SELECTION OF GROUNDWATER REMEDY: ASH PONDS AND EQUALIZATION POND

San Miguel Electric Cooperative, Inc.
Christine, Atascosa County, Texas

Issued: 26 May 2020

Prepared for: San Miguel Electric Cooperative, Inc.

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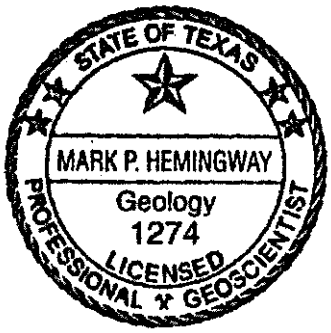

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1.0 INTRODUCTION

On behalf of San Miguel Electric Cooperative, Inc. (San Miguel), GSI Environmental Inc. (GSI) has prepared this report on the Selection of Groundwater Remedy for the San Miguel Electric Plant (the Plant) located near Christine, Atascosa County, Texas. This report, in accordance with requirements specified in 40 Code of Federal Regulations (CFR) § 257.97, describes the remedy selected for addressing groundwater impacts originating from two Coal Combustion Residual (CCR) management units at the Plant: Ash Water Transport Ponds A and B (Ash Ponds) and the Equalization Pond.

1.1 Site Description

The San Miguel Plant is located in south-central Atascosa County in Christine, Texas. Surrounding land use include the San Miquel Lignite Mine, reclaimed mine areas, oil and gas production, and a cattle ranch (herein, the Peeler Ranch). The Plant provides electricity to users in 42 South Texas counties.

The Plant has three units used for the ongoing management of CCR that are subject to the CCR Rule requirements: two surface impoundments (Ash Ponds and Equalization Pond) and one landfill (Ash Pile) (Figure 1):

Equalization Pond: The Equalization Pond is located on the eastern boundary of the Plant property and is a bermed impoundment; its western berm is shared with a freshwater storage pond. The Equalization Pond receives flue gas desulfurization scrubber wastewater (a spent limestone slurry) and sewage wastewater from the San Miguel Plant.

Ash Ponds: The Ash Ponds are located along the southern boundary of the site and east of the Yard Drainage Retention Pond. The Ash Ponds are bermed impoundments, with the northern (uphill) berm at or near natural grade. The two Ash Ponds are separated by a central 'splitter-dike,' with Ash Pond A on the north and Ash Pond B on the south. There is a connecting weir between the two ponds. The Ash Ponds receive bottom ash transport water, boiler blowdown, cooling tower blowdown, boiler feedwater treatment wastewater, and also stormwater runoff from a limited portion of the site. In addition, the Ash Ponds receive wastewater from the Equalization Pond as needed to manage the water level in the Equalization Pond, and periodic makeup water from the Yard Drainage Retention Pond.

Ash Pile: The Ash Pile is located northwest of the Plant and east of the Lignite Storage Pile and has an area of approximately one acre. CCR materials are collected from the Ash Pile, typically on a daily basis, and predominantly transported to mine areas undergoing reclamation.

1.2 Geology & Hydrogeology

Shallow geologic units at the San Miguel Plant consist of unconsolidated Eocene age sediments of the Jackson Group, with Quaternary alluvium present along surface drainages. The Jackson Group sediments typically comprise surficial and shallow stiff clays overlying a shallow silty to clayey water-bearing sand. This sand is designated as "Unit 22." Unit 22 meets the definition of an "uppermost aquifer" at the Plant based on the CCR Rule (§ 257.53) and is therefore the focus of San Miguel's groundwater monitoring under the CCR Rule. Unit 22 is a green-gray fine-grained

sand unit. In the immediate Plant area, the upper contact of Unit 22 varies from 5 to 30 ft below ground surface (bgs) and has a thickness ranging from 5 to 25 ft.

As shown in Figure 2, the overall groundwater gradient in Unit 22 is to the east and southeast. However, the potentiometric surface exhibits a high area, or mound, beneath the northwest portion of the Plant. Near this groundwater high, the gradient is radially outward. This radial pattern extends across the western portion of the Plant, but beyond that is gradually subsumed into the overall eastern-southeastern local gradient.

1.3 Status of Remedy Selection

The Ash Ponds and Equalization Pond have been in assessment monitoring since January 2018, since the confirmed observation of Statistically Significant Increases (SSIs) of detection monitoring parameters (40 CFR § 257.94; Appendix III) above established background concentrations. The Ash Pile is currently in detection monitoring. Information on the groundwater monitoring and corrective action program is provided in the 2019 Annual Groundwater Monitoring Report (GSI, 2020a), as well as previous annual groundwater monitoring reports.

The following key actions have been performed related to the assessment of corrective measures and remedy selection for the Ash Ponds and Equalization Pond:

- SSIs above Groundwater Protection Standards (GWPSs) were observed and confirmed for assessment monitoring constituents listed in Appendix IV of 40 CFR § 257.95. SSIs were confirmed for mercury and combined radium for the Ash Ponds, and combined radium for the Equalization Pond (GSI, 2020a). As required in the CCR Rule, this prompted San Miguel to initiate a procedure to evaluate and select a groundwater remedy, as well as collect data needed to support such a selection. In particular, information on the nature and extent of groundwater impacts were required.
- The extent of groundwater impacts related to the suspected releases was delineated through the installation of temporary and permanent off-Plant wells during the period of April through December 2019.
- A notice of initiation of Assessment of Corrective Measures was issued in May 2019 in accordance with 40 CFR § 257.95(g)(5).
- An Assessment of Corrective Measures Report for the Ash Ponds and Equalization Pond (GSI, 2019) was issued on 11 September 2019 in accordance with the requirements of 40 CFR § 257.96.
- A public meeting was held on 18 December 2019 in Christine, Texas to present the results of the Assessment of Corrective Measures in accordance with 40 CFR § 257.96(e). Comments received from the public meeting were considered during the remedy selection process.
- A semi-annual Remedy Selection & Design Progress Report for the Ash Ponds and Equalization Pond (GSI, 2020b) was issued on 11 March 2020 in accordance with the requirements of 40 CFR § 257.96(a).
- This Selection of Groundwater Remedy report is being issued, describing the selected remedy and how it meets the standards specified in 40 CFR § 257.96(b), described in Section 2.1.

2.0 CORRECTIVE MEASURES ALTERNATIVES & SELECTION OF REMEDY

2.1 Requirements for Evaluation and Selection of Remedy

As specified in 40 CFR § 257.97(b), any selected remedy must:

1. Be protective of human health and the environment;
2. Attain the groundwater protection standard as specified in § 257.95(h);
3. Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment;
4. Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;
5. Comply with standards for management of wastes as specified in § 257.98(d).

In addition, Sections § 257.96(c) and § 257.97(c) of the CCR Rule provide further detail on how potential remedies should be evaluated. This includes the timeframe for implementation of the remedy and its effectiveness in achieving the applicable GWPSs.

Based on these regulations and relevant guidance, GSI applied specific criteria to evaluate the implementability and short-term and long-term effectiveness of the remedy, the ability of the remedy to provide source control to reduce or eliminate future releases, and the degree to which the remedy addresses community concerns. These criteria are summarized in Table 1 and discussed in greater detail in the Assessment of Corrective Measures Report (GSI, 2019).

