

**SECTION A. APPLICATION NARRATIVE  
40 CFR 146.82(a)**

**MONTEZUMA NORCAL CARBON SEQUESTRATION HUB**

**Facility Information**

Facility name: Montezuma NorCal Carbon Sequestration Hub  
IW-A1

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Well location: Collinsville, Solano County, California  
Lat: 38°5'7.334" N Long: -121°51'30.914" W NAVD 88  
Sec 22 T 3 N R 1 E

**SECTION A. APPLICATION NARRATIVE  
40 CFR 146.82(a)**

## **Table of Contents**

A.1	Project Background and Contact Information [40 CFR 146.82(a)(1)].....	4
A.2	Site Characterization [40 CFR 146.82(a)(2), (3), (5), and (6)].....	13
A.3	AoR and Corrective Action .....	16
A.4	Financial Responsibility .....	16
A.5	Injection Well Construction.....	17
A.6	Pre-Operational Logging and Testing .....	17
A.7	Well Operation .....	18
A.7.1	Operational Procedures [40 CFR 146.82(a)(10)] .....	18
A.7.2	Proposed Carbon Dioxide Stream [40 CFR 146.82(a)(7)(iii) and (iv)] .....	19
A.8	Testing and Monitoring .....	19
A.9	Injection Well Plugging .....	20
A.10	Post-Injection Site Care (PISC) and Site Closure.....	20
A.11	Emergency and Remedial Response.....	21
A.12	Injection Depth Waiver and Aquifer Exemption Expansion .....	22
A.13	Optional Additional Project Information [40 CFR 144.4] .....	22
A.14	Other Information.....	23

## **List of Tables**

Table A-1. State of California & Key Partner Contacts.....	8
Table A-2. Proposed Operational Procedures.....	19

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

## **List of Figures**

Figure A-1. Montezuma Site Map with CO <sub>2</sub> Injection Well & Pipeline.....	6
Figure A-2. Regional Potential Co <sub>2</sub> Source Facilities and Pipeline Routes .....	7
Figure A-3A. Map of the Site Resources and Infrastructure: Oil and Gas Wells .....	9
Figure A-3B. Map of the Site Resources and Infrastructure: Water Wells.....	10
Figure A-3C. Map of the Site Resources and Infrastructure: Other Relevant Identified Surface and Subsurface Features .....	11

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

**A.1 PROJECT BACKGROUND AND CONTACT INFORMATION [40 CFR 146.82(A)(1)]**

The goal of the project is to construct and operate a successful carbon dioxide (CO<sub>2</sub>) geosequestration (GS) hub facility on the 3,200 acre Montezuma Wetlands, LLC property located in Solano County, California. The full-scale project objectives for this facility include:

- Collection and sequestration of million tons per year of CO<sub>2</sub> from multiple power plants and industrial sources estimated to emit over 17 million tons of CO<sub>2</sub> per year that are located within 45 miles of the site.
- Transport that CO<sub>2</sub> by barge and/or mainly underwater pipeline to Montezuma's existing offloading dock on the Sacramento River and then by on-site pipeline to the proposed injection location approximately 1 mile north of the dock.
- Pressurize the CO<sub>2</sub> at a compressor station in the injection area and inject supercritical CO<sub>2</sub> using three or more separate injection wells into distinct saline aquifers 8,000 to 14,000 feet below ground surface (bgs).
- Previous geologic and reservoir analyses determined a high potential for sequestration of 50 to 200 million tons of CO<sub>2</sub> at the site in these deep saline aquifers, the Domengine, Anderson, Hamilton and Martinez. Use of three or more injection wells and multiple injection zones would allow the GS project operational flexibility.
- Sequester the CO<sub>2</sub> in the subsurface reservoir storage complex operated under a United States Environmental Protection Agency (US EPA) Underground Injection Control (UIC) Class VI permit and California Air Resources Board (CARB) Permanence Certification programs.
- Implement advanced state-of-the-art monitoring programs for all aspects of the project so the regulatory agencies and public have confidence in the integrity and success of the transportation and sequestration activities.
- Inject the CO<sub>2</sub> into the storage complex for 40 years and potentially longer, followed by post-injection site care (PISC) and site closure of the storage complex per US EPA and CARB regulations.

The project objectives for the Montezuma Hub facility as related to this initial Class VI permit application for this facility include:

- Capture and collection of approximately 1 million tons per year of CO<sub>2</sub> or more, from the PG&E Gateway Station near Antioch, California, with potential additional contributions from Calpine's Delta Energy and Los Medanos power plant facilities in the same vicinity.
- Compress and transport the captured CO<sub>2</sub> to the Montezuma Carbon Storage Hub complex via the Stage 1 CO<sub>2</sub> pipeline.

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

- Inject and sequester the CO<sub>2</sub> within the Anderson sandstone under a Class VI UIC permit for a period of 40 years, followed by post-injection site care (PISC) and site closure of the storage complex per US EPA regulations and permit requirements.

Montezuma Carbon LLC (MC) will be the Operator of this sequestration project. Key collaborators include the University of California Berkeley (UCB) and Lawrence Berkeley National Laboratory (LBNL), who have studied the sequestration potential of the Montezuma Hills area since 2010. UCB and LBNL are leading the design of the pipeline and injection site monitoring programs, which will provide comprehensive data to document the integrity of pipeline operations, and provide a unique, multiple media approach to document the long-term containment of the CO<sub>2</sub> plume. Other collaborators include Svante ([www.Svanteinc.com](http://www.Svanteinc.com)) and Kiewit Engineering ([www.kiewit.com](http://www.kiewit.com)) who will, along with power plant personnel (and other industrial personnel, where applicable), design, provide and implement the capture program at emitter sites. Svante and Kiewit are recognized as world leaders in their fields.

The Montezuma CO<sub>2</sub> storage hub complex site is located on a deep-water 3,200-acre site in the northeastern portion of San Francisco Bay, near Collinsville in Solano County, CA. MC is leasing land from Montezuma Wetland, LCC. Montezuma Wetland, LLC owns its 3,200 acres in fee title with no outstanding loans or mortgages on the land. From September 2003 to the present, the Montezuma project operated as the dominant upland beneficial reuse site for dredge sediment, and it has received and placed approximately 10 million cubic yards of sediment dredged from San Francisco Bay Area ports, harbors, and channels. On October 27, 2020, the project reached a major milestone when 550-acres of the project site Montezuma filled to appropriate elevations, was successfully returned to tidal habitat. Years of monitoring have confirmed that the project has exceeded applicable ecological goals, with no contamination or other negative impacts, and the project has garnered unprecedented support from regional, state, and federal regulatory agencies. MC does not conduct any activities under RCRA, UIC, NPDES, or PSD permits. MC has not received or applied for permits or construction approvals under the CAA Nonattainment Program. MC has not received or applied for NESHAPS Preconstruction Approval under the CAA. MC has not received or applied for Ocean Dumping Permits under MPRSA. At this time, MC has not and does not anticipate the need for the specified permits directly related with the Class VI UIC injection well installation or operation. However, should other future construction, installation, or operations require any of these listed permits, MC will apply and obtain them in compliance with the applicable regulations.

