PLUGGING AND ABANDONMENT

40 CFR 146.92

SUTTER DECARBONIZATION PROJECT

1.0 Facility Information

Facility name: Sutter Energy Center

[redacted]

Facility contact: [redacted]

Well location: Robbins, Sutter County, CA

[redacted]

[redacted] will conduct injection well plugging and abandonment according to the procedures below.

2.0 Planned Tests or Measures to Determine Bottom-Hole Reservoir Pressure

During plugging and abandonment, an initial bottom hole pressure measurement will be made using either existing gauges and hydrostatic pressure calculations or a wireline deployed pressure gauge. 60-day notice will be provided prior to plugging operations. Adjustments to the plugging plan will be incorporated as per guidance.

3.0 Planned External Mechanical Integrity Test(s)

[redacted] will conduct at least one of the tests listed in Table 1 to verify external mechanical integrity prior to plugging the injection well as required by 40 CFR 146.92(a). 0-5000 psi rated gauges will be used for surface pressure monitoring during these tests.

Table 1. Proposed external mechanical integrity test prior to plugging [redacted].

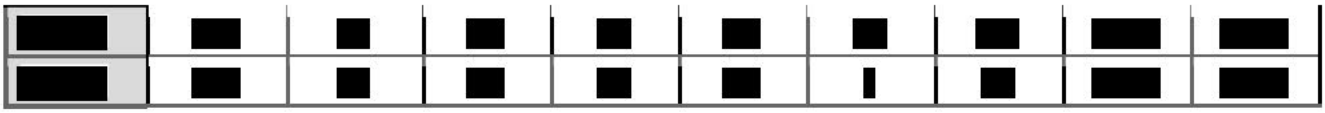
[redacted]

4.0 Information on Plugs

[redacted] will use the materials and methods noted in Table 2 to plug the injection well. The volume and depth of the plug or plugs will depend on the final geology and downhole conditions of the well as assessed during construction. The cement(s) formulated for plugging will be compatible with the carbon dioxide stream. The owner or operator will report the wet density and will retain duplicate samples of the cement used for each plug.

Table 2. Plug details for plugging Sutter Decarbonization Project wells.

	ID	Cement Used (Sacks)	Slurry Yield (ft^3/sack)	Slurry Volume (ft^3)	Slurry weight (lb/gal)	Planned Top, MD (ft)	Planned Bottom, MD (ft)	Cement Type	Method
[redacted]									



5.0 Narrative Description of Plugging Procedure

5.1 Notifications, permits, and inspections

In compliance with 40 CFR 146.92(c), [redacted] will notify the regulatory agency at least 60 days before plugging the well and provide updated Injection Well Plugging Plan along with relevant design updates, cement formulations, and necessary certification documents as appropriate. Plugging plans will be initiated with the approval of UIC Program Director.

5.2 Plugging procedures - narrative

Upon completion of the project, or at the end of life of the [redacted] injector, the well will be plugged and abandoned to meet the requirements of 40 CFR 146.92. The plugging procedure and materials will be designed to prevent any unwanted fluid movement, to resist the corrosive aspects of carbon dioxide/water mixtures, and to protect any USDWs. Any necessary revisions to the well plugging plan to address new information collected during logging and testing of the well will be made after construction, logging, and testing of the well have been completed. The final plugging plan will be submitted to the UIC Program Director for approval.

Based on bottomhole pressure measurements, the well will be flushed with a kill weight brine fluid with corrosion inhibitor. The selected brine composition will be aimed at minimizing corrosion risk over the PISC period. A minimum of two tubing volumes will be injected without exceeding fracture pressure. An external MIT will be conducted prior to plugging as outlined in Table 1. If a loss of mechanical integrity is discovered, the well will be repaired prior to proceeding with the plugging operations. Detailed plugging procedure are provided below.

All casing in this well will be cemented to surface at the time of construction and will not be retrievable at abandonment. After injection is terminated permanently, the injection tubing and packer will be removed. After the tubing and packer are removed, a retainer squeeze will be used to plug off the perforated horizontal lateral. The pressure used to squeeze the cement will be determined from the bottom-hole pressure data measured before beginning the plugging and abandonment process. However, the injection pressure of the cement will not exceed the fracture pressure of the Starkey Clean Sand Formation. If it appears that the injection pressure will exceed the fracture pressure and the planned amount of cement has not been pumped into the injection zone, cement pumping will cease, and the tubing will be removed from the cement retainer to allow the pressure to return to static conditions. After allowing the pressure to reduce, the tubing will be re-strung through the cement retainer and cement pumping will be attempted again. A rapid increase in pressure on the tubing would indicate that the perforations have been sealed with cement, and no additional cement will be added to the zone or plug. Next, balanced-plug placement method will be used to plug the remainder of the well per the schedule outlined in Table 2 and illustrated in Figure 1. The cement(s) formulated for plugging will be compatible with the carbon dioxide stream. The exact cement formulation

and required certification documents will be submitted to the agency with the well plugging plan prior to conducting the operation. The operator will report the wet density and will retain duplicate samples of the cement used for each plug. If, after flushing, the tubing and packer cannot be released, an electric line with tubing cutter will be used to cut off the tubing above the packer and the packer will be left in the well, and the cement retainer method will be used for plugging the injection formation below the abandoned packer. All the casing strings will be cut off at least 3 ft below the surface, below the plow line. A blanking plate with the required permit information will be welded to the top of the cutoff casing.