2.2 Selection of Remedy

The Assessment of Corrective Measures Report (GSI, 2019) evaluated the following corrective measures alternatives against the criteria outlined in Table 1:

- Institutional Controls
- Monitored Natural Attenuation (MNA)
- Phytoremediation (Hydraulic Control)
- *In situ* Redox Alteration/Manipulation
- Slurry/Barrier Walls
- Permeable Reactive Barriers (PRBs)
- Groundwater Extraction and Treatment (Hydraulic Control)

A “No Action” approach was also evaluated solely for purposes of comparison, although this alternative would not meet CCR Rule requirements.

The listed approaches are suitable for addressing metals-impacted groundwater and were evaluated based on site-specific conditions at the San Miguel Plant. For each alternative, source control is considered to be fully addressed by the retrofit and closure activities planned for the Ash Ponds and Equalization Pond and discussed further below.

A combination of source control, hydraulic control (via groundwater extraction), MNA, and institutional controls was selected as the final remedy to address groundwater impacts in Unit 22

from the Ash Ponds and Equalization Pond. The rationale for selection of these approaches is summarized below. The evaluation criteria for selection (or elimination) of the corrective measures alternatives is presented in Table 2.

Source Control: San Miguel will retrofit the Ash Ponds and terminate water inputs to the Equalization Pond in 2020. Closure of the Equalization Pond, likely including dewatering and capping, will follow in 2021. Completion of this work should terminate contribution of metals or other constituents from these impoundments to Unit 22 groundwater. When this contribution is terminated, groundwater remediation will begin to reduce the concentrations of metals in groundwater. Over time, this remediation is expected to decrease concentrations of metals in Unit 22 groundwater to below applicable standards.

Groundwater Extraction (Hydraulic Control): A series of extraction wells will be installed downgradient of Ash Ponds and Equalization Pond in areas of elevated metals concentrations to remove the groundwater containing the greatest mass of metals. Although boron is an Appendix III constituent, and therefore will not drive the extent of groundwater cleanup, it is both associated with CCR releases to groundwater and can be considered a conservative "tracer" of such releases. Therefore, GSI used the distribution of boron in groundwater to position the extraction wells. The distribution of elevated boron can be considered a conservative estimate of areas impacted by the suspected releases from the Ash Ponds and Equalization Pond. The proposed design of the groundwater extraction system is described in Section 3.0.

Monitored Natural Attenuation (MNA): MNA is the term used for a series of *in situ* naturally-occurring processes, requiring no human intervention that can reduce the mass, concentration, and/or mobility of groundwater contaminants. These natural processes are coupled with regular observations (monitoring) to confirm that attenuation processes are having the desired effect, and that the risks posed by the impacted groundwater have not changed unfavorably.

MNA includes a wide range of natural processes, but the major mechanisms by which metals are attenuated in the subsurface are sorption-desorption, dilution-dispersion, and precipitation. For the proposed remedy, MNA will be relied upon in areas where metals concentrations are lower and are expected to decrease naturally once source control efforts are completed. In higher concentration areas, the groundwater extraction wells described above will be operated until metals concentrations decline to such a degree that MNA can achieve GWPSs in a reasonable timeframe. The timeframe for active pumping will be defined within the first year of operation and will be reevaluated on an annual basis.

Institutional Controls: Institutional controls are non-engineered approaches such as administrative and legal controls that reduce exposure to contamination by limiting land or resource use and/or guiding public behavior. Upon the concurrence of the off-Plant landowner, a restrictive covenant or equivalent will be implemented to prevent the future use of Unit 22 groundwater and other shallow groundwater units (i.e., Unit 24) to a depth of 100 ft bgs to preclude any future exposures to human and/or ecological receptors. Unit 22 and 24 groundwater are not currently used at the Plant, nor are they suitable for human consumption based on levels of salinity (GSI, 2020c).

3.0 DESIGN OF THE SELECTED REMEDY

The selected remedy will include a combination of source control, hydraulic control via groundwater extraction, MNA, and institutional controls to address the groundwater impacts from

the Ash Ponds and Equalization Pond. The initial phase of the remedy will include the installation of groundwater extraction wells in Unit 22 to remove impacted groundwater in areas of higher CCR constituent concentrations. Installation and operation of the extraction wells will occur concurrently with the planned source control measures by San Miguel at the Ash Ponds and Equalization Pond.

The proposed groundwater extraction system will consist of six pumping wells as an initial phase, with two wells in each of the following downgradient locations (Figure 3):

- South-southwest of monitoring wells PZ-04 and AP-31,
- South of monitoring well AP-33, and
- East of monitoring well EP-33.

The proposed locations for the groundwater extraction wells coincide with areas of highest boron concentrations downgradient of the Ash Pond and Equalization Pond (Figure 3). Each well will be constructed with a 4" diameter casing, installed using mud rotary drilling techniques, and completed with a steel sleeve set in concrete at the surface. Well construction will comply with applicable State of Texas regulations.

Wells will be screened across the entirety of Unit 22 and may penetrate slightly into the uppermost portion of the underlying clay unit. Each well will be equipped with:

- a solar-powered pump for extraction of groundwater,
- a downhole transducer for continuous measurement of water levels and drawdown within the well,
- a volume totalizer to track the volume of water pumped from each well, and
- a check valve on the discharge line to prevent backflow to the well.

Discharge lines will transport pumped groundwater directly from each well to the Ash Ponds and/or (until water discharges are terminated in late 2020) the Equalization Pond for storage. In the event these ponds cannot temporarily receive water, groundwater will be pumped to tanks or tank batteries for temporary storage. One tank or battery will be located south of the Ash Ponds, and another east of the Equalization Pond. Water collected in these tanks will be collected by truck for reuse in dust suppression or other suitable on-site purpose or transported off-site for alternate use or disposal compliant with RCRA standards for management of wastes.

The extraction wells will be monitored on a regular basis to assess their operational performance (i.e., extraction volumes and flowrates; operational time), and groundwater samples will be collected periodically to monitor changes in CCR constituent concentrations. System monitoring activities will be conducted more frequently (i.e., daily or weekly) during the initial operation of the extraction wells, followed by a reduced frequency once operation and maintenance needs have been established based on pumping rate and well performance. Groundwater sampling will be performed weekly for the first four weeks of operation, then monthly through the first six months of operation. Thereafter, groundwater sampling will be performed in conjunction with the semi-annual monitoring events for the Plant wells.

Upon well installation and development, drawdown and recovery testing will be conducted on each well pair to estimate the zone of capture for each well under design conditions. The proposed well pairs will be spaced 50-100 ft apart. They can be operated simultaneously (under normal operating conditions for maximum groundwater recovery) or one at a time, where one well serves

as an observation well (not pumping) to assess the drawdown (or response) of the active extraction well. The design flowrate for each well is 2-3 gallons per minute.

Initial testing and performance data from the first six months of operation will be used to evaluate the need for additional extraction wells to supplement the system in the future. This evaluation will be repeated annually during the life of the pumping system.

Groundwater monitoring at the Plant wells will continue on a semi-annual basis in accordance with 40 CFR § 257.94(e) for the Ash Pile and 40 CFR § 257.95(e) – (g) for the Ash Ponds and Equalization Pond. Concentration trend analysis at the wells downgradient of the Ash Ponds and Equalization Ponds will be performed to assess the progress of CCR constituent concentrations toward their respective GWPSs and to assist in the rate of attenuation over time. In addition, the off-Plant Unit 22 monitoring wells will be sampled on an annual basis to help confirm whether the existing plume is stable and remaining localized.