Montezuma Wetlands, LLC has completed extensive site characterization work to acquire its existing Clean Water Act Section 404 permit, Section 401 Water Quality Certification, and site use permits from Solano County, the State Lands Commission, and the State of California San Francisco Bay Conservation and Development Commission. Those permits identify sensitive environmental and cultural areas on the site, and

## SECTION A. APPLICATION NARRATIVE 40 CFR 146.82(a)

the proposed Montezuma Carbon Storage Hub generally avoids those areas. MC will separately apply for permits from the Army Corps of Engineers, Solano County, the State Lands Commission, California Air Resources Board, and the State of California San Francisco Bay Conservation and Development Commission for its carbon pipeline and sequestration facilities.

The site has been well characterized for important environmental and habitat areas, and carbon sequestration facilities described above will be located in agricultural and industrial zoned areas well away from the restored wetland areas and far from sensitive habitats. Figure A-1 illustrates the proposed injection area and pipeline route from the CO<sub>2</sub> source facility(ies), to the Montezuma offloading dock, and to the injection area at IW-A1.

**FIGURE A-1. MONTEZUMA SITE MAP WITH CO<sub>2</sub> INJECTION WELL & PIPELINE**

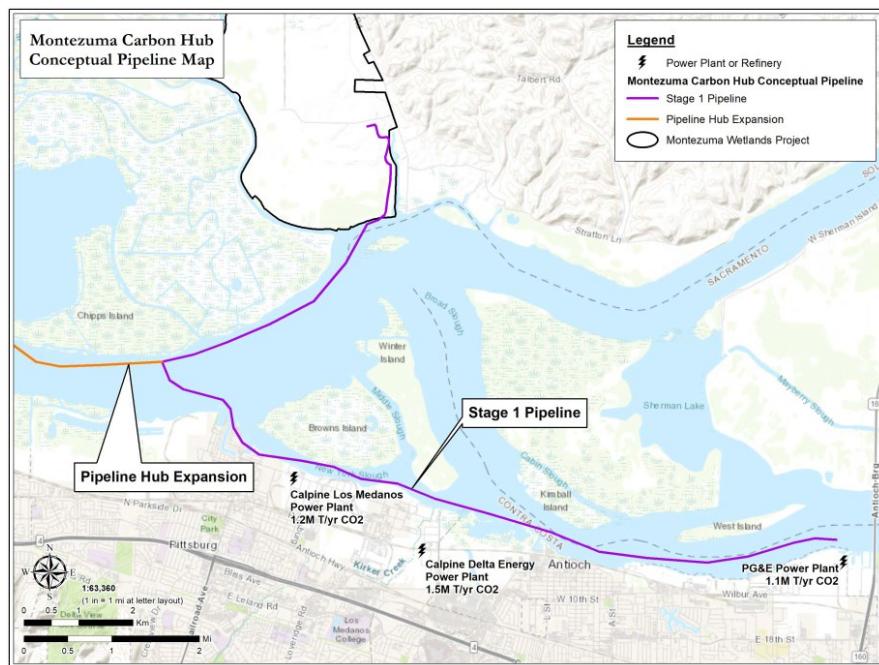
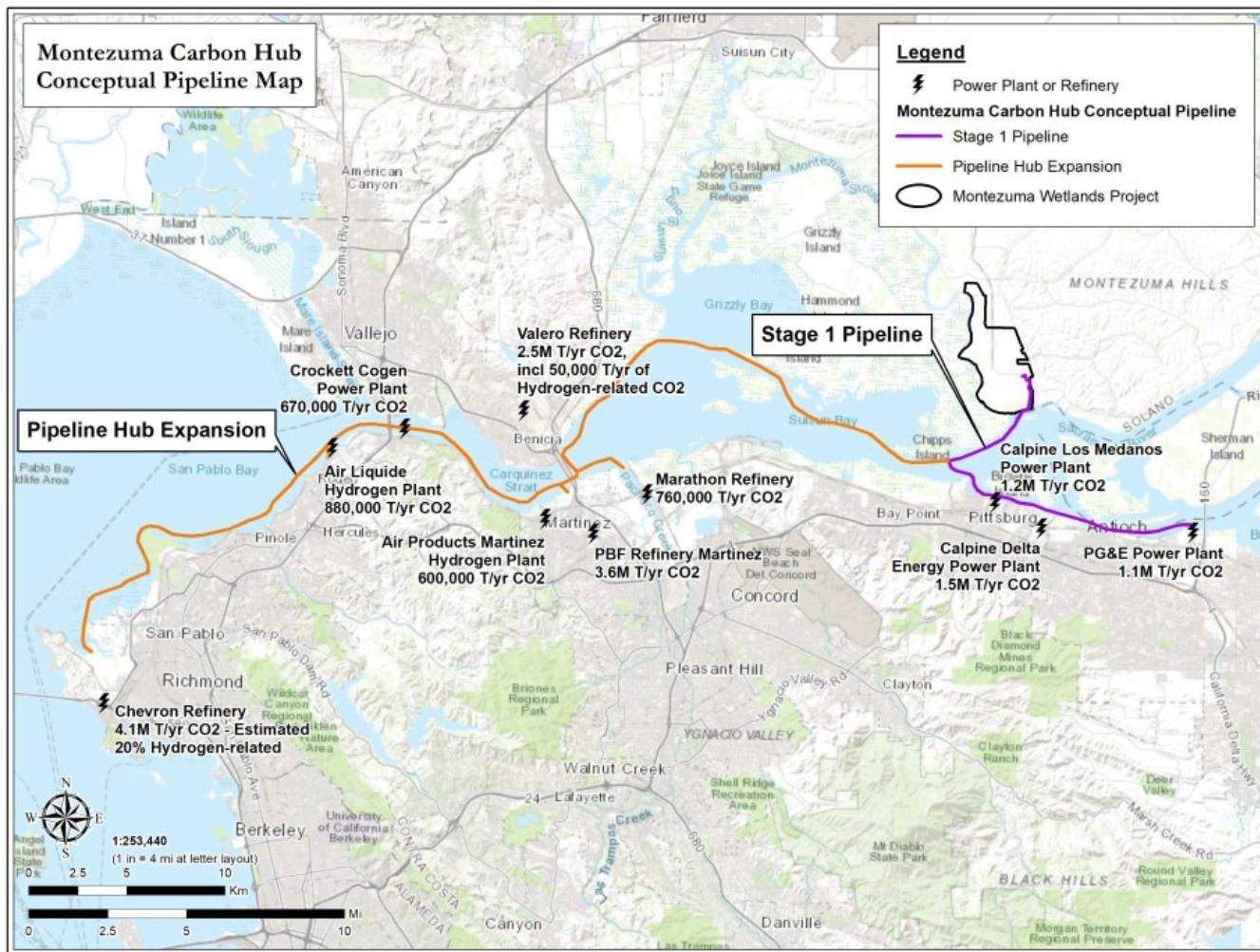


