CONSTRUCTION DETAILS
40 CFR 146.86

Facility Information

Facility Name: Pelican Renewables, LLC
Well Names: Rindge Tract CCS Well #1
Rindge Tract CCS Well #2

Facility Contact: John Zuckerman, Pelican Renewables – Managing Member
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Well Locations: Rindge Tract Island, San Joaquin County, California
38.021507, -121.428926 (Well #1)
38.014567, -121.415405 (Well #2)

Introduction

The construction details for the injection and monitoring wells are described herein. Pelican Renewables, LLC (Pelican) proposes constructing two new injection wells for the permanent sequestration of supercritical carbon dioxide (CO_2), Rindge Tract CCS Well #1 and Rindge Tract CCS Well #2. Pelican will ensure that the injection wells are constructed and completed to prevent the movement of fluids into or between USDWs or unauthorized zones. Also, the wells' construction will allow the use of appropriate testing devices and workover tools and continuous monitoring of the annulus space between the injection tubing and the long string casing.

In addition to the injection wells, Pelican will construct twelve monitoring wells on Rindge Tract Island: three in-zone monitoring wells (Mokelumne River Formation), six above-zone monitoring wells (Domengine and Markley Formations), and three shallow subsurface monitoring wells (near surface, 150 – 350 ft in depth). These wells will track the injection pressure front and carbon dioxide plume and monitor deep and shallow groundwater (see **Section 08, Testing and Monitoring Plan**, for more information). The monitoring wells will be constructed to prevent the movement of fluids into or between USDW's or other unauthorized zones. They will also be constructed to allow for fluid sampling within the monitoring zone and for the introduction of downhole testing devices and/or workover tools as needed.

After the construction of the injection well and monitoring well drilling pads, a conductor casing will be drilled and set to the specified depth for each well. The injection wells will be set within the Mokelumne River Formation (MRF) and will be drilled and constructed with surface casing and long string casing, and a gravel packed open-hole with slotted liner to total depths below ground surface (BGS) of approximately 6946 ft. (Well #1) and 6880 ft. (Well #2). Surface and long string casings will be cemented to surface. Long string casings will be completed with CO_2-resistant cement from total depth through the confining zone. Conceptual well construction diagrams for the injection wells are provided in **Appendix A**, **Figures 5-1** and **5-2**. Actual depths will depend on site-specific characterization data obtained when drilling the injection wells.

The monitoring wells will be drilled and constructed to depths within the injection zone, above the confining zone, and in the shallow subsurface. The injection zone monitoring wells will be set within the MRF and will be drilled and constructed with surface casing and long string casing to total depths of approximately 7,150 ft BGS (GMW-1Z), 6,975 ft BGS (GMW-2Z), and 6,825 ft BGS (GMW-3Z). The surface and long string casings will be cemented to surface. Long string casing will be completed with CO_2-resistant cement from total depth through the confining zone. Conceptual well construction diagrams for the injection zone monitoring wells are provided in **Appendix A**, **Figures 5-3, 5-4**, and **5-5**.

Monitoring wells drilled and constructed above the confining zone will be set within the Domengine and Markley Formations. The groundwater monitoring wells set within the Domengine Formation (GMW-1D, GMW-2D, & GMW-3D) will be drilled and constructed with surface casing and long string casing to total depths of approximately 5,000 ft BGS. Surface and long string casings will be cemented to surface. The long string casing will be completed with CO_2-resistant cement from total depth to approximately 4,200 ft BGS. The groundwater monitoring wells set within the Markley Formation (GMW-1M, GMW-2M, & GMW-3M) will be drilled and constructed with surface casing and long string casing to total depths of approximately 4,150 ft BGS. The surface and long string casings will be cemented to surface. Conceptual well construction diagrams for the Domengine and Markley Formation monitoring wells are provided in **Appendix A**, **Figures 5-6** and **5-7**.

Groundwater monitoring wells drilled and constructed in the shallow subsurface (GMW-1S, GMW-2S, & GMW-3S) will be set in the principal freshwater aquifer system between 150 ft to 350 ft BGS. These wells will be constructed with a single string of casing and slotted liner and completed with a lower gravel pack, bentonite seal cement, and neat cement to surface. A conceptual well construction diagram for the shallow monitoring wells is provided in **Appendix A**, **Figure 5-8**.

Formation lithology and relative depths are described in **Section 2 – Site Characterization**. Using a temperature gradient of 14°F per 1000 ft., the injection zone bottom hole temperature at 6946 ft BGS (Well #1) is approximately 169°F and at 6880 ft BGS (Well #2) is approximately 168°F. The following subsections include information on construction procedures, casing cementing specifications, tubing and packer program, annulus fluid, and wellhead.

Injection Well Construction Details

Construction Procedures

During drilling and completion operations, all activities are conducted in compliance with the U.S. Environmental Protection Agency (EPA) as listed in the Class VI Rule 40 CFR 146.86. Drilling fluids will be maintained during all drilling stages to: control bottom hole pressures, support the wellbore and maintain stability, prevent formation influx and seal permeable formations, circulate cuttings away from the drilling bit to the surface, mitigate drilling damage to the targeted reservoir, and to cool the drilling bit and work string. Maintaining proper drilling fluids is important to prevent the movement of fluids into or between USDWs. Mud samples will be analyzed throughout drilling to ensure downhole pressure control. Well control will be maintained at all times through the use and frequent testing of blowout preventers. Care will be taken to prevent or minimize the discharge or spillage of construction-related fluids and debris. All personnel will be trained in proper emergency response, and a response plan will be maintained onsite. All drilling and completion activities will be annotated on daily drilling reports.

The following general construction procedures will be used in construction and completion of the injection wells. **Section 6 - Pre-Operational Logging and Testing** contains information on deviation surveys, formation samples, logs and tests to be conducted during drilling and before the operation of the injection well.

Prepare the location. Survey the well pads; provide notification of subsurface work to local underground utility location authority; conduct earthwork grading to level the location and construction well pad mats; drive conductor casing; excavate and board cellar; lay down containment where rig substructure will be placed.

