

APPENDIX A.6

WELL DRILLING DETAILS

Gill Ranch Gas Storage Project

Preliminary Well Drilling Plan

Preliminary Drilling Plan

Well drilling for the proposed IW and OM wells requires specialized equipment and procedures. The following information provides preliminary specifications for the well drilling, including a description of the drilling work sequence and equipment layout; rig scheduling and staffing; onsite materials and storage / handling procedures; and drilling rig specifications for a typical rig that will be employed for this work. This drilling plan will be updated after the rig is selected and prior to drilling.

Rig Work Sequence, Specifications, and Equipment Layout. Drilling equipment includes a drill rig, a rotary table, mud motors, drill pipe, rock bits and shale shakers.

The drilling and completion process of an IW well includes the following steps:

- Rig up and set surface casing at a minimum depth of 1,100'.
- Drill conventionally for a vertical well or with directional tools in a deviated to horizontal well, to ~6,400' TVD (true vertical depth).
- Run and set an intermediate casing and cement in place.
- Drill a vertical or deviated hole to a total vertical depth around ~6,500'.
- Run and gravel pack a liner from 100' above the shoe of the intermediate casing to total depth of the well.
- Using a drilling rig or a workover rig run production casing in hole to around 6,400'. Install production tree. Swab well in and clean well. At this time the well is ready for gas injection.

The drilling and completion process of a salt water disposal well entails the following steps:

- Rig up and set surface casing at a minimum depth of 1,100'.
- Drill a straight hole to top of Santa Margarita Formation around 3,200' - 3,500'.
- Run and set an intermediate casing and cement in place.
- Drill a straight hole up to 100' into the formation.
- Run and gravel pack a liner from 100' above the shoe of the intermediate casing to the total depth of the well.

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- Using a drilling rig or a workover rig run tubing in hole to top of the liner. Install production tree. Swab well in and clean well.

At this point in the process the well is ready for water injection.

The drilling and completion process of an OM well entails the following steps:

- Rig up and set a surface casing at a minimum depth of 1,100'.
- Drill a straight hole to 6,700'.
- Run casing to bottom and cement the casing.
- Install production tree.
- Perforate well as needed

At this point in the process the well is ready for OM.

Typical drilling rig specifications for these types of wells are attached. The rig will be approximately 174 feet tall. The rig will be onsite for approximately 20 days per well. This unit will be leased on a long-term day rate based contract. At the end of the drilling process it will be removed from the job site.

The rig will be delivered to the site on tractor trailers; approximately 40 truck loads would arrive at the time of set up, with approximately 3-5 additional daily loads to deliver fuel, water, downhole equipment, mud, and supplies. All of this equipment will be removed at the end of the drilling program.

The attached rig specifications describe a typical drilling rig that will be employed for this Project.

Equipment that will be used during the drilling process includes:

- 142' Mast
- 30' substructure
- 2 Mud pumps, mud tank and shale shaker
- Cat walk and Pipe racks
- 4 Baker Tanks and 6 cuttings bins
- 15,000' drill pipe, 15,000' casing

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- 3 Generators and SCR house
- Logging truck
- Four pick-up trucks
- Vacuum truck
- Fuel and water tanks
- Well control equipment
- Parts House and pipe bins
- 4 Support trailers
- Assorted tools and downhole equipment

Drilling mud materials (in dry form) will to be transported to the well locations. During the drilling operation the drilling materials will be mixed in the designated mud tanks (part of the drilling rig) and used in the well for the purpose of removing the drilling cuttings during rotary drilling and containing the formation pressure. The well control equipment is used to contain any gas pressure that may migrate up through the mud column from the formation.

Use of the drill rig will require minor trenching to install lines for the safety and control equipment. In addition an earthen pit will be dug to store the drilling cuttings and used drilling mud.

Rig Schedule. The use of the rig will commence after GRS receives a CPCN from the CPUC and any other necessary authorizations. Actual time expected on each well is approximately 20 days. The entire drilling project is expected to take approximately six months.

Hours of Drilling Operation and Personnel. The drilling rig will operate 24 hours per day, seven days per week for the duration of drilling. A crew of 13 workers will be onsite. Of the 13, the rig crew (five people) will rotate on 8-hour shifts.

Water Demand and Source. Daily water demand during drilling operations is an estimated 16,000 gallons per day (gpd). Water for drilling will be obtained from an agricultural water well owned by an adjacent agricultural operator. Water will be trucked or temporarily piped and stored in a temporary water tank at the drill site. Bottled drinking water will be provided by the drilling contractor.

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Onsite Sanitary Facilities. Portable onsite sanitary facilities will be provided by the drilling contractor. These facilities will be removed at the completion of the drilling.