Figure A-2 illustrates a conceptual illustration of an underwater pipeline route to collect CO<sub>2</sub> from the North Bay industrial corridor, where refineries, hydrogen plants, and power plants emit upwards of 17 million tons of CO<sub>2</sub> annually. Montezuma hopes to collect upwards of 3 to 8 million tons of CO<sub>2</sub> annually from these sources for a 40- plus year period and inject 40 to 100 million tons of CO<sub>2</sub>.

SECTION A. APPLICATION NARRATIVE  
40 CFR 146.82(a)

FIGURE A-2. REGIONAL POTENTIAL CO<sub>2</sub> SOURCE FACILITIES AND PIPELINE ROUTES



Montezuma plans to construct a regional CO<sub>2</sub> pipeline network to bring CO<sub>2</sub> from these industrial sources to the Montezuma site. Montezuma is also exploring the opportunity to repurpose, upgrade, and or replace existing gas pipelines that cross the Sacramento/San Joaquin River.

Montezuma plans to construct the project within 18 months of acquiring all permits.

At this time, Montezuma is not seeking an injection depth waiver or aquifer exemption expansion.

In accordance with 40 CFR 146.82(a)(20), a list of state, tribe, and territory contacts will be included in the Geologic Sequestration Data Tool (GSDT) information uploads, and a summary of that table is provided as Table A-1. Based on information provided by the Secretary of Natural Resources Agency, Wade Crowfoot, there are no tribes or territories within the Area of Review (AoR).

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

**TABLE A-1. STATE OF CALIFORNIA & KEY PARTNER CONTACTS**

<b>Agency</b>	<b>Phone</b>
State of California San Francisco Bay Conservation and Development Commission Office – Larry Goldzband, Executive Director	(415) 352-3653
State Lands Commission – Jennifer Lucchesi, Executive Director	(916) 574-1900
California Department of Conservation – Gabe Tiffany, Deputy Director	(916) 322-1080
University of California at Berkely – Dr. James Rector III	Confidential Information
Lawrence Berkely National Laboratory – David Alumbaugh	Confidential Information

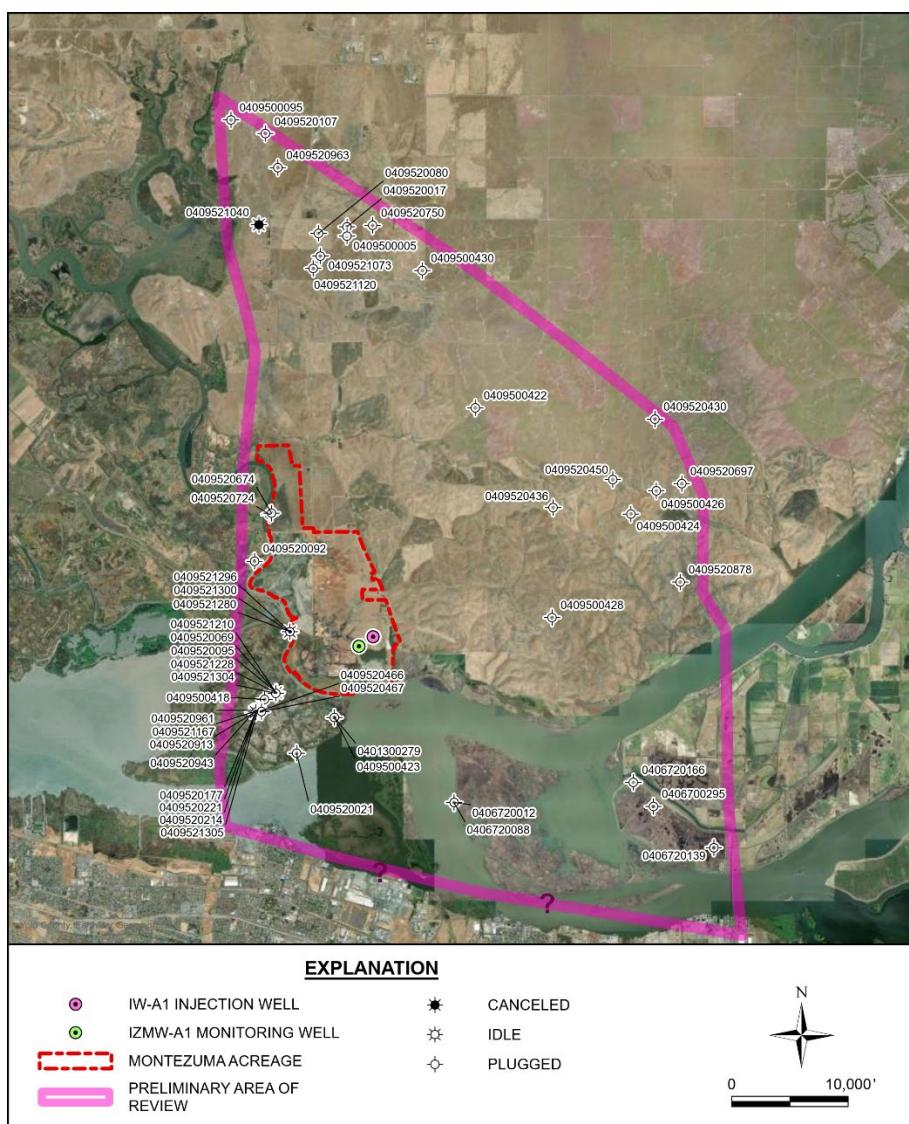
Similarly, key project and facility details as required by 40 CFR 146.82(a)(1) will also be uploaded into GSDT.