Mobilize in and rig up. Set rig substructure and rig appurtenances; raise derrick and install remaining equipment; mix spud fluids; make ready to drill surface hole.

Drill and complete surface hole. Commence drilling a surface hole from surface to casing set depth; conduct deviation (1 degree or less) surveys; conduct logging; run casing with centralizers; cement casing with approximately 25% excess; wait on cement; run cement bond log.

Drill and complete production hole. Drill out surface casing float shoe; drill to core point; conduct straight hole surveys; run core barrels and bit to core confining interval; drill to core point; conduct straight hole surveys; run core barrels and bit to core injection interval; drill to total depth; condition hole; conduct logging; run casing with centralizers and strapped fiber optic monitoring system; cement casing with approximately 25% excess; wait on cement; pressure test casing; run cement bond log.

Drill and complete open-hole. Drill out long string casing float shoe and drill to open hole total depth; perform borehole cleanout and displace drilling fluid; set sump packer below the desired injection interval; run in hole with the slotted liner and seal bore packer; set packer and proceed with gravel packing operations.

Install injection tubing. Run in hole with injection tubing and displace annular fluids with treated fresh water; stab tubing into seal bore packer; pack off tubing in the surface head; top off annulus with treated fresh water; pressure test annulus.

Rig down and demobilize. Rig down; off-rent equipment; demobilize; restore location.

Pre-operational testing. Set wellhead; pressure test wellhead; conduct reservoir testing; test fiber optic monitoring system.

Proposed pilot hole depths and diameters are provided in **Table 5-1**.

Table 5-1. Injection Well Open Hole Diameters & Intervals

Name	Depth Interval (feet BGS)	Open Hole Diameter (inches)	Comment
Rindge Tract CCS Well #1			
Conductor	0 - 80	24	Drilled to bedrock or hardground
Surface	0 - 4,200	17.5	Drilled to shale below lowermost USDW
Long-string	0 - 5,496	12.25	Drilled to top of injection zone
Open-hole	5,496 – 6,946	7.875	Drilled to base of injection zone
Rindge Tract CCS Well #2			
Conductor	0 - 80	24	Drilled to bedrock or hardground
Surface	0 - 4,200	17.5	Drilled to shale below lowermost USDW
Long-string	0 - 6,400	12.25	Drilled to top of injection zone
Open-hole	6,400 – 6,880	7.875	Drilled to base of injection zone

The operational injection schedule is presented in **Table 5-2**.

Table 5-2. Injection Schedule

Years	Injection Interval (Cretaceous Sand Identifier)	Volume (metric tons per year)
Rindge Tract CCS Well #1		
20	Mokelumne River Formation	1,250,000
Rindge Tract CCS Well #2		
20	Mokelumne River Formation	750,000

Casing & Cementing

As specified in 40 CFR 146.86(b), casing and cement or other materials used in the construction of the injection wells will have sufficient structural strength and be designed for the life of the geologic sequestration project. All well materials, including casing, cement, tubing and packer will be compatible with fluids with which the materials may be expected to come into contact and will meet or exceed standards developed for such materials by the American Petroleum Institute (API), American Society for Testing and Materials (ASTM) International, or comparable standards.

Casing centralizers will be used on the surface and long string casings to ensure sufficient cement bond to the borehole and casing. Float shoes will be run on the lowermost joint of the surface and long string casings. Surface casing will extend through the base of the lowermost USDW and will be cemented to surface. The long string casing will extend into the injection zone and will be cemented to surface.

Cementing will occur in stages so that CO_2 resistant non-corrosive cement blends, such as Halliburton's CorrosaCem Cement System (or functional equiv.), will be uniformly placed from total depth through the confining zone. Functional equivalent (equiv.) means the material would also meet the required protection standards in terms of corrosion resistance and all other relevant properties in lieu of the currently referenced material. If cement returns are not observed at the surface, remedial cementing techniques will be used to ensure sufficient bond. Cement and cement additives will be compatible with the carbon dioxide stream and formation fluids from total depth through the confining zone and of sufficient quality and quantity to maintain integrity over the design life of the geologic sequestration project. The casing and cementing program are designed to prevent movement of fluids into or between USDWs. The location and integrity of the surface and long string casing cement will be verified with a cement bond log (CBL), radial bond log (RBL), or ultrasonic imaging tool (USIT).

Halliburton's CorrosaCem Cement System is a reduced Portland cement solution for corrosive CO_2 environments. From Halliburton's CorrosaCem Cement System Data Sheet (2024), "CorrosaCem cement system is designed to minimize components that readily react with CO_2. Supplementary cementitious materials, that do not react with CO_2, replace the Portland cement in the system. This feature enhances the CO_2 corrosion resistance of the system. The modification of the blend with other additives lowers the permeability of the system, which mitigates the potential for CO_2 to penetrate the cement matrix. Elastomers and fibers enhance the system's elasticity to provide a more ductile barrier. This enables a more crack-resistant system to help withstand downhole forces during cyclic injection compared to conventional Portland systems."

The conceptual casing program is provided in **Table 5-3**, and the conceptual cementing program is provided in **Table 5-4**.

Table 5-3. Injection Well Casing Program

Casing [1]	Depth Interval (feet BGS)	Outside Diameter (inches)	Inside/Drift Diameter (inches)	Weight (lbs/ft)	Grade (API)	Design Coupling	Burst Strength (psi)	Collapse Strength (psi)
Conductor	0 - 80	20	19.124/18.936	94	J-55	STC	520	2,110
Surface	0-4,200	13.375	12.415/12.259	68	HCL-80	STC	5,020	2,910
Rindge Tract CCS Well #1								
Long-string	0 - 3,296	8.625	7.921/7.796	36	HCL-80, gas tight threads	LTC	6,490	6,060
Long-string	3,296 - 5,496	8.625	7.921/7.796	36	25 Cr-110 (or functional equiv.)	Premium	6,490	6,060
Rindge Tract CCS Well #2								
Long-string	0 - 3,230	8.625	7.921/7.796	36	HCL-80, gas tight threads	LTC	6,490	6,060
Long-string	3,230 - 6,400	8.625	7.921/7.796	36	25 Cr-110 (or functional equiv.)	Premium	6,490	6,060