As a final measure, the remedy will include institution controls to eliminate potential risk to receptors from impacted groundwater in Unit 22 and shallow groundwater. Upon landowner concurrence, institutional controls may include a restrictive covenant, to prevent the use of groundwater to a depth of 100 ft bgs within the impacted zone beneath and adjacent to the Plant. As previously noted, Unit 22 and 24 groundwater are not currently used at the Plant, nor are they suitable for human consumption based on levels of salinity (GSI, 2020).

4.0 SCHEDULE FOR IMPLEMENTING AND COMPLETING REMEDIAL ACTIVITIES

As specified in 40 CFR § 257.97(d), the following factors must be considered in determining the schedule of remedial activities:

1. Extent and nature of contamination, as determined by the characterization required under § 257.95(g);

   Discussion: The nature and extent of impact by Appendix IV constituents has been completed and confirmed to be generally localized to the vicinity of the Plant.

2. Reasonable probabilities of remedial technologies in achieving compliance with the groundwater protection standards established under § 257.95(h) and other objectives of the remedy;

   Discussion: Both groundwater extraction for hydraulic control and MNA are established technologies, with a demonstrated history of being capable of meeting remedy objectives.

3. Availability of treatment or disposal capacity for CCR managed during implementation of the remedy;

   Discussion: CCR managed as a part of this remedy is expected to be predominantly related to retrofit of the Ash Ponds and closure of the Equalization Pond. San Miguel has the capacity for these materials as a part of its operations.

4. Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy;

Discussion: Risks based on potential exposures are expected to be low prior to completion of the remedy. Unit 22 groundwater is neither currently used nor likely to be used in the foreseeable future, based primarily on its poor quality and the existence of high-quality alternative water sources. There are no confirmed areas of communication between Unit 22 and the surface.

5. Resource value of the aquifer including:

   (i) Current and future uses;

   (ii) Proximity and withdrawal rate of users;

   (iii) Groundwater quantity and quality;

   (iv) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to CCR constituents;

   (v) The hydrogeologic characteristic of the facility and surrounding land; and

   (vi) The availability of alternative water supplies

   Discussion: As noted above, Unit 22 groundwater is neither currently used nor likely to be used in the foreseeable future, based on its poor quality and its relatively low yields. There is no damage to wildlife, crops, vegetation, and physical structures due to CCR constituents in Unit 22 groundwater. There is abundant high-quality groundwater available from a deeper (>3,000 ft depth) aquifer, the Carrizo Sands.

6. Other relevant factors.

   Discussion: The planned remedy can be quickly implemented and begin having an effect on groundwater concentrations immediately upon such implementation. It will result in minimal disruption to surface use, and the installation and operation will have minimal potential for exposure to affected groundwater by the public and San Miguel personnel.

The anticipated schedule for design and implementation of the proposed remedy is summarized below.

Task	Anticipated Date
Installation and Operation of Extraction Wells	May/June 2020
Drawdown & Recovery Testing	June/July 2020
System monitoring	Daily or weekly during the initial operation of the extraction wells
MNA/Performance Monitoring	Weekly for the first four weeks of operation, and monthly through the first six months of operation. Thereafter, semi-annually with CCR monitoring events.
Establish Institutional Controls	Pending, based on landowner concurrence

5.0 REFERENCES

GSI, 2019. Assessment of Corrective Measures Report, San Miguel Electric Cooperative, Inc.; Issued 11 September 2019.

GSI, 2020a. 2019 Annual Groundwater Report, San Miguel Electric Cooperative, Inc.; Issued 31 January 2020.

GSI, 2020b. Semi-Annual Remedy Selection and Design Progress Report: Ash Ponds and Equalization Pond, San Miguel Electric Cooperative, Inc.; Issued 11 March 2020.

GSI, 2020c. Affected Property Assessment Report: Groundwater – Ash Ponds and Equalization Pond, San Miguel Electric Cooperative, Inc.; Issued 26 February 2020.

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TABLES

Table 1. Evaluation Criteria for Potential Groundwater Corrective Measure Alternatives

Implementability	Short Term Effectiveness	Long Term Effectiveness	Source Control/Control of Potential for Future Releases	Community Concerns
Time required to begin remedy Time required to complete remedy Regulatory Permits & Approvals required Type & Degree of O&M & monitoring required Degree of Difficulty in Implementing Remedy Availability of Resources & Expertise for the Remedy	Degree of control of any immediate high risks, such as high toxicity or explosive characteristics Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts	Potential to attain the GWPS Long-term reliability of the remedy Degree to which the remedy uses treatment technologies Degree to which the remedy would remove contaminated material released from the CCR unit from the environment Likelihood of need for remedy replacement Degree of compliance with RCRA for management of remedy-related wastes Degree to which remedy will address risks to human health or the environment over the long term Likely magnitude of residual risks at the conclusion of remedy implementation	Source Control to Reduce or Eliminate Further Releases	Degree to which the remedy addresses known community concerns

Table 2. Assessment of Corrective Measures Alternatives

INSTITUTIONAL CONTROLS				
Implementability	**Short Term Effectiveness**	**Long Term Effectiveness**	**Source Control/Control of Potential for Future Releases**	**Community Concerns**
Time required to begin remedy: Institutional controls (ICs) could be put in place immediately with landowner concurrence. **Time required to complete remedy:** ICs would remain in place until GWPSs are achieved for off-site groundwater. The time required would depend on other remedy elements. **Regulatory Permits & Approvals required:** None, as the remedy will be self-implemented. **Type & Degree of O&M & monitoring required:** None. **Degree of Difficulty in Implementing Remedy:** Administrative aspects of ICs are straightforward. Landowner concurrence is required for many types of ICs. **Availability of Resources & Expertise for the Remedy:** All resources, services, and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** No risk, as IC implementation does not involve a field component.	**Potential to attain the GWPS:** None, if used independently. ICs will not improve groundwater quality, and therefore must be used in conjunction with some other corrective measure. **Long-term reliability of the remedy:** None, if used independently. ICs will not improve groundwater quality, and therefore must be used in conjunction with some other corrective measure. **Degree to which the remedy uses treatment technologies:** None. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None. **Likelihood of need for remedy replacement:** None. **Degree of compliance with RCRA for management of remedy-related wastes:** No remedy-related wastes would be generated by implementation of ICs. **Degree to which remedy will address risks to human health or the environment over the long term:** High. ICs can effectively reduce or eliminate potential exposure pathways, thereby reducing potential risks. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Identical to current risks, if used independently. IC will not improve groundwater quality, and therefore must be used in conjunction with some other corrective measure.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** Low, unless utilized in conjunction with another corrective measure.