Figures A-3A, A-3B, and A-3C provide detailed maps of the project site illustrating the following characteristics in conformance to 40 CFR 146.82(a)(2):

- **Injection Well:** Denoted by the label IW-A1 with small purple dot with black outline.

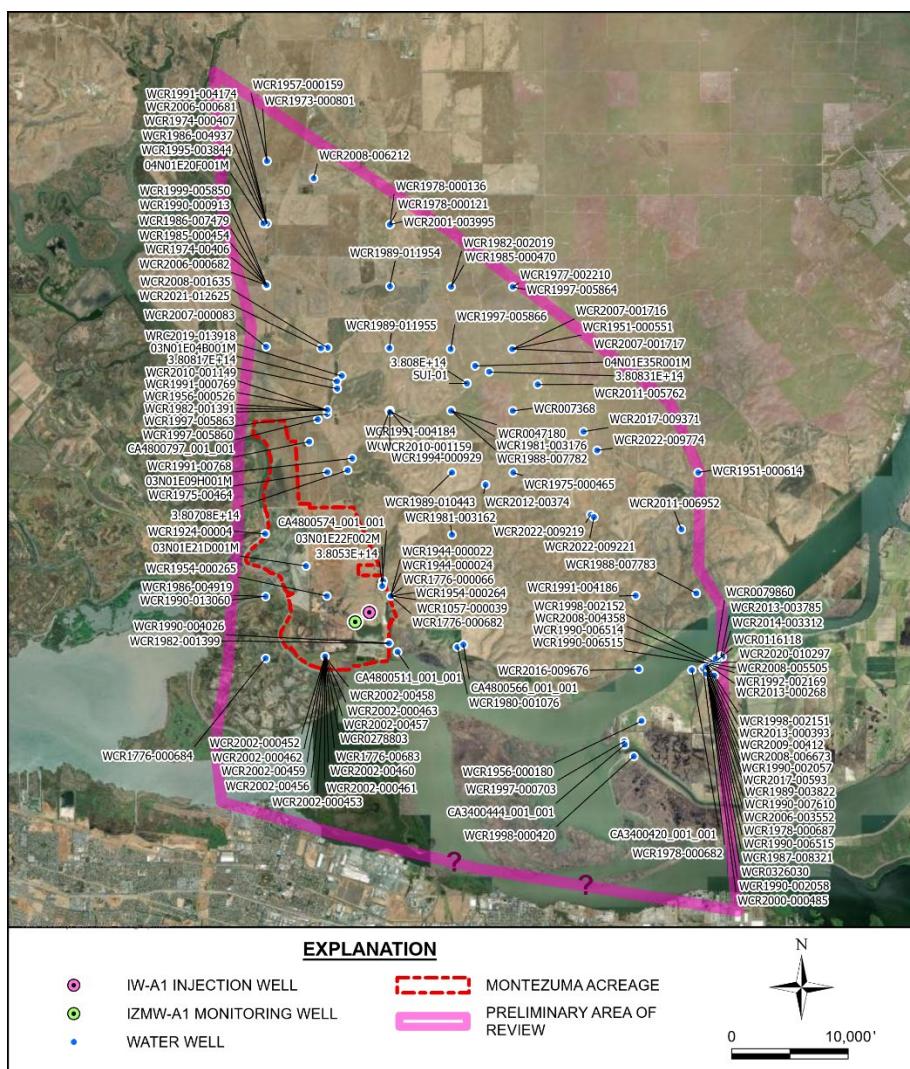
**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

**FIGURE A-3A. MAP OF THE SITE RESOURCES AND INFRASTRUCTURE: OIL AND GAS WELLS**



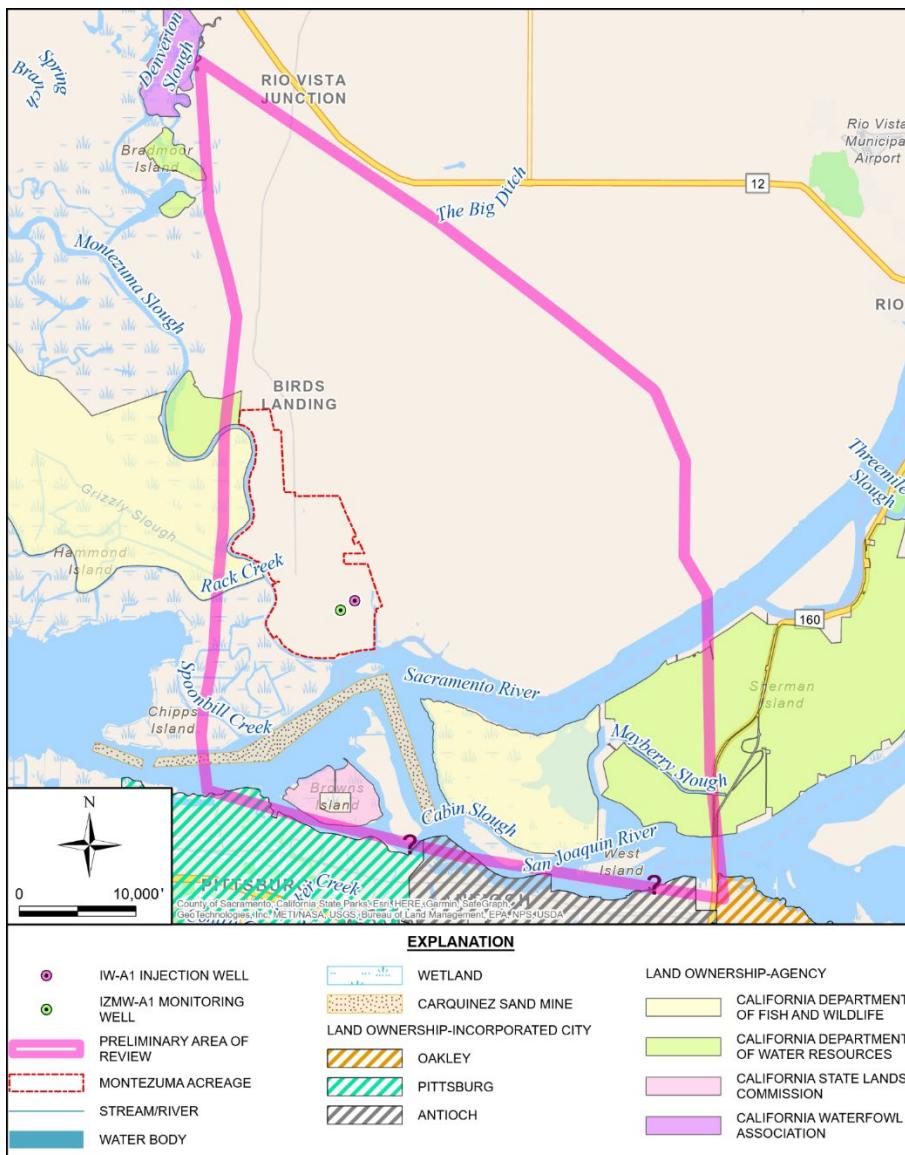
**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