(1) Conceptual casing program may be revised based on products available at the time of completion

Table 5-4. Injection Well Cementing Program

Casing	Casing Depth Interval (feet BGS)	Borehole Diameter (inches)	Casing Outside Diameter (inches)	Cement Interval (feet)	Cement [1][2]
Conductor	0 - 80	24	20	0 - 80	Using a water well driller, drill 24" hole to 80' from surface, run 20" conductor and fill outside of the casing with ~200 cf of concrete.
Surface	0-4,200	17.5	13.375	0 - 4,200	1660 sacks of Class G cement premixed with 6% gel and 3% NaCl, (yield 1.71, weight 13.6 ppg), followed with 760 sacks of Class G cement with 2% CaC12, 0.75% Halad-322, 0.2% Halad-344, and 0.15% Super CBL (Yield 1.15, Ramp up slurry weight from 15.8 to 16.2 ppg). 25% excess.
Rindge Tract CCS Well #1					
Long-string	0 - 4,100	12.25	8.625	0 – 4,100	1050 sacks of Class G cement premixed with 6% gel and 3% NaCl, (yield 1.71, weight 13.6 ppg), followed with 610 sacks of Halliburton type CorrosaCem CO2 resistant cement mix (or functional equiv.) (Yield 1.20, Weight 15.8 ppg). 25% excess cement in open-hole only (top of CO_2 resistant cement is estimated at 4100'-).
Long-string	4,100 - 5,496	12.25	8.625	4,100 - 5,496	
Rindge Tract CCS Well #2					
Long-string	0 - 4,100	12.25	8.625	0 – 4,100	1050 sacks of Class G cement premixed with 6% gel and 3% NaCl, (yield 1.71, weight 13.6 ppg), followed with 1000 sacks of Halliburton type CorrosaCem CO_2 resistant cement mix (or functional equiv.) (Yield 1.20, Weight 15.8 ppg). 25% excess cement in open-hole only (top of Co2 resistant cement is estimated at 4100'-).
Long-string	4,100 – 6,400	12.25	8.625	4,100 – 6,400	

(1) Conceptual cement program may be revised based on similar products available at completion

(2) Cement calculations are estimates and include 25% - 100% excess

Tubing & Packer

Supercritical carbon dioxide will be injected into the well through tubing, packer, and a gravel-packed slotted liner that are comprised of corrosion resistant materials. The CO_2 stream will originate from a Pelican-controlled facility.

The CO_2 stream will be transported from the facilities to the injection well in a supercritical state. The anticipated liquid CO_2 stream composition is characterized in **Table 5-5**.

Table 5-5. Chemical Composition of Liquid CO_2 Stream

Component	Composition by Volume (Maximum or Minimum)	
Carbon Dioxide (CO_2) 99.0%	Min	
Air	0.8%	Max
Ethanol (C_2H_6O)	100 ppm	Max
Methanol (CH_3OH)	100 ppm	Max
Other Alcohols	10 ppm	Max
Acetaldehyde (CH_3CHO)	100 ppm	Max
Ethyl Acetate ($C_4H_8O_2$)	80 ppm	Max
Acetic Acid (CH_3COOH)	10 ppm	Max
Nitric Oxide (NOx)	2 ppm	Max
Nitrogen Dioxide (NO_2)	2 ppm	Max
Hydrogen Sulfide (H_2S)	15 ppm	Max
Other Sulfurs	2 ppm	Max
Methane (CH_4)	20 ppm	Max
Acetone $(CH_3)_2CO$	20 ppm	Max
Others	none	Max

Tubing and packer materials used in the construction of the injection well will be compatible with fluids with which the materials may be expected to come into contact. These materials and/or coatings will meet or exceed standards developed by API, ASTM International, or comparable standards.

A packer will be placed at the terminus of the injection tubing and isolate the annulus from the injection zone for continuous monitoring for tubing and packer leaks, as described in **Section 8 – Testing and Monitoring**. The packer will be installed inside the long string casing near the top of the injection interval.

The tubing will stab into a seal bore packer, AS-1X mechanical packer (or equivalent). The packer will be manufactured or plated with corrosion resistant materials and will be rated with a minimum

7,000 psi differential, which exceeds the anticipated differential during installation, workovers, and injection.

Specifications for the conceptual tubing and packer design are provided in **Tables 5-6** and **5-7** below.

Table 5-6. Injection Well Tubing Specifications (1)

Name	Depth Interval (feet BGS)	Outside Diameter (inches)	Inside/Drift Diameter (inches)	Weight (lbs/ft)	Grade (API)	Design Coupling	Axial Load lbs (in air)	Tensile Strength (MPa)	Yield Strength (MPa)	Burst Strength (psi)	Collapse Strength (psi)
Rindge Tract CCS Well #1											
Injection tubing	5,396	5.500	4.892/4.767	17	25 Cr-110 (or functional equiv.)	Premium	91,732	862	758 - 965	10,640	7,478
Slotted Liner	5,396 – 6,946	5.500	4.892/4.767	17	25 Cr-110 (or functional equiv.)	LTC	26.350	655	552 - 655	N/A	1,500
Rindge Tract CCS Well #2											
Injection tubing	6,300	5.500	4.892	17	25 Cr-110 (or functional equiv.)	Premium	107,100	862	758 - 965	10,640	7,478
Slotted Liner	6,300 – 6,880	5.500	4.892/4.767	17	25 Cr-110 (or functional equiv.)	LTC	9,860	655	552 - 655	N/A	1,500

(1) Conceptual tubing program may be revised based on similar products available at the time of completion

Table 5-7. Injection Well Packer Specifications (1)

Packer Type and Material	Packer Setting Depth (feet BGS)	Length (inches)	Packer Main Body Outer Diameter (inches)	Packer Inner Diameter (inches)
Rindge Tract CCS Well #1				
Baker Hughes Removable CRA Premier Packer (25Cr or functional equiv.).	5,396	98	7.921	5.5
Rindge Tract CCS Well #2				
Baker Hughes Removable CRA Premier Packer (25Cr or functional equiv.).	6,300	98	7.921	5.5

(1) Conceptual packer program may be revised based on similar products available at the time of completion

Annulus Fluid

The annular space above the packer between the long string casing and injection tubing will be filled with fluids to provide structural support for the injection tubing and continuous monitoring of internal mechanical integrity. If required, fluid pressure measured at the surface within the annulus will be maintained to exceed the maximum injection pressure within the injection tube at the elevation of the injection zone. This pressure differential (surface) will not exceed a value that is more than 200 psi greater than the injection pressure at the surface. For Well #1, assuming packer placement at a measured depth of 5,396 ft., the volume of the annular space will be approximately 15,325 gallons and for Well #2, assuming packer placement at a measured depth of 6,300 ft., the volume of the annular space will be approximately 15,138 gallons.