Assessment of Remedy: SELECTED

- Institutional controls are non-engineered approaches such as administrative and legal controls that reduce exposure to contamination by limiting land or resource use and/or guiding public behavior.
- Upon landowner concurrence, a restrictive covenant or equivalent will be implemented at the site to prevent the use of Unit 22 groundwater and other shallow groundwater units to a depth of 100 ft below ground surface to eliminate any potential risk to humans and/or ecological receptors.
- **Institutional controls will be implemented in concert with other corrective measure alternatives: Source control, groundwater extraction (hydraulic control), and MNA.**

Table 2. Assessment of Corrective Measures Alternatives (continued)

MONITORED NATURAL ATTENUATION (MNA)				
Implementability	**Short Term Effectiveness**	**Long Term Effectiveness**	**Source Control/Control of Potential for Future Releases**	**Community Concerns**
Time required to begin remedy: Monitored natural attenuation (MNA) would commence upon implementation of source control, which is closure or retrofitting of Ash Ponds and Equalization Pond. The monitoring component, however, has already commenced, and would continue during the period prior to retrofit and closure, and then throughout the remedy period. **Time required to complete remedy:** If implemented without an active component, the timeframe for MNA to achieve GWPS would likely be long (i.e., potentially decades). With an active component, the timeframe should be considerably shorter, but will still likely exceed 10 years. **Regulatory Permits & Approvals required:** None, as the remedy will be self-implemented. **Type & Degree of O&M & monitoring required:** Long-term monitoring is required to track the effects of mass removal and/or concentration declines. Monitoring frequencies typically decline with remedy implementation time (i.e., quarterly monitoring is used initially, then transitions to semiannually and then annually). Monitoring analytes also tend to transition to a more limited list of key indicator parameters. **Degree of Difficulty in Implementing Remedy:** Generally low degree of difficulty, given that the monitoring well system is already in place and site characterization is complete. Special analysis for attenuation factors may be useful as a part of site characterization. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low risks, associated with a limited increase in vehicular traffic during well installation, sampling, and closure. The risk of causing cross-media impacts is low, since only a small volume of subsurface material would be moved to the surface, and this material would be managed in accordance with RCRA requirements.	**Potential to attain the GWPS:** High, given sufficient time. To achieve GWPS in a reasonable timeframe at this site, however, MNA must be used in conjunction with some other corrective measure. **Long-term reliability of the remedy:** Generally high once source control has been achieved. Natural processes tend to be reliable in reducing contaminant concentrations over time. **Degree to which the remedy uses treatment technologies:** None. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None. MNA would rely primarily on immobilization or dilution of the CCR constituents released to the environment rather than removal. **Likelihood of need for remedy replacement:** Low, since the remedy relies on natural processes. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There is minimal waste generation associated with this remedy, and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** High. Given sufficient time, or if used in conjunction with other corrective measures, MNA can reduce concentrations of groundwater constituents to below GWPS, such that they do not pose an unacceptable risk to human health or the environment. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To the extent that the community concerns reflected a desire to restore groundwater quality and continue to allow surface use for ranching purposes, the use of MNA as a part of a larger remedy should be effective in addressing those concerns.

Assessment of Remedy: SELECTED

- MNA is an *in situ* naturally-occurring collection of processes, requiring no human intervention, that reduces the concentration, mass, and/or mobility of contaminants.
- These processes are coupled with regular observations (monitoring) to confirm that attenuation processes are continuing to have the desired effect, that groundwater impacts are stable or declining, and that the risks posed by the impacted groundwater have not changed.
- MNA includes a wide range of natural processes, but the major mechanisms by which metals are attenuated in the subsurface are sorption-desorption, dilution-dispersion, and precipitation.
- For the proposed remedy, MNA will be relied upon in areas where metals concentrations are lower and are expected to decrease once source control efforts are completed. Groundwater extraction wells will be operated until metals concentrations are lowered to such a degree that MNA can achieve GWPSs in a reasonable timeframe.
- **MNA will be implemented in concert with other corrective measure alternatives: Source control, groundwater extraction (hydraulic control), and institutional controls.**

Table 2. Assessment of Corrective Measures Alternatives (continued)

PHYTOREMEDIATION				
Implementability	**Short Term Effectiveness**	**Long Term Effectiveness**	**Source Control/Control of Potential for Future Releases**	**Community Concerns**
Time required to begin remedy: 3-5 years to plant and establish tree population, if successful. **Time required to complete remedy:** Varies from years to decades depending on size and movement of the groundwater plume and the number, size, type, and health of trees. **Regulatory Permits & Approvals required:** None, as the remedy would be self-implemented. **Type & Degree of O&M & monitoring required:** Trees would need to be maintained until plume size is reduced Frequent monitoring and periodic maintenance of trees is needed to ensure successful growth, particularly during the initial planting phase. Supplemental irrigation may be required during dry periods. Shed leaves and pruned branches would have to be collected and managed. Dead trees would have to be replaced. **Degree of Difficulty in Implementing Remedy:** Moderate to high; requires substantial effort (deep rooting technology, irrigation pumping) to establish tree population. May be difficult to establish at this site given groundwater salinity, water depth, and climate. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low; exposure of workers to fertilizers or amendments for plant growth, and possibly to subsurface soils if holes are drilled for tree planting. Leaves may fall and reintroduce constituents to the environment if not timely collected and managed. The risk of causing cross-media impacts is low, since only a small volume of subsurface material would be moved to the surface.	**Potential to attain the GWPS:** Phytoremediation is unlikely to be successful in attaining GWPS at this site, given challenges posed by climate, water depth, and water quality. **Long-term reliability of the remedy:** Low, given anticipated difficulties with implementation. **Degree to which the remedy uses treatment technologies:** None **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** Moderate, as the phytoremediation system would act as a natural pumping system, withdrawing CCR constituents from the subsurface with groundwater. **Likelihood of need for remedy replacement:** If trees were successfully established, they would need to be replaced on an individual basis as necessary through the life of the remedy. **Degree of compliance with RCRA for management of remedy-related wastes:** High. Wastes generated can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** Phytoremediation is unlikely to be successful in addressing potential risks at this site, given challenges posed by climate, water depth, and water quality. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low if successful. The remedy would continue until groundwater constituents are below GWPS.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To the extent that the community concerns reflected a desire to restore groundwater quality and continue to allow surface use for ranching purposes, the use of phytoremediation is unlikely to be effective in addressing those concerns.

Assessment of Remedy: NOT SELECTED

- Phytoremediation is the use of plants to degrade, immobilize, or remove contaminants in or from the environment.
- The effectiveness of such systems depends strongly on site-specific conditions such as:
  - Depth of impacted water – typically depths must be reachable by tree root systems, or supplemental pumping and irrigation will be required.
  - Water quality – more saline waters require salt-tolerant plants, which limits the potential selection of tree species.
  - Climate – challenging climates, such as those with hot, dry summers or long cold winters, may also limit the potential selection of tree species to those sufficiently hardy to tolerate such conditions.
- Site conditions at the San Miguel Plant are not favorable for the growth and development of a phytoremediation approach, given the high temperatures during the summer months, the saline groundwater conditions in Unit 22, and the depths of Unit 22 which extend > 50 ft bgs in some locations. As a result, this technology was not selected for the final remedy.

