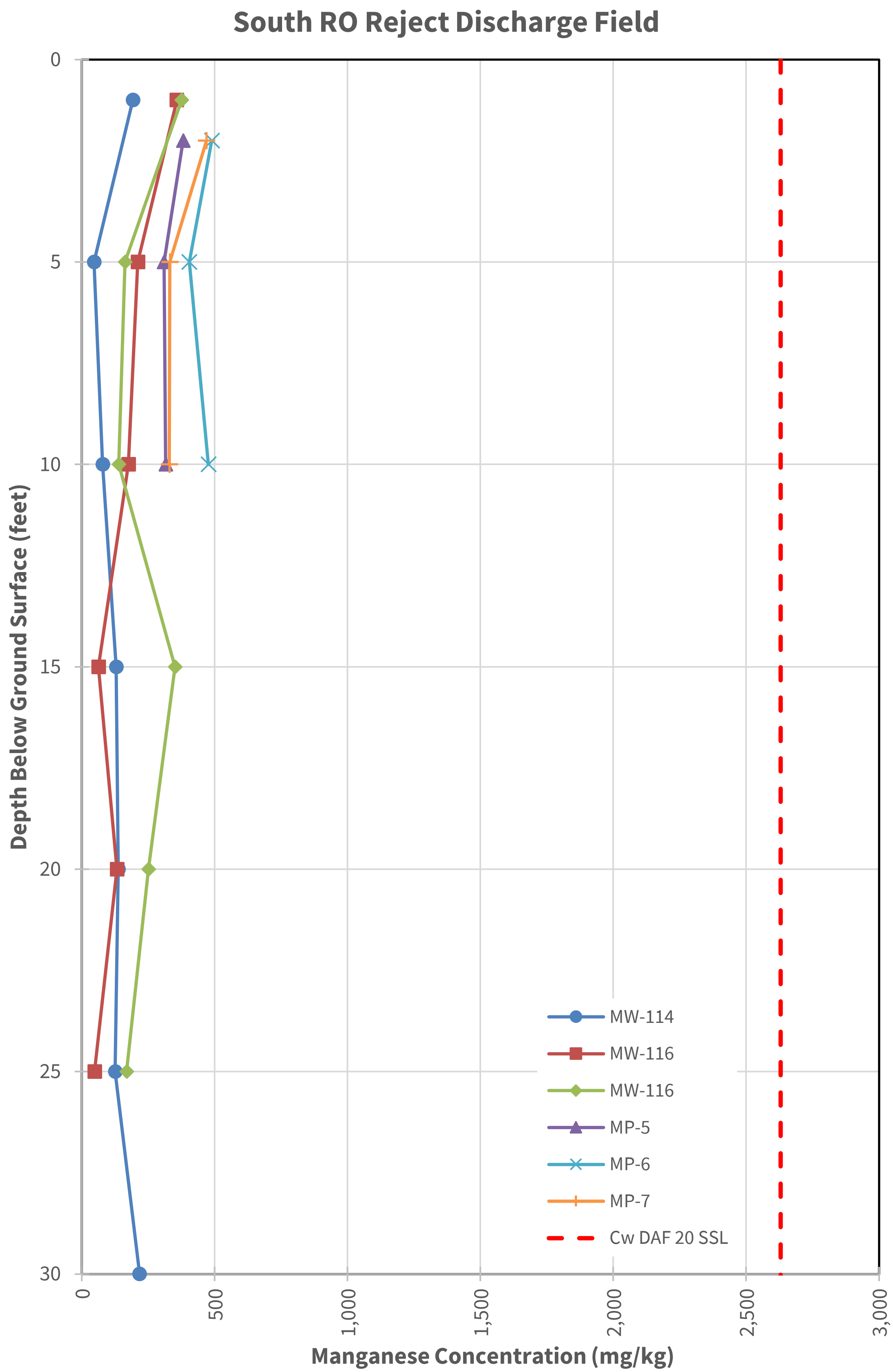

North RO Reject Discharge Field
Depth Below Ground Surface (feet)
0
5
10
15
20
25
30
0
10
20
30
40
50
60
Fluoride Concentration (mg/kg)
MW-117
MW-118
MW-119
MP-2
MP-3
MP-4
Cw DAF 20 SSL = 12,000 mg/kg