The annulus fluid will be freshwater with a corrosion inhibitor, biocide and an oxygen scavenger. Depending on final selection of tubing, long string and packer materials, the annulus may include a dilute salt solution such as potassium chloride (KCl), sodium chloride (NaCl), calcium chloride ($CaCl_2$), or similar solutions. The fluid will be mixed onsite using freshwater or it will be acquired pre-mixed. The fluid will also be filtered to ensure that solids do not interfere with the packer or other components of the annulus monitoring system.

Alarms & Shut-off Devices

As described in *Continuous Recording of Operational Parameters* (**Attachment 08, Testing and Monitoring Plan**), the injection wells will be configured with real-time monitoring gauges that will track injection pressure, injection rate, injection volume, CO_2 stream temperature, and annular pressure. The monitoring gauges will be incorporated into a Supervisory Control and Data Acquisition (SCADA) system, which will remotely monitor and transmit operational data to a Central Control Facility (CCF). The SCADA system will be connected to a series of alarms and an injection well Surface Safety Valve (SSV). When an alarm is triggered, the SCADA system will 1) send out an automatic alert to the Central Control Facility, and 2) automatically activate the emergency SSV and shut-in the well if annulus pressure, injection pressure, injection rate, or CO_2 stream temperature thresholds are exceeded. The thresholds for these parameters are provided in **Attachment 07, Class VI Operating and Reporting Conditions, Table 7-1**.

As noted, an SSV will be incorporated into the wellhead at each injection well. The SSV will be incorporated into the SCADA system and will be configured to operate both remotely and automatically. The remote configuration will allow the Central Control Facility to respond to emergencies and shut-in the well as needed. The automatic configuration will instantly trigger the SSV and effectively shut-in the well if tubing and/or annulus alarm thresholds are exceeded. If an SSV is automatically triggered, an emergency and remedial response action will be initiated as delineated in **Attachment 11, Emergency and Remedial Response Plan, Table 11-3**.

Wellhead

The wellhead and Christmas tree will be composed of materials compatible with the injection fluid to minimize corrosion. In general, all components that come into contact with the CO_2 injection fluid will be made of a corrosion-resistant alloy such as stainless steel. Because the CO_2 injection fluid will be very dry, use of stainless-steel components for the flow-wetted components is a conservative measure to minimize corrosion and increase the life expectancy of this equipment. Materials that will not have contact with the injection fluid will be manufactured of carbon steel.

All materials will comply with the API Specification 6A – Specification for Wellhead and Christmas Tree Equipment.

Demonstration of Well Material Compatibility

Well construction material compatibility with the injectate, formation brine, and interactions thereof was evaluated using the corrosion modeling capabilities within the OLI Systems software. Corrosion rates and localized pitting potential was calculated for the indicated grade of corrosion resistant alloy (CRA) (L-80 Pipe with Chrome 25, **Attachment G – Construction Details**). The corrosion models were parameterized with representative compositions of the CO_2 injectate and formation brines under the worst-case scenarios of downhole temperature and pressure (169 °F and 4,489 psi as specified in Section 2 – Site Characterization and Table 1 of the Class VI Operating and Reporting Conditions). Details of the CO_2 injectate and formation brine compositions are included below. All calculation summaries for steel alloy corrosion in OLI Systems with the run parameters are included in **Attachment B**.

The planned CO_2 composition used to evaluate corrosion compatibility is described in **Table 5-5** as the maximum anticipated concentration. CO_2 content is anticipated to be 99% by volume or greater. The anticipated water content of the stream is below the water saturation limit and acid dropout phases from CO_2 stream are not a concern for corrosion at wellhead conditions or injection temperatures and pressures. Of the impurities listed in the CO_2 injectate, nitric oxide compounds (NOx, 2 ppm), hydrogen sulfide (H2S, 15 ppm), and other sulfurs (modeled as SO_2, 2 ppm) are the principal concerns for adding to the corrosive environment. Upon mixing with an aqueous phase, acid-forming components including CO_2, SO_2, NO_2, H_2S can partition between the supercritical and aqueous phases and create an acidic aqueous environment in which corrosion may be favored. Ionic species such as SO_2 and H_2S can also further contribute to increasing corrosion rates through reactions such as sulfide stress cracking (SSC) on alloy surfaces.

Brine compositions for wells in the vicinity of the Rindge Tract CCS and from formations adjacent to the Mokelumne River Formation are represented in **Table 2-7** of the **Class VI Permit Application Narrative**. For the corrosion compatibility evaluation, maximum values for the listed constituent were used to represent a worst-case scenario for corrosion. Charge balance was maintained in the model by adjusting the dominant ion (e.g., Na+). Maximum chloride concentrations, which directly impact corrosion rates, are parameterized at 12,400 mg/L for the corrosion models.

Four scenarios at the downhole conditions were evaluated in the corrosion models, reflecting different operational and post injection site care (PISC) timelines. As corrosion rates generally increase with temperature and pressure, these four scenarios were evaluated at the worst-case scenarios for downhole temperature and pressure as conservative models.