Table 2. Assessment of Corrective Measures Alternatives (continued)

IN SITU REDOX ALTERATION				
Implementability	**Short Term Effectiveness**	**Long Term Effectiveness**	**Source Control/Control of Potential for Future Releases**	**Community Concerns**
Time required to begin remedy: *In situ* redox alternation (ISR) would require 1-2 years for treatability studies and/or pilot testing, reagent selection, field-scale design, installation of monitoring and injection wells. **Time required to complete remedy:** Uncertain, but at least several years. Time for ISR completion is dependent on a number of site-specific conditions, including hydrogeological variability, groundwater velocities, configuration of injection well system, and selected reagent, that cannot be confirmed until after pilot testing and/or full-scale implementation. **Regulatory Permits & Approvals required:** State permit will be required for subsurface injection of reagents. **Type & Degree of O&M & monitoring required:** ISR has significant O&M and monitoring requirements, including periodic re-injection of reagent and redevelopment of injection wells. Regular groundwater monitoring would be required for treatment performance evaluation. **Degree of Difficulty in Implementing Remedy:** Moderate, due to challenges in injecting into lower permeability sands (i.e., Unit 22) and achieving adequate three-dimensional delivery throughout that unit. In addition, multiple reagents may be required for the various constituents present, and these reagents may be adversarial to one another. Finally, some constituents may not be affected by redox or pH changes. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low; associated with operation of injection and monitoring well installation equipment, and limited increase in vehicular traffic during reagent injection, well installation, sampling, and closure. If strong chemical oxidants are used, however, these would entail higher risks, since these chemicals are reactive and potentially hazardous to humans and the environment, and therefore require management and special handling. The risk of causing cross-media impacts is low, since only a small volume of subsurface material would be moved to the surface.	**Potential to attain the GWPS:** Low, given anticipated difficulties with subsurface delivery and the development of a reagent program capable of immobilizing targeted constituents without mobilizing others. **Long-term reliability of the remedy:** Moderate if successful. Some remobilization of metals is possible. **Degree to which the remedy uses treatment technologies:** High; *in situ* chemical treatment of metal constituents is a key aspect of the corrective measure. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None. ISRA would rely primarily on immobilization of the CCR constituents released to the environment rather than removal. The constituents would still be present, but not in a form that would allow them to flow with groundwater into a well and be transported to the surface. **Likelihood of need for remedy replacement:** Low; some periodic replenishment of reagents will be required over time, and injection wells may possibly require replacement if redevelopment is not successful. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There is some potential for chemical waste generation associated with this remedy (e.g., unused or off-specification reagents), and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** High if successful. This technique can permanently immobilize metals, removing them from the groundwater, and thereby reducing or eliminating risks associated with those constituents. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low if successful. The remedy would continue until groundwater constituents are below GWPS.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To the extent that the community concerns reflected a desire to restore groundwater quality and allow surface use for ranching purposes, the use of ISR is unlikely to be effective in addressing those concerns.

Assessment of Remedy: NOT SELECTED

- *In situ* Redox Alteration can be used for the treatment of dissolved metals by creating a treatment zone in the subsurface. Typically, this is based on the injection of oxidizing or reducing agents to generate a treatment zone that is favorable for metals immobilization. As redox-sensitive metals migrate through this treatment zone, they are immobilized via complexation and precipitation reactions.
- The treatment efficiency of this technology requires a detailed understanding of subsurface conditions, including groundwater flow, oxidation-reduction potential, hydraulic conductivity, and constituents present. At complex sites, pilot and/or bench scale testing may also be required.
- At San Miguel, some of the CCR constituents of interest are not strongly affected by changes in pH or oxidation-reduction potential and would not be significantly impacted by addition of a chemical reagent. Effective delivery of the reagents into the subsurface is also anticipated to be difficult. As a result, this technology was not selected for the final remedy.

Table 2. Assessment of Corrective Measures Alternatives (continued)

SLURRY/ BARRIER WALLS (WITH HYDRAULIC CONTROL)				
Implementability	**Short Term Effectiveness**	**Long Term Effectiveness**	**Source Control/Control of Potential for Future Releases**	**Community Concerns**
Time required to begin remedy: 2-3 years for groundwater modeling, pumping tests, design, and installation of slurry wall, pumping wells, and water piping and treatment systems. **Time required to complete remedy:** Could vary from years to decades at this site, depending on the rate at which hydraulic control and natural attenuation processes remove constituents from Unit 22 groundwater. **Regulatory Permits & Approvals required:** Possible state permits for surface discharge or subsurface injection, depending on treated water disposition. **Type & Degree of O&M & monitoring required:** High. Would require redevelopment and replacement of pumping wells, O&M of water treatment system, routine groundwater monitoring upgradient and downgradient of the slurry wall, routine monitoring of water discharge, periodic testing and redevelopment of injection wells, if used. **Degree of Difficulty in Implementing Remedy:** High; would require extensive surface disturbance for excavation and construction of slurry wall, in addition to drilling and well installation, piping installation, water treatment system construction, and possibly injection well construction. The installation of the slurry wall is subject to depth limitations. At this site, given the geometry of the impoundments relative to groundwater flow, the slurry wall and hydraulic control system would have to be quite long (approximately 1.25 miles). **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** High; with significant worker safety concerns during drilling, excavation, slurry/barrier installation, and increases in vehicular traffic for well installation, sampling, and closure. The risk of causing cross-media impacts is moderate to high, since significant volumes of subsurface material will be brought to the surface during excavation and pumping.	**Potential to attain the GWPS:** Moderate, given sufficient time, and assuming implementation hurdles can be overcome. Note that improvements in groundwater quality would depend on the effectiveness of hydraulic control and natural attenuation processes in removing or reducing constituent concentrations upgradient of the slurry wall, and the effectiveness of natural attenuation processes downgradient of the slurry wall. **Long-term reliability of the remedy:** Generally high in the areas downgradient of the slurry wall, assuming that the hydraulic control component is adequate. **Degree to which the remedy uses treatment technologies:** Moderate to high; this technology requires a hydraulic control component. Water extracted by this hydraulic control would potentially require treatment, if this water was to be discharged or injected. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** Moderate, as the hydraulic control portion of the remedy would withdraw CCR constituents from the subsurface with groundwater, but only upgradient of the slurry wall. **Likelihood of need for remedy replacement:** Unlikely, unless the slurry wall material degrades over time. Extraction wells in the hydraulic control portion of the system may have to be periodically replaced, if redevelopment programs are not effective. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There may be significant waste generation associated with this remedy, but those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** If the slurry wall and related systems achieve hydraulic and physical containment, then concentrations of groundwater constituents both upgradient and downgradient of the slurry wall will decline over time to below GWPS (see **Potential to attain the GWPS**, above), reducing or eliminating risks to human health or the environment. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To the extent that the community concerns reflected a desire to restore groundwater quality and allow surface use for ranching purposes, the use of slurry walls and hydraulic control would likely be effective in addressing those concerns. However, this option may raise community concerns because it will result in significant surface disturbance.

Assessment of Remedy: NOT SELECTED

- Slurry/barrier walls are hydraulic barriers designed to impede and/or divert impacted groundwater. They usually consist of a trench filled with a slurry of low permeability materials (e.g., bentonite clay, Portland cement). Physical barriers such as sheet piling can also be used for shallow aquifers.
- Typically, slurry/barrier walls must be accompanied by groundwater extraction to avoid accumulation of groundwater on the upgradient side of the barrier.
- At San Miguel, the length and depth of slurry required would result in a very large construction effort and a significant degree of surface disturbance. This would also require the potential pumping of very large volumes of groundwater from the upgradient area of the slurry wall. The magnitude of these efforts and the challenges anticipated in managing large volumes of groundwater are considered to be significant disadvantages for this remedy. In addition, the time required to achieve GWPS in many locations would be long, i.e., comparable to MNA. As a result, this technology was not selected for the final remedy.