**FIGURE A-3B. MAP OF THE SITE RESOURCES AND INFRASTRUCTURE: WATER WELLS**



**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

**FIGURE A-3C. MAP OF THE SITE RESOURCES AND INFRASTRUCTURE: OTHER RELEVANT IDENTIFIED SURFACE AND SUBSURFACE FEATURES**



- **Area of Review:** The conservative 100-year outline for the CO<sub>2</sub> plume and the structurally limited interpretation of the pressure front; the latter of which has some uncertainty along its southern border along the south side of the Sacramento River.
- **Faults and Fractures:** MC searched public databases and found records for several faults or fractures within the AoR, and in fact, the preliminary interpretation is that several of these structures control the pressure front for this injection well. The key faults bordering the west and east sides of the AoR are the Kirby Hills and Sherman Island faults, respectively. South of the Sacramento River are the David and Antioch faults. See Section A.I.3 of the Site Characterization attachment to the Application Narrative for additional information on faults and fractures.

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

- Class I through Class V Wells: There are no active Class I through Class V wells located within the areal extent of the AoR.
- Oil & Gas Wells/Deep Boreholes: There are several identified oil and gas fields controlled by the subsurface geology and structures near or with the AoR. The public records for active and legacy oil and gas wells within the AoR were researched and used to create Appendix B-1. 40 CFR 146.82(a)(2) requires that injection wells, producing wells, abandoned wells, plugged wells or dry holes, and deep stratigraphic boreholes be displayed. The oil and gas wells within the AoR are displayed on Figure A-3A, indicating that there are plugged, cancelled, and idle wells. Wells reported specifically as injection, abandoned (other than plugged), or deep stratigraphic boreholes were not identified in public records. Appendix B-1 lists each of the oil and gas wells within the AoR and notes that the plugged wells were “dry hole” or “dry gas” wells. The idle well was a “dry gas” well. The evaluation of the Figure A-3A and Appendix B-1 O&G wells is presented in Section B.5 of the Area of Review and Corrective Action Plan and includes a recommendation for which of the legacy plugged and abandoned O&G wells are candidates for further evaluation and potential corrective action.
- Water wells: Figure A-3B and Appendix B-2 lists search findings for water wells identified within the AoR. The deepest of the wells does not exceed an 800 ft depth, and none of the water wells penetrate the multiple underlying shale units that act as confining units, providing over 9,000 ft of separation between the deepest of these wells and the Anderson Sandstone injection interval. Thus, there is no need for corrective action on any of these wells at this time.
- State- or US EPA-approved subsurface Clean-up Sites: MC searched public databases and found no records for State- or US EPA-approved subsurface clean-up sites within the areal extent of the AoR. However, the Concord Naval Weapons Station and Travis Air Force Base Superfund sites are located outside the AoR toward the southwest and north, respectively.
- Surface Bodies of Water: Figure A-3C displays surface water bodies. For instance, Montezuma Slough borders the west side of the Montezuma property, an un-named slough is located at the southeast corner of the Montezuma property, and the Sacramento River borders the south side of the property. Portions of each of these surface water features occur within the areal extent of the AoR.
- Springs: MC searched public records and found no evidence of springs within the areal extent of the AoR.
- Mines and Quarries: MC searched public databases and found that Suisun Associates obtained two US Army Corps of Engineers permits to hydraulically dredge construction grade sands from the Suisun Channel of the Sacramento River between Chipp's Island and southern end of Winter Island. A sand mine is displayed on Figure A-3C. Other than these mining activities, no records of surface or subsurface mines or quarries were identified within the AoR.

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

- Structures for Human Occupancy: Approximately 20 areas were identified within the AoR to contain one or more residential/commercial building structures; except for the small cluster located at Collinsville, near the southeast corner of the project site, all other structures are well outside the predicted CO<sub>2</sub> plume front.
- Boundaries and Roads: The Montezuma project site lies within Solano County, CA. Several public roads provide access to the site (Figure A-3C), State Road 12 runs east to west north of the project area, and Collinsville Road runs roughly along the eastern edge of the Montezuma site. The boundaries for Contra Costa and Sacramento Counties are located along the southern edge of Solano County near the approximate center of the Sacramento River. There are no Tribal, State, or Territory boundaries within the AoR.

Primary contact for Montezuma Carbon LLC is:

Jim Levine, Managing Partner

2000 Powell Street, Suite 920

Emeryville, CA 94608

Phone: 510-409-1765

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**GSDT Submission - Project Background and Contact Information**

**GSDT Module:** Project Information Tracking

**Tab(s):** General Information tab; Facility Information and Owner/Operator Information tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

Required project and facility details **[40 CFR 146.82(a)(1)]**

**A.2 SITE CHARACTERIZATION [40 CFR 146.82(A)(2), (3), (5), AND (6)]**

This permit includes a Site Characterization attachment to the Application Narrative that meets the requirements of 40 CFR 146.82(a)(2), (3), (5), (6) and 40 CFR 146.83.

- An overview of regional geology, hydrogeology, and local structural geology [40 CFR 146.82(a)(3)(vi)]

A thorough evaluation of the regional and local geology and hydrogeologic units and their associated structures is provided. In the vicinity of the GS site, the shallow geologic units to 2000 feet below ground surface (ft bgs) are generally undifferentiated non-marine materials and include the lowermost Underground Source of Drinking Water (USDW), which is the Tehama Formation. Beneath this are shales and sandstones that provide a set of potential injection and confining zones.

## SECTION A. APPLICATION NARRATIVE 40 CFR 146.82(a)

This permit application targets an injection zone in the Anderson Sandstone (11,300 – 12,600 ft bgs). The injection zone will be within a syncline where the sandstone layer is very thick (up to 200 ft). Above the injection zone is the Meganos / Upper Martinez Shale that will act as the primary upper confining unit (9,900 – 11,300 ft bgs), and below the injection zone is the Lower Martinez Shale that will act as the primary lower confining unit (12,600-13,900 ft bgs).