1. Installation – compatibility with formation brine
2. Injection – compatibility with a mixture of mostly CO_2 injectate combined with a small amount of formation brine (90% injectate/10% brine by volume)
3. Flowback – compatibility with a 50% injectate/50% brine mixture by volume
4. Plume Arrival to In-zone Observation (IOB) wells – compatibility with a 10% injectate/90% brine mixture by volume

For each scenario (except installation), the CO_2 injectate is mixed with the specified volumetric ratio with the formation brine. The installation scenario reflects only the presence of the formation brine, prior to injection commencement. In the OLI model, the thermodynamic framework based on mixed solvent electrolyte theory and the Soave-Redlich-Kwong (SRK) equation of state is used to predict the phase distribution between the supercritical CO_2 injectate phase and the formation brine. These equilibrations yield a corrosive environment that can be evaluated in contact with corrosion resistant alloys (CRA), in this case, 25Cr steel. Corrosion rates (mm/yr) are calculated in the software as are localized pitting corrosion potentials based on the polarization curve.

These corrosion rates can then be applied and evaluated over the project timeframes to estimate total material loss to corrosion. A conservative value of <10% of material loss based on the specified wall thickness and no localized pitting potential was used as a baseline for material compatibility. This value was chosen as a conservative estimate to ensure the strength integrity of the tubing based on generalized corrosion allowances surveyed in the literature. The injection tubing is specified as 5.5-in17lb/ft tubulars with a nominal wall thickness of 0.304 inches. Thus, a 10% material loss would result in a corrosion allowance of no more than 0.0304 inches. As the injection tubing is the smallest tubing size specified in the well construction, it is assumed that any corrosion rate that satisfies the <10% material loss for the injection tubing will be suitable also for any long-string or other tubing.

Calculated corrosion rates and pH values for 25Cr steel are presented in **Table 5-8**. Corrosion rates vary from 1.82×10^{-5} in/yr to 2.57×10^{-5} in/yr, with the highest corrosion rates occurring under the scenario of the active CO_2 injection. No localized pitting was predicted under any conditions. For the duration of the 20-year injection period, these corrosion rates correspond to material losses of 0.0004 to 0.0005 in. Including a 50-year PISC period (70 years total from start of injection), material losses are predicted to range from 0.0013 to 0.0018 in.

Table 5-8. Modeled Corrosion Rates for 25Cr Steel

	Injection Scenario (Injectate:Brine Volume Ratio)			
	Installation (0 Inj: 1 Brine) 169 °F | 4,489 psia	Injection (9 Inj: 1 Brine) 169 °F | 4,489 psia	Flowback (1 Inj: 1 Brine) 169 °F | 4,489 psia	IOB Plume Arrival (1 Inj: 9 Brine) 169 °F | 4,489 psia
	25Cr			
Corrosion rate, in/yr	1.82E-05	2.57E-05	2.56E-05	2.51E-05
pH	6.71	4.19	4.19	4.19
Material Loss, in:				
after 10 yrs	0.0004	0.0005	0.0005	0.0005
after 70 yrs	0.0013	0.0018	0.0018	0.0018

These material losses, which reflect worst-case, conservative estimates for operational conditions, are well below the 0.0304-inch threshold defined above and thus, 25Cr is evaluated as suitable to all conditions and usages.

Monitoring Well Construction Details

Construction Procedures

During drilling and construction operations, all activities will be conducted in compliance with the U.S. Environmental Protection Agency (EPA) as listed in the Class VI Rule 40 CFR 146.86 and 146.90. Drilling fluids will be maintained during all drilling stages to: control bottom hole pressures, support the wellbore and maintain stability, prevent formation influx and seal permeable formations, circulate cuttings away from the drilling bit to the surface, mitigate drilling damage to the targeted reservoir, and to cool the drilling bit and work string. Maintaining proper drilling fluids is important to prevent the movement of fluids into or between USDWs. Mud samples will be analyzed throughout drilling to ensure downhole pressure control. Well control will be maintained at all times through the use and frequent testing of blowout preventers. Care will be taken to prevent or minimize the discharge or spillage of construction-related fluids and debris. All personnel will be trained in proper emergency response, and a response plan will be maintained onsite. All drilling and construction activities will be annotated on daily drilling reports.

The following general construction procedures will be used in the drilling and construction of the monitoring wells.

Prepare the location. Survey the well pads; provide notification of subsurface work to local underground utility location authority; conduct earthwork grading to level the location and install construction well pad mats; drive conductor casing; excavate and board cellar; lay down containment where rig substructure will be placed.

Mobilize in and rig up. Set rig substructure and rig appurtenances; raise derrick and install remaining equipment; mix spud fluids; make ready to drill surface hole.

Drill and complete surface hole. Commence drilling surface hole from surface to casing set depth; conduct deviation (1 degree or less) surveys; conduct logging; run casing with centralizers; cement casing with approximately 25% excess; wait on cement; run cement bond log. (Applies to monitoring wells drilled and set in the Mokelumne, Domengine, and Markley Formations)

Drill and complete production hole. Drill out surface casing float shoe; drill to core point; conduct straight hole surveys; run core barrels and bit to core confining interval; drill to core point; conduct straight hole surveys; run core barrels and bit to core injection interval; drill to total depth; condition hole; conduct logging; run casing with centralizers, strapped fiber optic monitoring system, and fluid sampling system; cement casing with approximately 25% excess; wait on cement; pressure test casing; run cement bond log; displace and/or swab the casing of unwanted fluids; fill casing with freshwater and corrosion inhibitor and top off as needed; seal casing at surface. (Applies to wells drilled and set in the Mokelumne, Domengine, and Markley Formations)

Rig down and demobilize. Rig down; off-rent equipment; demobilize; restore location.

Pre-operational testing. Set surface equipment, test fiber optic monitoring system and fluid sampling system.

Proposed monitoring well borehole depths and diameters are provided in **Table 5-9**.