5.3 Plugging procedures - detailed

1. In compliance with 40 CFR 146.92(c), the regulatory agency will be notified at least 60 days before plugging the well and provide updated plugging plan, if applicable. Review historic MIT data and remedial work.

2. Move-in (MI) Rig onto [redacted] and rig up (RU). All CO_2 pipelines will be marked, locked and tagged out and noted with rig supervisor prior to MI.

3. Conduct and document a safety meeting.

4. Record bottom hole pressure (BHP) from down hole gauge and calculate kill fluid density.

5. Open all valves on the vertical run of the tree and check pressures and flow.

6. Pressure test the pump and line to [redacted] (or [redacted]). Fill tubing with kill weight brine (as determined by bottom hole pressure measurement). Bleeding off tubing occasionally may be necessary to remove all air from the system. Test casing annulus to [redacted] and monitor. If there is pressure remaining on tubing, rig to pump down tubing and inject two tubing volumes of kill weight brine. Monitor tubing and casing pressure for 1 hour. If both casing and tubing are dead, then nipple up blowout preventers (NU BOPs). Monitor casing and tubing pressures.

7. If the well is not dead or the pressure cannot be bled from the tubing, rig up (RU) slickline and set a plug in the lower profile nipple below packer. Circulate tubing and annulus with kill weight fluid until the well is dead. After the well is dead, nipple down the tree, nipple up blow-out preventers (BOPs), and perform a function test on the BOPs. BOPs should have appropriately sized single pipe rams on top and blind rams in the bottom ram for tubing. Pressure test pipe rams and blind rams to [redacted] and [redacted] maximum anticipated working pressure high. Test annular preventer to [redacted] and [redacted] maximum anticipated working pressure high. Test all full open safety valves (TIWs), BOPs choke and kill lines, and choke manifold to [redacted] and [redacted] maximum anticipated working pressure high. NOTE: Make sure the casing valve is open during all BOP tests. After testing BOPs pick up tubing string and unlatch seal assembly from seal bore. Rig slick line and lubricator back to well and remove X-plug from well. Rig to pump via lubricator and circulate until well is dead.

8. Pull out of hole with tubing and control lines laying it down as tubing is removed. NOTE: Ensure that the well is over-balanced by a minimum of 100 psig so there is no backflow due to formation pressure and there are always at least 2 well control barriers in place.

9. Pull the seal assembly, pick up a tubing work string, and trip in hole (TIH) with the packer retrieving tools. Latch onto the packer follow manufactures recommendations for unsetting the packer and pull out of hole laying down same. Next, confirm the well's mechanical integrity by performing one of the permitted external mechanical integrity tests presented in Table 1. Contingency: If unable to pull seal assembly, RU electric line and make cut on tubing string just above packer. Note: Cut must be made above packer at least 5-10 ft MD. If unable to pull the packer, pull the work string out of hole and proceed to the next step. If problems are noted, update the cement remediation plan (if needed), and confer with agency prior to plugging operations.

10. TIH with work string to total depth (TD) with bit and scraper. Add fluid every 3 joints of tubing removed and keep the hole full at all times. Circulate the well and prepare for cement plugging operations. TOH.

11. The lower section of the well will be plugged using CO_2 resistant cement (Evercrete) from TD around [redacted] to around [redacted] above the top of the Capay formation (to approximately [redacted]). This will be accomplished by placing 500 ft incremental plugs as described in Figure 1. Using a density of [redacted] slurry with a yield of [redacted] approximately [redacted] of Evercrete will be required. Cement retainers may be optionally used if formation drinks cement. Actual cement volume will depend upon actual weight of the casing within the plugged zone as well as the length of plug set as determined during the plugging operation. No more than two plug will be pumped before cement is allowed to set and plugs verified by setting work string weight down onto the plug.

12. Pump 1,000 ft of gel spacer (composition TBD) to fill the casing before additional cement plugs are pumped in shallower depths to protect the shallow freshwater aquifers. Next, mix and spot 500 ft balanced plug in 9 ⅝ inch casing (approximately 184 sacks Class G mixed at [redacted] with yield [redacted]). Pull out of plug and reverse circulate tubing. Repeat this operation until a total of two plugs have been set. Lay down work string while pulling from well. After the two plugs have been set pull tubing from well and shut in for 12 hours. Trip in hole with tubing and tag cement top. Calculate volume for final plug. Pull tubing back out of well. Nipple down BOPs and cut all casing strings below plow line (min 3 ft below ground level or per local policies/standards and other identified requirements). Trip in well and set final cement plug. Total of approximately [redacted] total cement will be used in all remaining plugs above [redacted]. Lay down all work string, etc. Rig down all equipment and move out. Clean cellar to where a plate can be welded with well name onto lowest casing string at 3 ft, or as per permitting agency directive.