- Maps and cross sections of the AoR [40 CFR 146.82(a)(3)(i) and 146.82(a)(2)]

MC reviewed, evaluated, and prepared numerous maps and cross-sections as part of its analysis, evaluation, documentation, and explanation of the regional and local geology and hydrogeologic conditions at and in the vicinity of the proposed subsurface carbons storage complex.

- The location, orientation, and properties of known or suspected faults and fractures that may transect the confining zone(s) in the AoR, along with a determination that they should not interfere with containment, but rather aid to structurally contain and control it [40 CFR 146.82(a)(3)(ii)]

The maps and cross sections of the AoR [40 CFR 146.82(a)(3)(i) and 146.82(a)(2)], as well as preliminary modeling, indicate that the AoR is bounded by faults that act as no-flow zones. This interpretation is supported by gas fields in the area where extraction and injection has not resulted in influence across the faults.

- Data on the depth, areal extent, thickness, mineralogy, porosity, permeability, and capillary pressure of the injection and confining zone(s) and on lithology and facies changes [40 CFR 146.82(a)(3)(iii)]
- Geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone(s) [40 CFR 146.82(a)(3)(iv)]

The Anderson Sandstone and upper / lower confining unit characteristics are presented based on regional information. This information includes well borings as well as gas field data sheets for the area. Much of this information will be updated by implementation of the Pre-operational Testing Program.

- Information on the seismic history of the area, including the presence and depths of seismic sources, and a determination that the seismicity will not interfere with containment [40 CFR 146.82(a)(3)(v)]

The nearby Kirby Hills fault is an active fault that has a history of extremely deep earthquakes in the Montezuma area. Nearly all earthquakes from 1969 to 2019 have M<3.0 with hypocenters at depths below 15 km, at least 7 km below the estimated top of basement. While there is natural seismicity in the area, CO<sub>2</sub> injection is not expected to result in induced seismicity. This low likelihood is due to: 1) the injection interval is 2-3 miles above the top of the crystalline basement and 8-12 miles above the seismicity area; 2) the confining units are impermeable thick, continuous shales with an additional 2-3 miles of largely shale

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

confining zones separating the reservoir from the basement; 3) all major faults in the area are known from gas production adjacent to the fault to be impermeable; and 4) none of the huge volumes of gas withdrawn in the area has affected pressures away from the field nor induced seismicity.

- Geologic and topographic maps and cross sections illustrating regional geology, hydrogeology, and the geologic structure of the local area [40 CFR 146.82(a)(3)(vi)]
- Maps and stratigraphic cross sections indicating the general vertical and lateral limits of all USDWs, water wells, and springs within the AoR, their positions relative to the injection zone(s), and the direction of water movement (where known) [40 CFR 146.82(a)(5)]

This permit presents multiple maps and cross sections that depict the area. This information was used for initial Site Characterization as well as preliminary modeling to establish the AoR.

- Baseline geochemical data on subsurface formations, including all USDWs in the AoR [40 CFR 146.82(a)(6)],

This permit reviews regional geochemistry information. This information will be supplemented by baseline geochemical data collection that is described in the Pre-operational Testing Program and the Testing and Monitoring Program.

- Data to support a demonstration to the Project Director of site suitability for the GS project with respect to injection zone and confining zone(s) properties [40 CFR 146.83]

The site is considered suitable for CO<sub>2</sub> injection, including modeling that indicates: The simulations showed: 1) A single vertical well can inject one MMtonnes/year for over 40 years into the 1,300 ft thick Anderson sand reservoir located at 11,300 ft; 2) the plume extent is approximately 1.3 km in radius after 100 years and pressure increases of less than 1.7 MPa are created on the sealing faults to the east and west of the injection well; 3) there is enough acreage at the site to put in at least three Anderson vertical injection wells on the current acreage; 4) other sand units (Domengine, Hamilton and potentially others), could potentially store comparable amounts of CO<sub>2</sub>, and we believe that overall site has a most likely storage estimate of over 250 MMtonnes of CO<sub>2</sub> at injectivity rates of over 5 MMtonnes per year; and 5) even if pessimistic forecasts of reservoir parameters are used, the site has storage potential of over 80 MMtonnes at rates of over 2 MMtonnes per year.

It is our current opinion that there is a negligible risk of leakage into shallow units due to injection. The confining units are impermeable thick, continuous shales that extend in intervals for thousands of feet above the injection interval. All the major faults in the area (Kirby Hills, Midland, and Sherman Island) are known

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

from gas production adjacent to the fault to be impermeable traps, so fluids cannot migrate up the large faults to the surface. Moreover, there is no evidence of faulting near the injection well, and the shales above and below the reservoir are continuous far past the modeled plume extent.

### **A.3 AOR AND CORRECTIVE ACTION**

Based on the preliminary modeling analyses and influenced by the closed boundary assumptions, the pressure front extends outward from IW-A1 to the sealed faults to the north, west, and eastern sides of the MC project site. There is some uncertainty about the nature of the Antioch and Davis faults south of the project and on the other side of the Sacramento River.

MC is completing a detailed evaluation of the identified deep oil and gas wells that penetrate the deep confining units within the AoR and in close proximity to the injection well. Until such time as that evaluation is complete and those wells have been removed from further consideration for needing corrective action, MC will provide financial responsibility cost estimates for their potential remedial attention and action.

#### **AoR and Corrective Action GSDT Submissions**

**GSDT Module:** AoR and Corrective Action

**Tab(s):** All applicable tabs

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

- Tabulation of all wells within AoR that penetrate confining zone *[40 CFR 146.82(a)(4)]*
- AoR and Corrective Action Plan *[40 CFR 146.82(a)(13) and 146.84(b)]*
- Computational modeling details *[40 CFR 146.84(c)]*

### **A.4 FINANCIAL RESPONSIBILITY**

MC plans to provide financial responsibility pursuant to 40 CFR 146.82(a)(14) and 146.85 using a combination of an escrow, trust fund, and commercial insurance to cover the estimated costs of corrective actions, well plugging and abandonment, post-injection site care (PISC) and site closure, and emergency and remedial response including endangerment to Underground Sources of Drinking Water (USDWs), respectively.

Although no corrective actions are currently deemed necessary, MC is committed to conducting a more detailed evaluation of the identified deep oil and gas wells that penetrate the deep confining units within the AoR, and especially those in close proximity to the injection well. As a conservative measure and until these efforts have been completed and accepted by the agency, MC has included costs for the potential corrective actions for seven oil and gas wells to satisfy the requirement of 40 CFR 146.85(a)(2)(i).