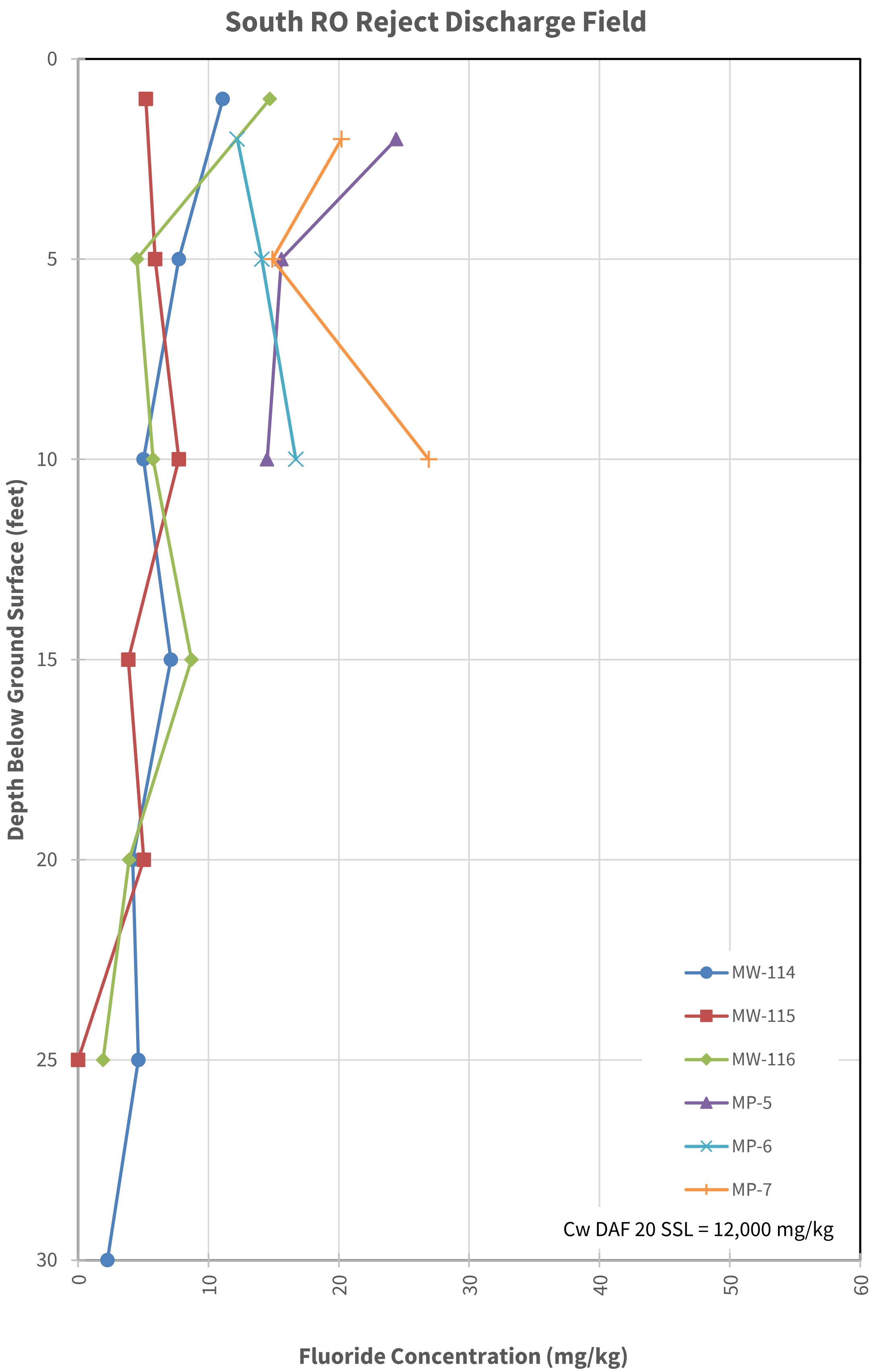

North RO Reject Discharge Field
Depth Below Ground Surface (feet)
0
5
10
15
20
25
30
35
Sulfate Concentration (mg/kg)
0
5,000
10,000
15,000
20,000
25,000
MW-117
MW-118
MW-119
MP-2
MP-3
MP-4
No Cw DAF 20 SSL
estabalished for Sulfate