Table 5-9. Monitoring Well Open Hole Diameters & Intervals

Name	Depth Interval (feet BGS)	Open Hole Diameter (inches)	Comment
MRF Monitoring Well #1 (GMW-1Z)			
Conductor	80	17.5	Drilled to bedrock or hardground
Surface	4,200	12.25	Drilled to shale below the lowermost USDW
Long-string	7,150	8.75	Drilled to base of the Mokelumne Formation
MRF Monitoring Well #2 (GMW-2Z)			
Conductor	80	17.5	Drilled to bedrock or hardground
Surface	4,000	12.25	Drilled to shale below the lowermost USDW
Long-string	6,975	8.75	Drilled to base of the Mokelumne Formation
MRF Monitoring Well #3 (GMW-3Z)			
Conductor	80	17.5	Drilled to bedrock or hardground
Surface	4,000	12.25	Drilled to shale below the lowermost USDW
Long-string	6,825	8.75	Drilled to base of the Mokelumne Formation
GMW-1D, GMW-2D, & GMW-3D			
Conductor	80	17.5	Drilled to bedrock or hardground
Surface	4,200	12.25	Drilled to shale below the lowermost USDW
Long-string	5,000	8.75	Drilled to base of Domengine Formation
GMW-1M, GMW-2M, & GMW-3M			
Conductor	80	20	Drilled to bedrock or hardground
Surface	420	12.25	Drilled below base of shallow aquifer system
Long-string	4,150	8.75	Drilled to base of Markley Formation
GMW-1S, GMW-2S, & GMW-3S			
Long-string	150 - 350	6	Drilled to shallow zone of principal freshwater

Casing & Cementing

As specified in 40 CFR 146.86(b), casing and cement or other materials used in the construction of the monitoring wells will have sufficient structural strength and be designed for the life of the geologic sequestration project. All well materials, including casing, cement, tubing, and packer will be compatible with fluids with which the materials may be expected to come into contact and will meet or exceed standards developed for such materials by the API, ASTM International, or comparable standards. The casing and cementing program is designed to prevent movement of fluids into or between USDWs.

The following information pertains to the Mokelumne River Formation (GMW-Z), Domengine Formation (GMW-D), and Markley Formation (GMW-M) monitoring wells.

Casing centralizers will be used on surface and long string casings to ensure sufficient cement bond to the borehole and casing. Float shoes will be run on the lowermost joint of the surface and long string casing strings. Surface casing will extend through the base of the lowermost USDW and will be cemented to surface. The long string casing will be set in the desired monitoring zone and cemented to surface.

Cementing will occur in stages so that CO_2 resistant non-corrosive cement blends (e.g., CorrosaCem or functional equiv.) are uniformly placed from total depth through the confining zone (GMW-1Z, GMW-2Z, GMW-3Z monitoring wells), or total depth through the monitoring zone (GMW-1D, GMW-2D, GMW-3D monitoring wells). If cement returns are not observed at the surface, remedial cementing techniques will be used to ensure sufficient bond. Cement and cement additives will be compatible with the carbon dioxide stream and formation fluids and of sufficient quality and quantity to maintain integrity over the design life of the geologic sequestration project. The monitoring well casing program is summarized in **Table 5-10** and the monitoring well cementing program is summarized in **Table 5-11**.

Table 5-10. Monitoring Well Casing Program

Casing (1)	Depth Interval (feet BGS)	Outside Diameter (inches)	Inside/Drift Diameter (inches)	Weight (lbs/ft)	Grade (API)	Design Coupling	Burst Strength (psi)	Collapse Strength (psi)
GMW-1Z (See well schematics for casing set depths for GMW-2Z & GMW-3Z)								
Conductor	0 - 80	13.375	12.615/12.459	54.5	J-55	STC	2,730	1,130
Surface	0 - 4,200	9.625	8.835/8.679	40	J-55	LTC	3,950	2,570
Long-string	0 - 4,000	4.5	4.0/3.875	11.6	J-55	LTC	6,320	5,560
Long-string	4,000 - 7,150	4.5	4.0/3.875	11.6	25Cr-110 (or functional equiv.)	Premium	6,320	5,560
GMW-1D (See well schematics for casing set depths for GMW-2D & GMW-3D)								
Conductor	0 - 80	13.375	12.615/12.459	54.5	J-55	STC	2,730	1,130
Surface	0-4,200	9.625	8.835/8.679	40	J-55	LTC	3,950	2,570
Long-string	0 – 3,500	4.5	4.0/3.875	11.6	J-55	LTC	6,320	5,560
Long-string	3,500 – 5,000	4.5	4.0/3.875	11.6	25Cr-110 (or functional equiv.)	Premium	6,320	5,560
GMW-1M (See well schematics for casing set depths for GMW-2M & GMW-3M)								
Conductor	0 - 80	16	15.01/14.822	84	J-55	STC	2,980	1,410
Surface	0 - 400	9.625	8.921/8.765	36	J-55	STC	3,520	2,020
Long-string	0 – 4,150	4.5	4.0/3.875	11.6	J-55	LTC	6,320	5,560
GMW-1S, GMW-2S, & GMW-3S								
Long string	150 - 350	4.5	4.0	2.1	Schedule 40 PVC	Coupling	220	190

(1) Conceptual casing program may be revised based on products available at the time of completion