13. The procedures described above may be modified during execution as necessary to ensure a plugging operation that protects worker safety as well as all identified USDWs. Any significant modifications due to unforeseen circumstances will be described in the Plugging report. Plugging report will be submitted within 60 days after plugging is completed and include:

- Pumping charts and all lab information.
- Plug emplacement type, depth range (top/bottom), cement type, grade, weight, and quantities used for each plug.
- Notes on plug tagging.
- Construction/plugging schematics with USDW depths.

- Certification of 10-year report retention.
- Certification as accurate by Calpine and plugging contractor.
- Well flushing and kill fluids description along with fluids and volumes.
- Notes on debris or tight restrictions.
- Documentation of removed completion equipment (tubing, control lines, packers, gauges).
- Squeeze cementing descriptions (if applicable).

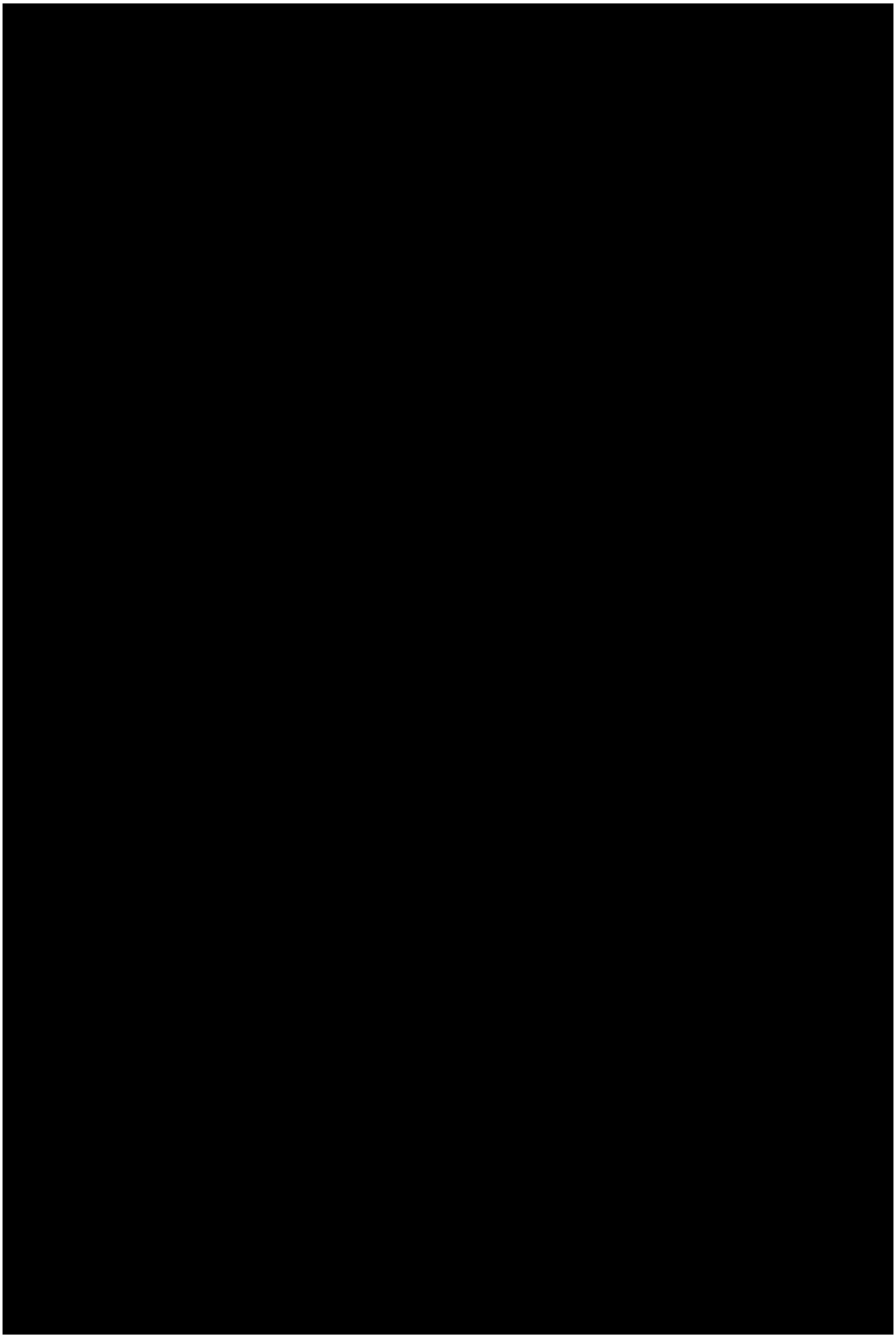


Figure 1. Generalized well plugging plan for Sutter Decarbonization Project injection wells.