Onsite Hazardous Materials. Onsite hazardous materials during drilling activities will include:

- 12,300 gallons diesel fuel stored in a temporary tank
- 500 gallons lube oil.

Drilling Waste Handling and Disposal. Drilling waste will consist primarily of drilling cuttings and used mud. The used drilling mud and the drilling cuttings will be collected in an earthen pit next to the drilling rig and will be transported by truck after the drilling operations are completed, to a county permitted disposal site. There are no hazardous chemicals in the proposed drilling mud.

Other Wastes. Other wastes will be generated and hauled off site for disposal or recycling during drilling, including:

- Minor amounts of waste lube oil
- 100 bbl unused or contaminated Sodium Chloride brine
- 50 bbl cement or cement contaminated mud
- Miscellaneous trash, pails, sacks and pallets

Spill Contingency and Emergency Response. GRS will develop a spill and emergency response contingency plan for the Project. The contingency plan will address well upsets (e.g., blowouts).

A separate and parallel spill prevention and countermeasure control plan (SPCC Plan) associated with the drilling program will be included in the final drilling plan. The SPCC Plan will include specific protection measures to contain any spilled fluids onsite. These measures may include sand bag barriers, silt fencing, construction fencing, and restriction of work to pre-developed areas. Equipment staging and maintenance would be performed in a designated location away from vegetated areas or drainages.

Noise and Vibration. Engine/pump noise from the drilling rig is estimated as follows:

- Rig floor: approx. 93 dBa
- At 50-feet elevation: approx. 85 dBa
- At 150 feet elevation: approx. 78 dBa

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- Permissible exposure over 8 hours = 85 dBa.

Vibration levels are anticipated to be imperceptible on surrounding properties due to the absorptive characteristics of the sandy loam soils underlying the drill site.

Light and Glare. Night operations will require lighting on the rig floor and certain sections of the rig mast. Lights will be shielded and focused inward on the work location to avoid offsite glare.

Drilling and Production Emissions. The drilling rig prime mover and auxiliary equipment will be powered by portable onsite diesel generators. This portable equipment will be appropriately registered with the California Air Resources Board (CARB) Portable Equipment Registration Program (PERP).

Fire Protection. The drilling rig package will include water storage and fire suppression equipment. A safety manual which addresses fire safety and suppression will be on site.

Site Security. The well drilling is a 24/7 operation. The onsite personnel and supervision will provide security vigilance.

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Typical Drill Rig Specifications

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| <u>Drilling Range:</u> | 20,000' with 5" Drillpipe. |
| <u>Drawworks:</u> | National 1320 UE 2,000 H.P. Driven by (2)-1,000 H.P. General Electric 752 DC Traction Motors With a Baylor 7838 Electric Brake and Electrical Control Panel. |
| <u>Mast:</u> | DSI 142' High, Rated at 1,200,000# GNC and 1,300,000# Static Hook Capacity. |
| <u>Substructure:</u> | DSI 30' High With 1,800,000# Capacity. |
| <u>Mud Pump #1:</u> | National 12-P-160, 6-1/2"x10", 1,600 H.P., Powered by (2)-1,000 H.P. General Electric 752 Traction Motors Charged by (1)6x8 Centrifugal Pump. |
| <u>Mud Pump #2:</u> | National 12-P-160, 6-1/2"x10", 1,600 H.P., Powered by (2)-1,000 H.P. General Electric 752 Traction Motors Charged by (1)-6x8 Centrifugal Pump. |
| <u>Rotary Table:</u> | Oilwell 27-1/2" Independently Powered by (1)-1,000 H.P. General Electric 752 Traction Motor |
| <u>Traveling System:</u> | Continental Emsco 7 Sheave, 750 Ton Block/BJ Dynaplex 750 ton Hook and Oilwell PC 650 Swivel. |
| <u>SCR/Power System:</u> | (3)-Detroit Diesel, 16V2000 (1,495 BHP Each) Diesel Engines Driving (3)-Marathon 1,357 KW Generators Ross Hill Electric 3 Bridge SCR Unit and G.E. Electrical Control Unit. |
| <u>Mud System:</u> | (3)-Pit System, 1,400 Total Barrels, With Shaker, Volume, Mud Cleaning, Suction and Pill Mixing Compartments, (6)-Mud Agitators, and (2)-5x6 Centrifugal Pumps. |
| <u>Blow Out Prevention Equipment:</u> | Hydril GK 13-5/8", 5,000# Annular, Shaffer 13-5/8", 5,000# D-Ram, Koomey 160 Gallon Accumulator and 5,000# Choke Manifold. |
| <u>Water/Fuel Storage:</u> | 400 BBLS / 21,000 Gallons. |
| <u>Auxiliary Equipment:</u> | (2)-Air Winches, Wireline Unit (.092"), (2)-Air compressors, Upper & |