Table 2. Assessment of Corrective Measures Alternatives (continued)

PERMEABLE REACTIVE BARRIER (PRB)				
Implementability	**Short Term Effectiveness**	**Long Term Effectiveness**	**Source Control/Control of Potential for Future Releases**	**Community Concerns**
Time required to begin remedy: 3-5 years for groundwater modeling, pumping tests, design, installation of PRB, installation of monitoring wells. **Time required to complete remedy:** Likely decades at this site, depending on the rate at which natural attenuation processes remove constituents from Unit 22 groundwater downgradient of the PRB. **Regulatory Permits & Approvals required:** None. **Type & Degree of O&M & monitoring required:** Low to moderate. Routine groundwater monitoring upgradient and downgradient of the PRB. Possible flushing and redevelopment of the PRB if evidence of plugging is observed. **Degree of Difficulty in Implementing Remedy:** High; would require extensive surface disturbance for excavation and construction of PRB. The installation of the PRB is subject to depth limitations. At this site, given the geometry of the impoundments relative to groundwater flow, the PRB would have to be quite long (approximately 1.25 miles). **Availability of Resources & Expertise for the Remedy:** Requires specialty expertise and other resources that are generally available, but for which delays may occur depending on competition for resources from other installations.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** High; with significant worker safety concerns during PRB installation. The risk of causing cross-media impacts is moderate to high, since significant volumes of subsurface material will be brought to the surface during excavation.	**Potential to attain the GWPS:** Moderate, given sufficient time, and assuming implementation hurdles can be overcome. Note that improvements in groundwater quality would depend on the effectiveness of natural attenuation processes in removing or reducing constituent concentrations upgradient and downgradient of the slurry wall. **Long-term reliability of the remedy:** Generally high, as long as there are no changes in groundwater chemistry that could remobilize metals from the PRB media or surrounding portion of the water-bearing zone. **Degree to which the remedy uses treatment technologies:** High, as reactive media interactions with groundwater constituents is a treatment technology. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None to low. PRBs would rely primarily on immobilization of the CCR constituents released to the environment rather than removal. **Likelihood of need for remedy replacement:** Moderate, as reactive media may need to be replaced /reactivated over time. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There is some potential for chemical waste generation associated with this remedy (e.g., unused or off-spec reactive media), as well as significant waste generation associated with construction activities, and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** If the PRB is effective in immobilizing constituents as they migrate through, then concentrations of groundwater constituents both upgradient and downgradient of the slurry wall will decline over time to below GWPS (see **Potential to attain the GWPS**, above), reducing or eliminating risks to human health or the environment. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To the extent that the community concerns reflected a desire to restore groundwater quality and allow surface use for ranching purposes, the use of PRBs would likely be effective in addressing those concerns. However, this option may raise community concerns because it will result in significant surface disturbance.

Assessment of Remedy: NOT SELECTED

- A permeable reactive barrier (PRB) involves placement of a reactive media in the subsurface across the flow path of a contaminated groundwater plume. The movement of the contaminant through the reactive material brings about a reaction that degrades or immobilizes it. Reactive media that have been used in the lab- and field-scale systems for the immobilization of metals and radionuclides include zerovalent iron, phosphates (e.g., apatite), lime or limestone, ferric hydroxide, and zeolites.
- At San Miguel, the length and depth of PRB required would result in a very large construction effort. The magnitude of this effort and the degree of surface disturbance it would cause are considered to be significant disadvantages for this remedy. In addition, the time required to achieve GWPS in many locations would be long, i.e., comparable to MNA. As a result, this technology was not selected for the final remedy.

Table 2. Assessment of Corrective Measures Alternatives (continued)

GROUNDWATER EXTRACTION (HYDRAULIC CONTROL)				
Implementability	**Short Term Effectiveness**	**Long Term Effectiveness**	**Source Control/Control of Potential for Future Releases**	**Community Concerns**
Time required to begin remedy: Less than 1 year for initial phase installation and commencement of pumping. Timing of expansion of pumping system (if needed) would depend on first phase performance data. **Time required to complete remedy:** Generally expected to be greater than 10 years but will strongly depend on first phase and subsequent performance data. **Regulatory Permits & Approvals required:** Possible state permits for discharge to surface water or subsurface injection of extracted water, if those activities are required. **Type & Degree of O&M & monitoring required:** High. Redevelopment and replacement of pumping wells, O&M of water treatment system (if required), routine groundwater monitoring upgradient and downgradient of the pumping system; routine monitoring of water discharge (if required), periodic testing and redevelopment of injection wells (if required), periodic collection of water for reuse (if required). **Degree of Difficulty in Implementing Remedy:** Low, depending on the number of extraction wells required and the method selected for disposition of pumped groundwater. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low, associated primarily with installation of extraction wells, and limited increase in vehicular traffic during well installation, sampling, and closure. The risk of causing cross-media impacts is low, since only a small volume of subsurface material would be moved to the surface.	**Potential to attain the GWPS:** Moderate to high. Improvements in groundwater quality related to groundwater extraction will be predominantly observed in the areas where the pumping system is installed. **Long-term reliability of the remedy:** High, assuming that the hydraulic control component is adequate to maintain a high degree of groundwater capture. **Degree to which the remedy uses treatment technologies:** Moderate, to the extent that extracted groundwater is required for surface discharge or subsurface injection. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** High, to the extent that extracted groundwater contain constituents from the CCR unit. **Likelihood of need for remedy replacement:** Extraction wells may have to be periodically replaced, if redevelopment programs are not effective. **Degree of compliance with RCRA for management of remedy-related wastes:** There is minimal waste generation associated with this remedy, and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** Within the areas influenced by pumping, constituents will decline over time to below GWPS, reducing or eliminating risks to human health or the environment. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To the extent that the community concerns reflected a desire to restore groundwater quality and allow surface use for ranching purposes, the use of hydraulic control would likely be effective in addressing those concerns. This option reduces contaminant mass from the impacted aquifer, which was one community concern.

Assessment of Remedy: SELECTED

- Under this approach, vertical recovery wells are typically installed to extract and limit the migration of impacted groundwater beyond a selected boundary.
- Extracted groundwater may require treatment prior to discharge or re-injection, unless otherwise disposed of or reused in accordance with state or federal regulations.
- The initial phase of the remedy will include the installation of groundwater extraction wells in areas of elevated CCR constituent concentrations in Unit 22 to limit the migration of impacted groundwater and reduce contaminant mass in the impacted aquifer.
- Installation and operation of the extraction wells will generally occur concurrently with ongoing source control measures by San Miguel at the Ash Ponds and Equalization Pond.
- GSI used the distribution of boron in groundwater to position the extractions wells, since boron is associated with CCR releases to groundwater and can be considered a conservative “tracer” of such releases.
- Extracted groundwater will be pumped directly from each well to the Ash Ponds and/or Equalization Pond. In the event that these ponds cannot receive water, groundwater will be pumped to collection tanks stationed at each of the two CCR units for temporary storage. Water in these tanks will be collected by truck for reuse in dust suppression or other suitable purpose or transported for off-site disposal compliant with RCRA standards for management of wastes.
- **Groundwater extraction (hydraulic control) will be implemented in concert with other corrective measure alternatives: Source control, MNA, and institutional controls.**