Table 5-11. Monitoring Well Cementing Program

Casing	**Casing Depth Interval** (feet BGS)	**Borehole Diameter** (inches)	**Casing Outside Diameter** (inches)	**Cement Interval** (feet)	**Cement** (1)(2)
GMW-1Z (See well schematics for casing set depths for GMW-2Z & GMW-3Z)					
Conductor	0 - 80	17.5	13-3/8	0 - 80	Using a water well driller, drill 24" hole to 80' from surface, run 20" conductor and fill outside of the casing with ~150 cf of concrete
Surface	0 - 4,200	12.25	9.625	0 - 4,200	760 sacks of Class G cement premixed with 6% gel and 3% NaCl, (yield 1.71, weight 13.6 ppg), followed with 340 sacks of Class G cement with 2% CaC12, 0.75% Halad-322, 0.2% Halad-344, and 0.15% SuperCBL (Yield 1.15, Ramp up cement weight from 15.8 to 16.2 ppg). 25% excess.
Long string	0 - 4,000	8.75	4.5	0 – 4,000	750 sacks of Class G cement premixed with 6% gel and 3% NaCl, (yield 1.71, weight 13.6 ppg), followed with 1000 sacks of Halliburton type CorrosaCem CO_2 resistant cement mix (or functional equiv.) (Yield 1.20, Weight 15.8). 25% excess cement in open-hole only (top of CO_2 resistant cement is estimated at 4000'+).
Long string	4,000 – 7,150	8.75	4.5	4,000 – 7,150	
GMW-1D, 2D, 3D (See well schematics for casing set depths for GMW-2D & GMW-3D)					
Conductor	0 - 80	17.5	13-3/8	0 - 80	Using a water well driller, drill 24" hole to 80' from surface, run 20" conductor and fill outside of the casing with ~150 cf of concrete.
Surface	0 - 4,200	12.25	9.625	0 - 4,200	760 sacks of Class G cement premixed with 6% gel and 3% NaCl, (yield 1.71, weight 13.6 ppg), followed with 340 sacks of Class G cement with 2% CaC12, 0.75% Halad-322, 0.2% Halad-344, and 0.15% Super CBL (Yield 1.15, Ramp up cement weight from 15.8 to 16.2 ppg). 25% excess.
Long string	0 – 3,500	8.75	4.5	0 – 3,500	660 sacks of Class G cement premixed with 6% gel and 3% NaCl, (yield 1.71, weight 13.6 ppg), followed with 450 sacks of Halliburton type CorrosaCem CO_2 resistant cement mix (or functional equiv.) (Yield 1.20, Weight 15.8). 25% excess cement in open-hole only (top of CO_2 resistant cement is estimated at 3500'-).
Long string	3,500 – 5,000	8.75	4.5	3,500 – 5,000	
GMW-1M, 2M, 3M (See well schematics for casing set depths for GMW-2M & GMW-3M)					
Conductor	0 – 80	20	16	0 – 80	Using a water well driller, drill 20" hole to 80' from surface, run 16" conductor and fill outside of the casing with ~90 cf of concrete.
Surface	0 – 400	12.25	9.625	0 – 400	120 sacks Class G cement with 6% gel and 2% CaCl2 Lead Cement (13.6 ppg, 1.71 yield) followed with 60 sacks Class G cement premixed with 2% CaCl2 (15.8 ppg, 1.14 yield), 100% excess.
Long string	0 – 4,150	8.75	4.5	0 – 4,150	700 sacks of Class G cement premixed with 6% gel and 3% NaCl, (yield 1.71, weight 13.6 ppg), followed with 340 sacks of Class G cement with 2% CaC12, 0.75% Halad-322, 0.2% Halad-344, and 0.15% Super CBL (Yield 1.15, Ramp up slurry weight from 15.8 to 16.2 ppg). 25% excess.

(1) Conceptual cement program may be revised based on similar products available at completion

(2) Cement calculations are estimates and include 25% - 100% excess

Tubing & Packer

The principal monitoring gauges (fiber-optic cable and fluid sampling system) for the Mokelumne, Domengine, and Markley Formation monitoring wells will be installed on the exterior of the long string casing and cemented in place, therefore tubing and packer are not included in the monitoring well design.