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

**Financial Responsibility GSDT Submissions**

**GSDT Module:** Financial Responsibility Demonstration

**Tab(s):** Cost Estimate tab and all applicable financial instrument tabs

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

Demonstration of financial responsibility **[40 CFR 146.82(a)(14) and 146.85]**

## **A.5 INJECTION WELL CONSTRUCTION**

The injection well is designed and will be drilled, tested, and completed as a CO<sub>2</sub> injection well under a Class VI permit issued to MC by the US EPA. This well drilling program is intended to collect and obtain the necessary field data to support a US EPA UIC Class VI permit application. Following the Injection period, the plan is for IW-A1 to be re-completed as a Class VI injection zone monitoring well during the Post-Injection Site Care (PISC) period.

## **A.6 PRE-OPERATIONAL LOGGING AND TESTING**

MC will carry out a Pre-Operational Testing Program in conformance to 40 CFR 146.82(a)(8) and 146.87.

The plan includes: (a) Comprehensive logging and testing to ensure IW-A1 (and IZMW-A1) conforms to Class VI well construction standards, and establish a baseline of formation properties (depth, thickness, porosity, permeability, lithology, salinity) from field data collected during drilling of IW-A1 and IZMW-A1, (b) Coring and formation fluid sampling in all relevant geologic formations from the upper secondary confining zones down through the lower pressure dissipation zone, (c) Measurement of injection zone fluid temperature, pH, conductivity, reservoir pressure, and static fluid level, (d) Method for determining fracture pressure and other physical and chemical characteristics of the injection and confining zones, and (e) Pressure fall-off test and a pump/injectivity test of IW-A1 to determine near-wellbore formation properties.

The testing activities described in this document are restricted to IW-A1 and IZMW-A1 during the Pre-Injection period. Testing and monitoring activities during the Injection and Post-Injection Site Care (PSIC) periods are described in the Testing and Monitoring Plan, along with other non-related Pre-Injection period activities such as above confining zone geochemical monitoring. Class VI requirements for injection well construction do not strictly apply to a monitoring well, however MC has elected to follow the protocols in 40 CFR 146.87 to ensure IZMW-A1 is built to an appropriate standard. Construction of IZMW-A1 also provides an opportunity to gather additional field data (depth, thickness, porosity, permeability, lithology, salinity) on formation properties within the project site. The testing activities described in this program apply to IW-A1 and IZMW-A1, some or much of this testing may be carried out on a stratigraphic test well prior to

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

issuance of the Class VI permit and that well may be converted to either IW-A1 or IZMW-A1 pending design completion.

**Pre-Operational Logging and Testing GSDT Submissions**

**GSDT Module:** Pre-Operational Testing

**Tab(s):** Welcome tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

Proposed pre-operational testing program **[40 CFR 146.82(a)(8) and 146.87]**

## A.7 WELL OPERATION

### A.7.1 OPERATIONAL PROCEDURES [40 CFR 146.82(A)(10)]

Table A-2 provided the proposed operational procedures. The design basis for the permit is a CO<sub>2</sub> injection rate of 1,00,000 metric tons per year over a 40-year Injection period, resulting in 40,00,000 metric tons for the project. Daily average and maximum injection rates assume injection will be conducted approximately 335 days per year. This accounts for 1 month, or 30 days, of downtime per year. On operational days, the average and maximum rate of CO<sub>2</sub> injection rate will be the same: approximately 2,985 metric tons per day, which equates to 1,000,000 metric tons per year. The maximum injection pressure was calculated by a fixed mass flow rate of the model and may change pending the wellhead design and pre-operational testing. The recommended injection pressure is estimated based on regional well data and may change pending the well design and pre-operational testing. For consistency with 40 CFR 146.88(a), 90% safety factor was applied to the estimated fracture gradient as required for US EPA UIC Class VI permits. Annulus pressure and annulus pressure/tubing differential values are set from system hydraulic calculations that assure the annular fluid is always at a higher pressure than the injection fluid along the entire run of the injection tubing.

The design basis flow rate and Injection period may change over time as the regional storage potential of the site is evaluated and realized. Changes to either will warrant formal updates, reviews, and approvals by the Program Director.

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

**TABLE A-2. PROPOSED OPERATIONAL PROCEDURES**

Parameters/Conditions	Limit or Permitted Value
Maximum Injection Pressure	
Surface	2,291 psi
Downhole	7,202 psi
Recommended Injection Pressure	
Surface	2,000 psi
Downhole	7,000 psi
Maximum Injection Rate	1,000,000 metric tons/year (2,985 tons/day)
Average Injection Rate	1,000,000 metric tons/year (2,985 tons/day)
Maximum Injection Volume and/or Mass	40,000,000 metric tons
Average Injection Volume and/or Mass	40,000,000 metric tons
Maximum Annulus Pressure	3,000 psi
Annulus Pressure/Tubing Differential	$\geq$ 100 psi

**A.7.2 PROPOSED CARBON DIOXIDE STREAM [40 CFR 146.82(A)(7)(III) AND (IV)]**

There are expected to be multiple sources of CO<sub>2</sub> for injection, including refineries, hydrogen plants, and power plants. These CO<sub>2</sub> sources may change over time, so the CO<sub>2</sub> stream characteristics may also change. Cleanup and dehydration of the source stream will be conducted at the source facility. Due to existing air quality rules, the power plant CO<sub>2</sub> sources are already low in nitrogen oxides and sulfur oxides. As such, there are not expected to be significant concentrations of other airborne contaminants in the gas stream after cleanup and dehydration. The moisture factor will be less than 0.1% and additional verification information on the composition will be provided by the specific sources once pilot plants are operational. MC is currently working with its potential CO<sub>2</sub> sources and the CO<sub>2</sub> capture process and pipeline transport engineering teams to characterize the chemical and physical composition of the CO<sub>2</sub> stream(s) anticipated to be injected more fully. These ongoing efforts include an evaluation of the anticipated CO<sub>2</sub> characterization from the various industrial sources and are also expected to include relevant process modeling by knowledgeable professionals. Once these CO<sub>2</sub> stream analyses and resulting data are available to MC, those data will be provided to the USEPA and incorporated into the Class VI application. The Testing and Monitoring Plan describes methods that will be used to assess the physical and chemical characteristics of the CO<sub>2</sub> stream over time, and to assess potential corrosiveness and interactions with the subsurface.