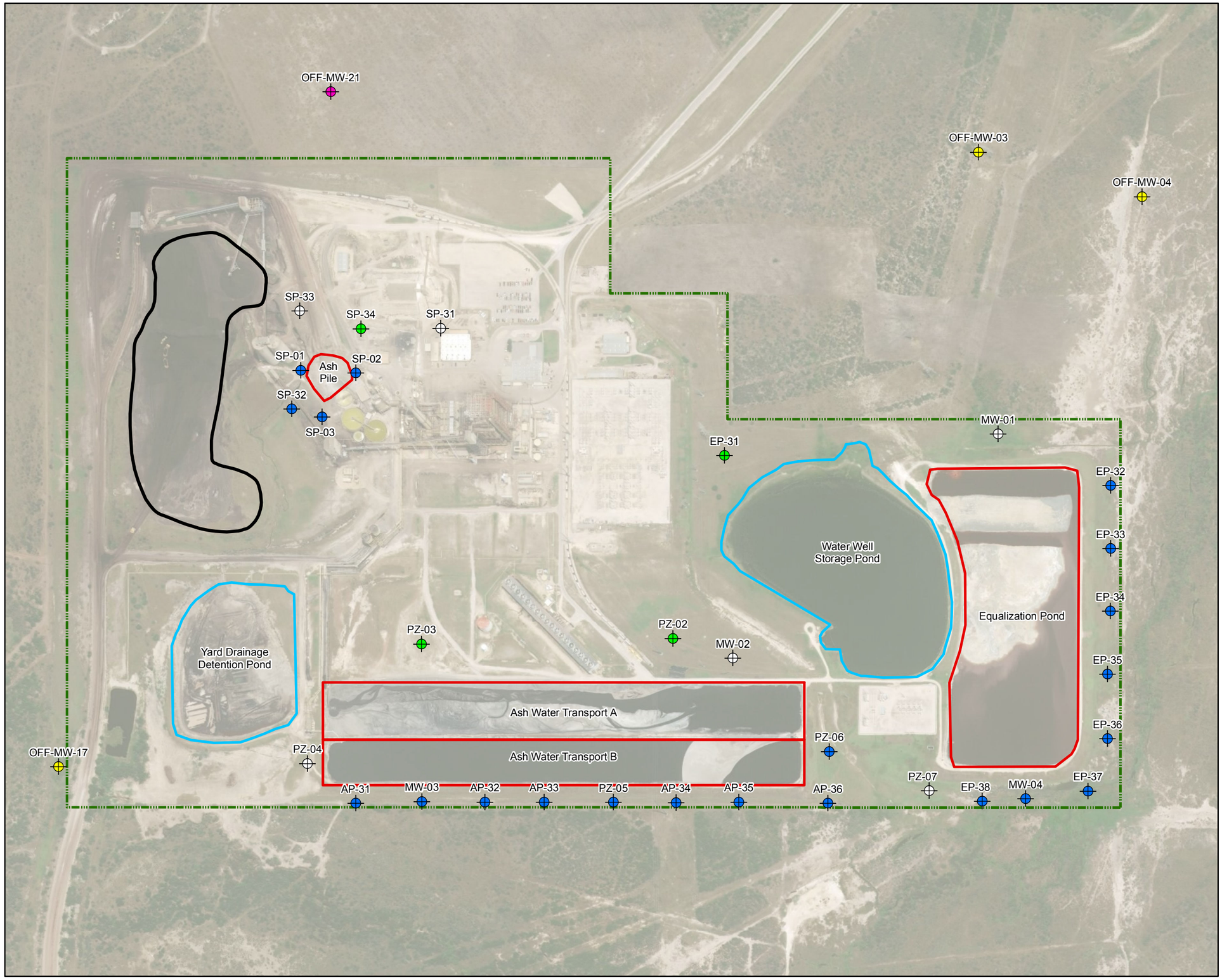
GSI Job No. 5076
Issued: 26 May 2020

SELECTION OF GROUNDWATER REMEDY: ASH PONDS AND EQUALIZATION POND

San Miguel Electric Cooperative, Inc.

Christine, Atascosa County, Texas

FIGURES



N

LEGEND

- Off-Site Unit 22 Assessment Monitoring Well
- Off-Site Deeper Sand Monitoring Well
- Upgradient Coal Combustion Residual (CCR) Monitoring Well
- Downgradient CCR Monitoring Well
- Groundwater Elevation Observation Well
- Approximate Plant Property Boundary
- CCR Unit
- Non-CCR Impoundment
- Lignite Storage Pile

Note

Aerial imagery provided by Esri ArcGIS Online, July 2018.

Feet
0 250 500

Projected Coordinate System
Datum: NAD 83
State Plane Texas South Central
Units: Feet

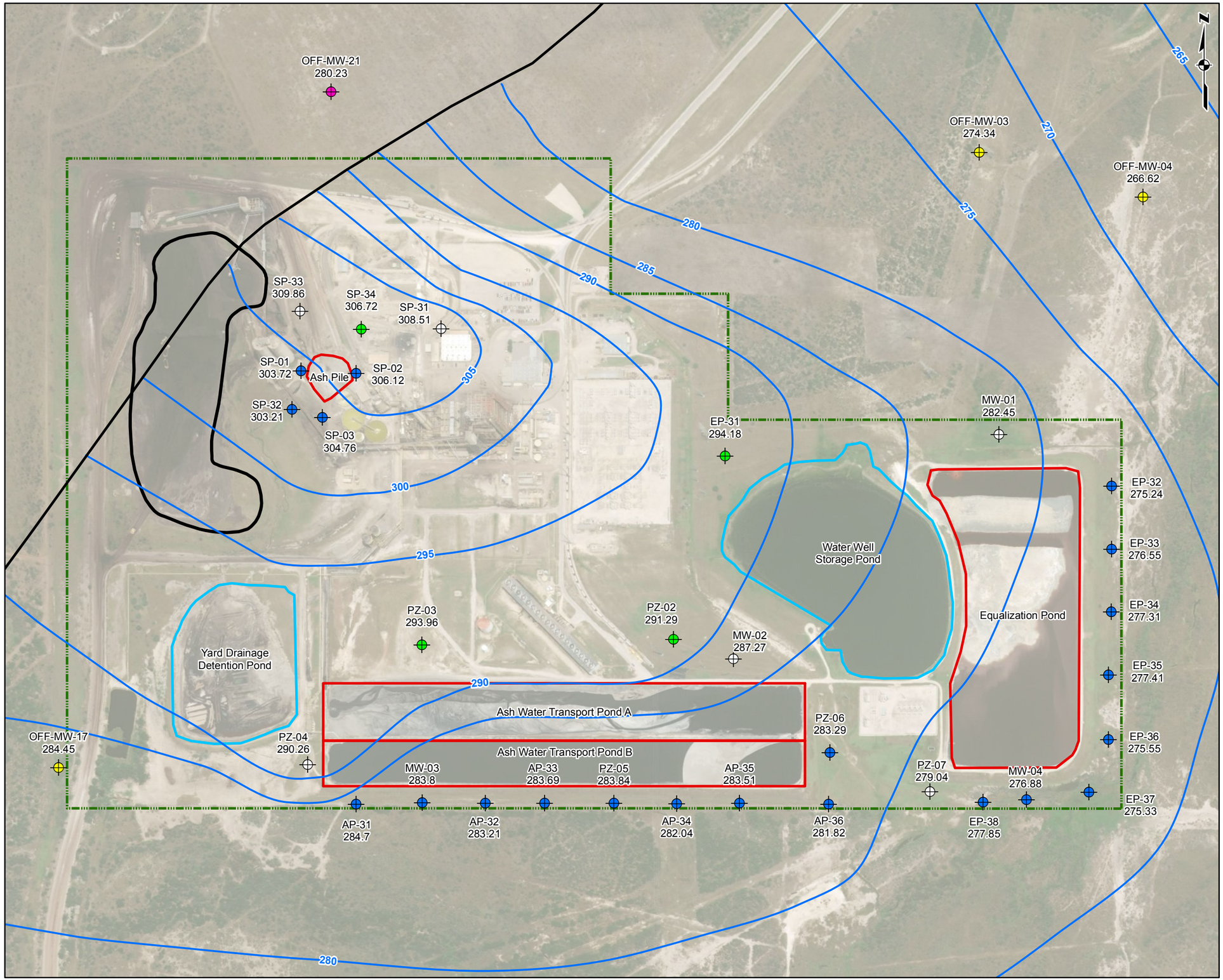
GSI ENVIRONMENTAL

SITE MAP

San Miguel Electric Cooperative, Inc. Facility
Atascosa County, Texas

GSI Job No. 5076	Drawn By: AV
Issued: 26-May-2020	Chk'd By: MLS
Map ID: **SMEC_PlantGWMap**	Appv'd By: SDR