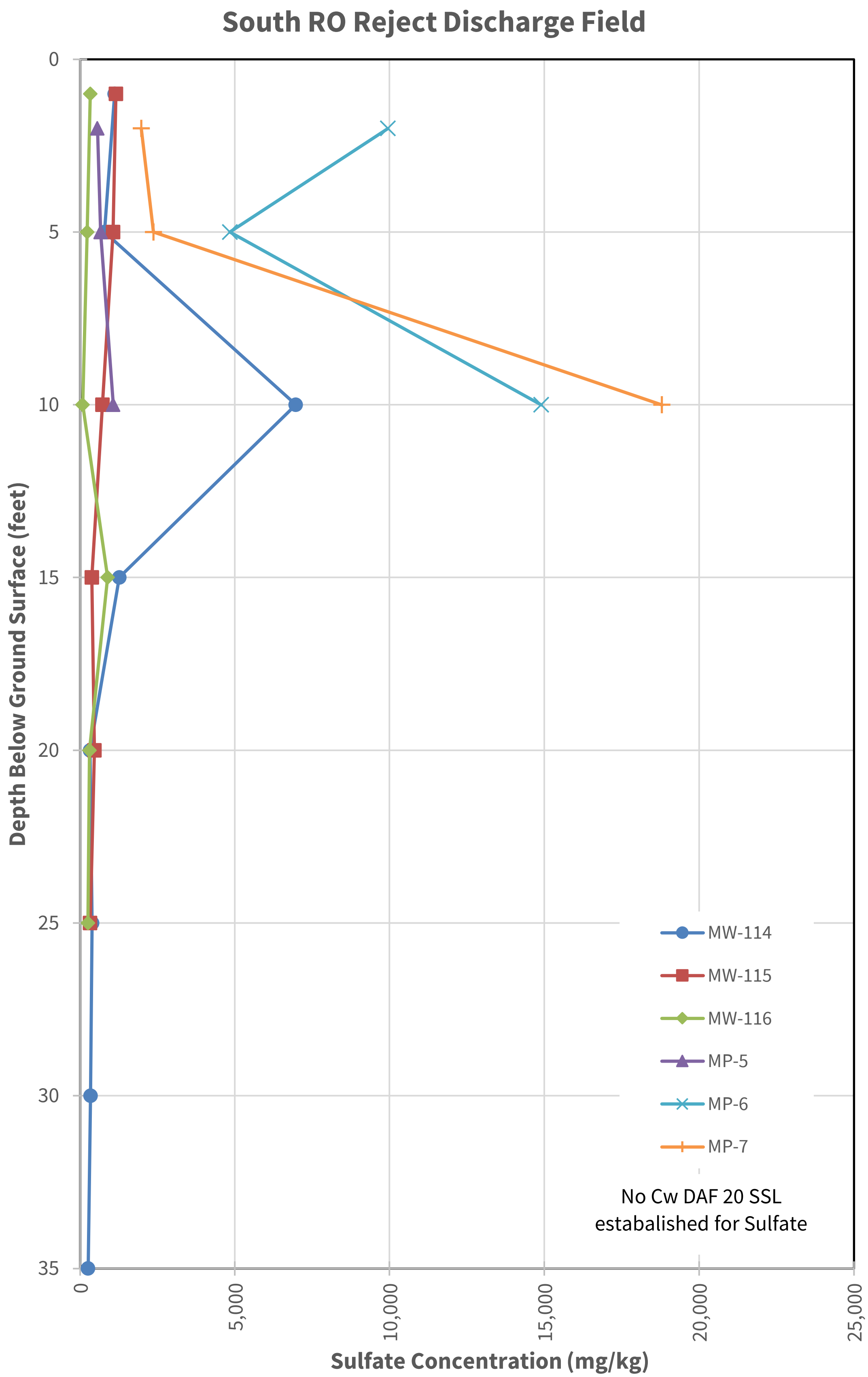

South RO Reject Discharge Field
Depth Below Ground Surface (feet)
Arsenic Concentration (mg/kg)
0
5
10
15
20
25
30
0
1
2
3
4
5
6
7
8
9
10
MW-114
MW-115
MW-116
MP-5
MP-6
MP-7
Cw DAF 20 SSL


South RO Reject Discharge Field
Depth Below Ground Surface (feet)
0
5
10
15
20
25
30
0
1
2
3
4
5
6
7
8
9
10
Cobalt Concentration (mg/kg)
MW-114
MW-116
MW-116
MP-5
MP-6
MP-7
Cw DAF 20 SSL


South RO Reject Discharge Field
Depth Below Ground Surface (feet)
Iron Concentration (mg/kg)
0
5
10
15
20
25
30
0
5,000
10,000
15,000
20,000
25,000
MW-114
MW-115
MW-116
MP-5
MP-6
MP-7
Cw DAF 20 SSL


South RO Reject Discharge Field
Depth Below Ground Surface (feet)
0
5
10
15
20
25
30
0
500
1,000
1,500
2,000
2,500
3,000
Manganese Concentration (mg/kg)
MW-114
MW-116
MW-116
MP-5
MP-6
MP-7
Cw DAF 20 SSL


South RO Reject Discharge Field
Depth Below Ground Surface (feet)
0
5
10
15
20
25
30
0
10
20
30
40
50
60
Fluoride Concentration (mg/kg)
MW-114
MW-115
MW-116
MP-5
MP-6
MP-7
Cw DAF 20 SSL = 12,000 mg/kg


South RO Reject Discharge Field
0
5
10
15
20
25
30
35
Depth Below Ground Surface (feet)
0
5,000
10,000
15,000
20,000
25,000
Sulfate Concentration (mg/kg)
MW-114
MW-115
MW-116
MP-5
MP-6
MP-7
No Cw DAF 20 SSL
estabalished for Sulfate

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 335110

CONDITIONS

Operator:	
HF Sinclair Navajo Refining LLC ATTN: GENERAL COUNSEL Dallas, TX 75201	OGRID: 15694
	Action Number: 335110
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

CONDITIONS

Created By	Condition	Condition Date
michael.buchanan	Response to Notice of an Administratively Incomplete Stage 2 Abatement Plan for the Former Reverse Osmosis (RO) Reject Discharge Fields has been accepted for the record.	5/3/2024