**A.8 TESTING AND MONITORING**

The Testing and Monitoring Plan describes how Montezuma Carbon, LLC (MC) will monitor the Montezuma Carbon Sequestration Hub pursuant to 40 CFR 146.90. In addition to demonstrating that the well is operating

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

as planned, the carbon dioxide plume and pressure front are moving as predicted, and that there is no endangerment to USDWs, the monitoring data will be used to validate and adjust the geological models used to predict the distribution of the CO<sub>2</sub> within the storage zone to support AoR reevaluations and a non-endangerment demonstration.

See the Testing and Monitoring Plan and the Quality Assurance and Surveillance Plan for more information.

**Testing and Monitoring GSDT Submissions**

**GSDT Module:** Project Plan Submissions

**Tab(s):** Testing and Monitoring tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

Testing and Monitoring Plan **[40 CFR 146.82(a)(15) and 146.90]**

**A.9 INJECTION WELL PLUGGING**

Montezuma Carbon, LLC (MC) will plug and abandon IW-A1 in accordance with 40 CFR 146.92. After serving as an injection well, IW-A1 will be re-completed as a monitoring well during the post-injection site care (PISC) period. Well plugging and abandonment of IW-A1 will occur after completion of its monitoring well service during PISC.

See the Injection Well Plugging Plan for additional information.

**Injection Well Plugging GSDT Submissions**

**GSDT Module:** Project Plan Submissions

**Tab(s):** Injection Well Plugging tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

Injection Well Plugging Plan **[40 CFR 146.82(a)(16) and 146.92(b)]**

**A.10 POST-INJECTION SITE CARE (PISC) AND SITE CLOSURE**

The PISC and Site Closure plan describes the activities that MC will perform to meet the requirements of 40 CFR 146.93. MC will monitor groundwater quality and track the position of the carbon dioxide plume and pressure front for at least the 50-year default timeframe. Additional long-term monitoring opportunities will be explored by LBNL at a later date.

MC may not cease post-injection monitoring until a demonstration of non-endangerment of USDWs has been approved by the UIC Program Director pursuant to 40 CFR 146.93(b)(3). Following approval for site closure,

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

MC will plug all monitoring wells, restore the site, and submit a site closure report and associated documentation.

See the Post-Injection Site Care and Site Closure Plan for more information, including supporting information for the alternative PISC timeframe demonstration.

<b>PISC and Site Closure GSDT Submissions</b>
<p><b>GSDT Module:</b> Project Plan Submissions <b>Tab(s):</b> PISC and Site Closure tab</p> <p>Please use the checkbox(es) to verify the following information was submitted to the GSDT:</p> <p><input checked="" type="checkbox"/> PISC and Site Closure Plan <b>[40 CFR 146.82(a)(17) and 146.93(a)]</b></p>
<p><b>GSDT Module:</b> Alternative PISC Timeframe Demonstration <b>Tab(s):</b> All tabs (only if an alternative PISC timeframe is requested)</p> <p>Please use the checkbox(es) to verify the following information was submitted to the GSDT:</p> <p><input type="checkbox"/> Alternative PISC timeframe demonstration <b>[40 CFR 146.82(a)(18) and 146.93(c)]</b></p>

#### **A.11 EMERGENCY AND REMEDIAL RESPONSE**

MC shall take actions to address movement of the injection fluid or formation fluid in a manner that may endanger an Underground Source of Drinking Water (USDW) during the Construction, Injection, or Post-Injection Site Care (PISC) periods.

If MC obtains evidence that the injected carbon dioxide (CO<sub>2</sub>) stream and/or associated pressure front may cause an endangerment to a USDW, MC must perform the following actions:

1. Initiate shutdown plan for the injection well IW-A1.
2. Take all steps reasonably necessary to identify and characterize any release.
3. Notify the United States Environmental Protection Agency (US EPA) Region 9 Underground Injection Control (UIC) Program Director, David Albright, of the emergency event in writing within 24 hours with detailed information about the endangerment.
4. Implement applicable portions of the approved Emergency and Remedial Response Plan (ERRP).

Where the phrase “initiate shutdown plan” is used, the following protocol will be employed: MC will immediately cease injection. However, in some circumstances, MC will, in consultation with the US EPA UIC

**SECTION A. APPLICATION NARRATIVE**  
**40 CFR 146.82(a)**

Program Director, determine whether gradual cessation of injection (using the parameters set forth in the Summary of Requirements of the Class VI permit) is appropriate.

**Emergency and Remedial Response GSDT Submissions**

**GSDT Module:** Project Plan Submissions

**Tab(s):** Emergency and Remedial Response tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

Emergency and Remedial Response Plan *[40 CFR 146.82(a)(19) and 146.94(a)]*

**A.12 INJECTION DEPTH WAIVER AND AQUIFER EXEMPTION EXPANSION**

At this time, no Injection Depth Waiver or Aquifer Exemption Expansion is being pursued.

**Injection Depth Waiver and Aquifer Exemption Expansion GSDT Submissions**

**GSDT Module:** Injection Depth Waivers and Aquifer Exemption Expansions

**Tab(s):** All applicable tabs

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

Injection Depth Waiver supplemental report *[40 CFR 146.82(d) and 146.95(a)]*  
 Aquifer exemption expansion request and data *[40 CFR 146.4(d) and 144.7(d)]*

**A.13 OPTIONAL ADDITIONAL PROJECT INFORMATION [40 CFR 144.4]**

Upon request, MC will provide the USEPA with any of the additional project information they require to ensure they are in compliance with the following list of Federal laws that may be applicable to this project.

- The Wild and Scenic Rivers Act, 16 U.S.C. 1273 et seq. Identify any national wild and scenic river that may be impacted by the activities associated with the proposed project.
- The National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq. Identify properties listed or eligible for listing in the National Register of Historic Places that may be affected by the activities associated with the proposed project. If previous historic and cultural resource survey(s) have been conducted, provide the results of the survey(s).

**SECTION A. APPLICATION NARRATIVE  
40 CFR 146.82(a)**

- The Endangered Species Act, 16 U.S.C. 1531 et seq. Identify any endangered or threatened species that may be affected by the activities associated with the proposed project. If a previous endangered or threatened species survey has been conducted, provide the results of the survey.
- The Coastal Zone Management Act, 16 U.S.C. 1451 et seq. Identify any coastal zones that may be affected by the activities associated with the proposed project.]

**A.14 OTHER INFORMATION**

Upon request by the UIC Program Director or agency staff, MC will provide any additional relevant and applicable project information