FIGURE 1



LEGEND

- Off-Site Unit 22 Assessment Monitoring Well
- Off-Site Deeper Sand Monitoring Well
- Upgradient Coal Combustion Residual (CCR) Monitoring Well
- Downgradient CCR Monitoring Well
- Groundwater Elevation Observation Well
- Approximate Plant Property Boundary
- CCR Unit
- Non-CCR Impoundment
- Lignite Storage Pile
- 309.86 Groundwater Elevation (ft amsl)
- Groundwater Potentiometric Surface, Dashed where inferred
- Unit 22 Dry Boundary, Dashed where inferred (wells NW of this line are interpreted to be screened in the Deeper Sand)

Notes

1) Aerial imagery provided by Esri ArcGIS Online, September 2017.
2) Groundwater elevations from onsite wells are calculated using top of casing elevations reported in "Groundwater Sampling Report – Event 8 – August 2017" (AECOM, 2017). Offsite groundwater elevations are calculated using top of casing elevations surveyed by SMECI personnel in August 2019. All depth to water measurements were collected by GSI Environmental Inc. on August 9, 2019.
3) ft amsl = feet above mean sea level.

Feet
0 250 500

Projected Coordinate System
Datum: NAD 83
State Plane Texas South Central
Units: Feet

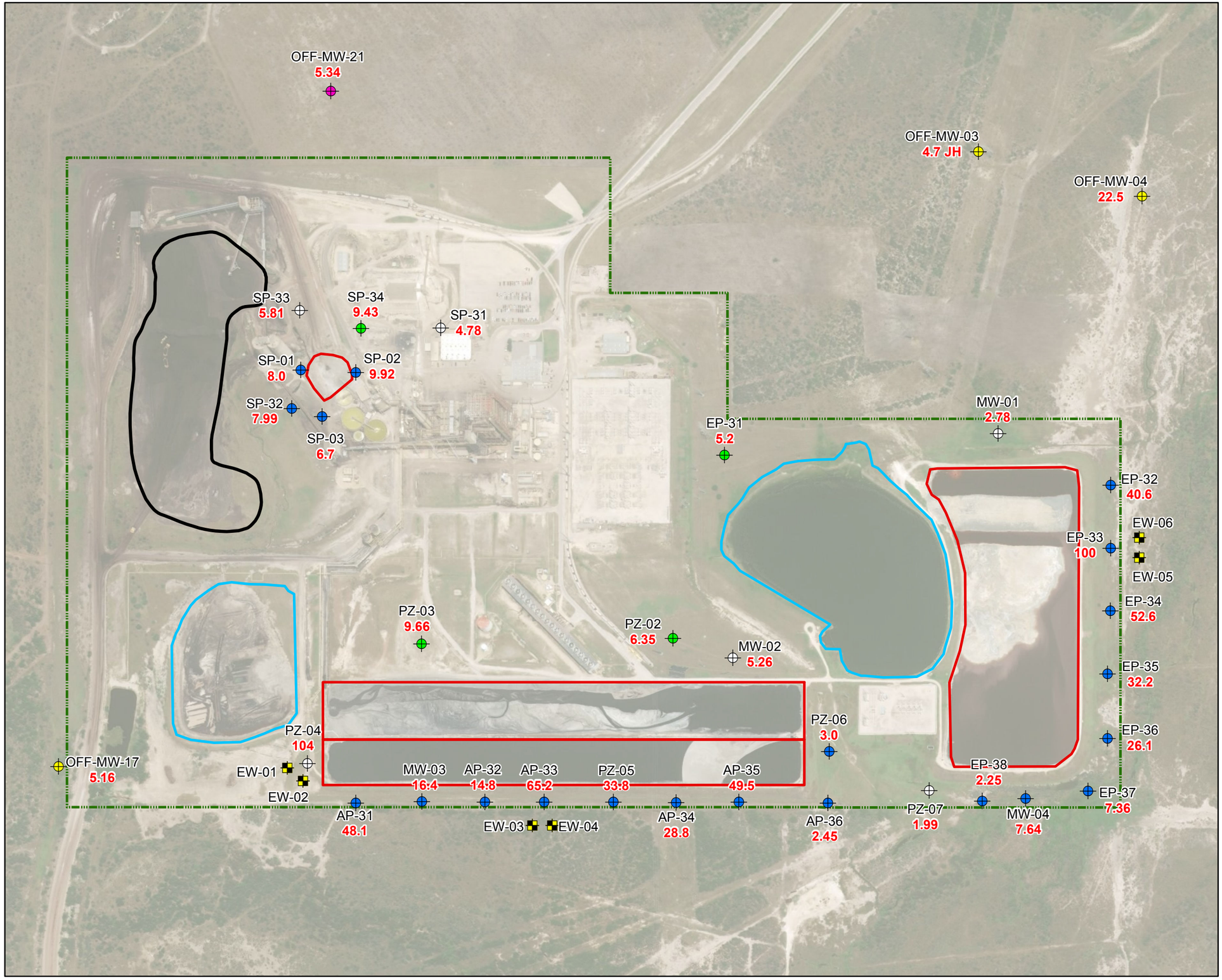
GSI ENVIRONMENTAL

POTENTIOMETRIC SURFACE - AUGUST 2019

San Miguel Electric Cooperative, Inc. Facility
Atascosa County, Texas

GSI Job No. 5076	Drawn By: AV
Issued: 26-May-2020	Chk'd By: MLS
Map ID: **SMEC_CCRGWE0819**	Appv'd By: SDR

FIGURE 2



LEGEND

- Approximate Location of Proposed Groundwater Extraction Well
- Off-Site Unit 22 Assessment Well
- Off-Site Deeper Sand Assessment Well
- Upgradient Coal Combustion Residual (CCR) Monitoring Well
- Downgradient CCR Monitoring Well
- Groundwater Elevation Observation Well
- Approximate Plant Property Boundary
- CCR Management Unit
- Non-CCR Impoundment
- Lignite Storage Pile
- 6.35 Boron Concentration in mg/L
- JH Percent Recovery Greater than Vaildation Specifications, Estimated Results Bias High

Notes

1) Aerial imagery provided by Esri ArcGIS Online, July 2018.
2) Wells were sampled August 12-15, 2019 by GSI Environmental, Inc.
3) All concentrations shown in milligrams per liter (mg/L).
4) Boron background value = 6.64 mg/L.

Feet
0 250 500

Projected Coordinate System
Datum: NAD 83
State Plane Texas South Central
Units: Feet

GSI ENVIRONMENTAL

BOREN CONCENTRATIONS AND PROPOSED GROUNDWATER EXTRACTION WELL LOCATIONS

San Miguel Electric Cooperative, Inc. Facility
Atascosa County, Texas

GSI Job No. 5076	Drawn By: AV
Issued: 26-May-2020	Chk'd By: JMS
Map ID: SMEC_CCRGWEx_Boron0819	Appv'd By: SDR

FIGURE 3