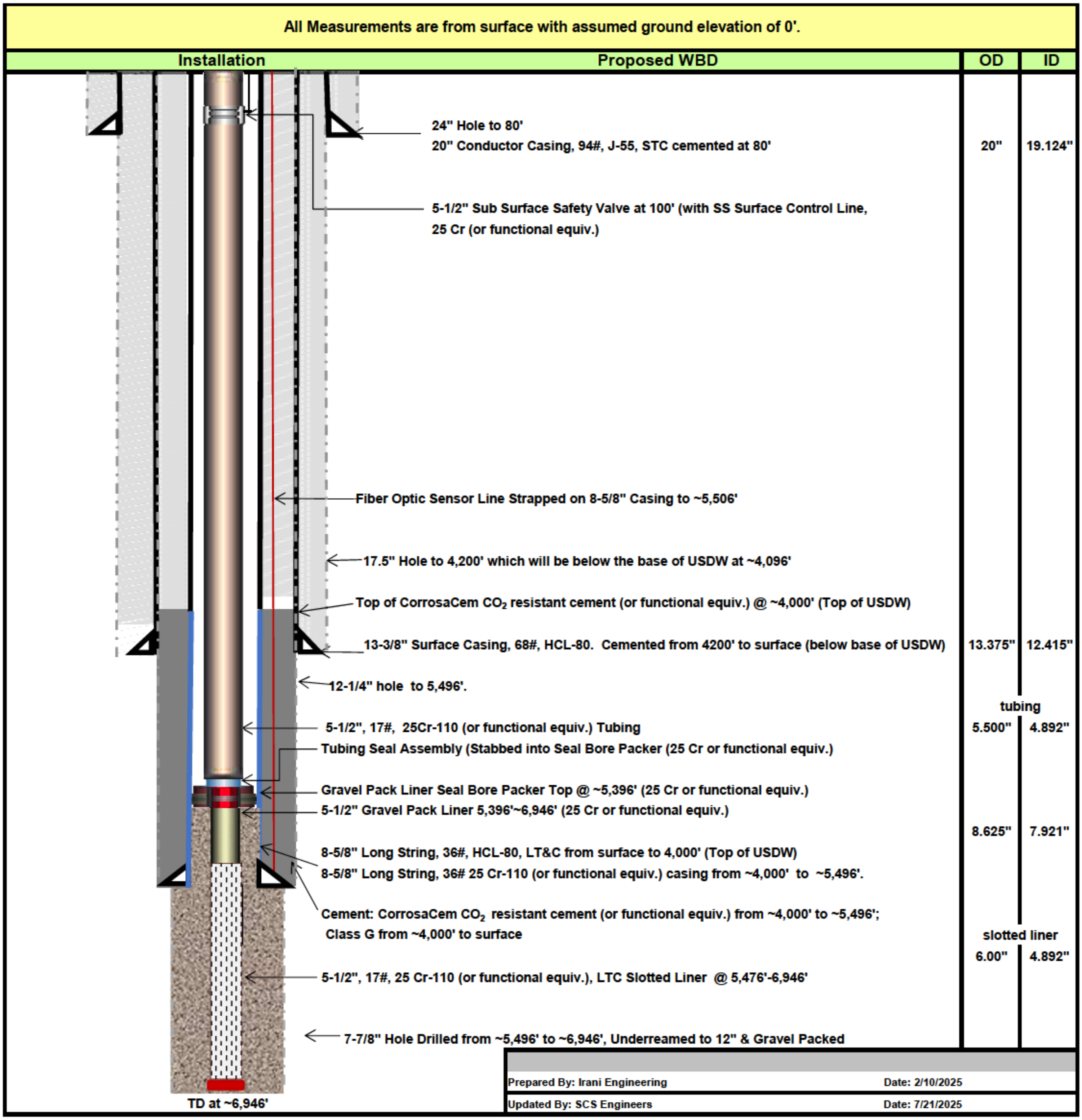
Annulus Fluid

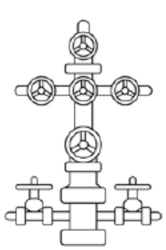
The long string casing for the Mokelumne, Domengine, and Markley Formation monitoring wells will be filled with a mixture of freshwater, corrosion inhibitor, biocide, and oxygen scavenger. The long string casing will be capped at the surface and monitored for fluid and/or pressure fluctuations as needed.

Wellhead

The long string casing will be completed at the surface with a standard wellhead and tree cap. The wellhead and/or tree cap will be fitted with ports to allow for fluid level and pressure monitoring gauges.

APPENDIX A





Surface Equipment

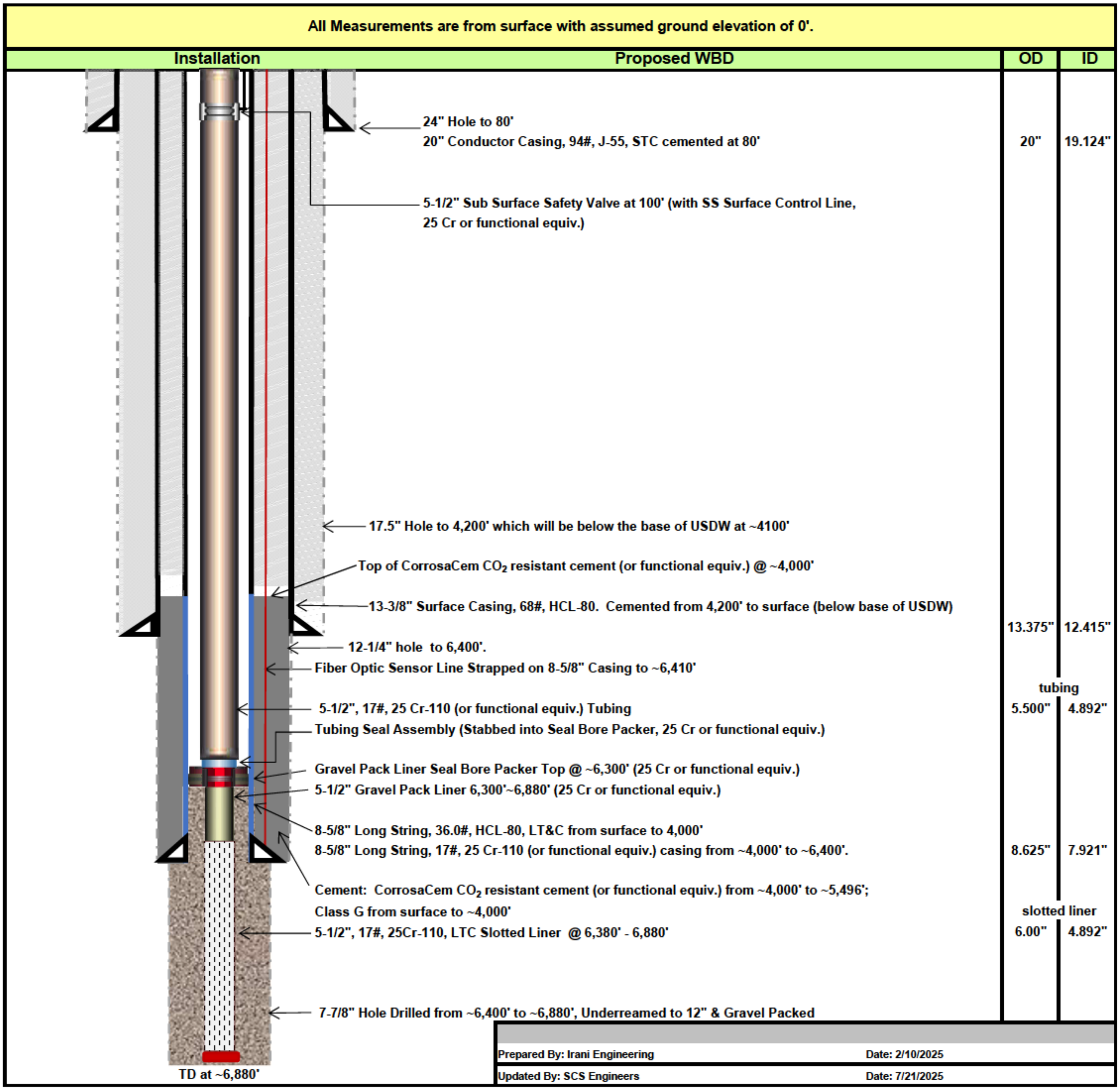
The injection well will be completed at surface with a well head, tree, real-time monitoring devices, alarms, and a Surface Safety Valve (SSV) for automatic shut-off.

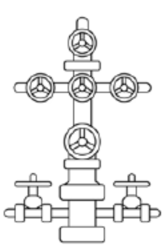
FIGURE 5-1

CONCEPTUAL WELL CONSTRUCTION DIAGRAM
RIDGE TRACT CCS WELL #1
PELICAN RENEWABLES, INC.
SAN JOAQUIN COUNTY, CALIFORNIA

SCS ENGINEERS

Wichita, KS | August 2025





Surface Equipment

The injection well will be completed at surface with a well head, tree, real-time monitoring devices, alarms, and a Surface Safety Valve (SSV) for automatic shut-off.

FIGURE 5-2

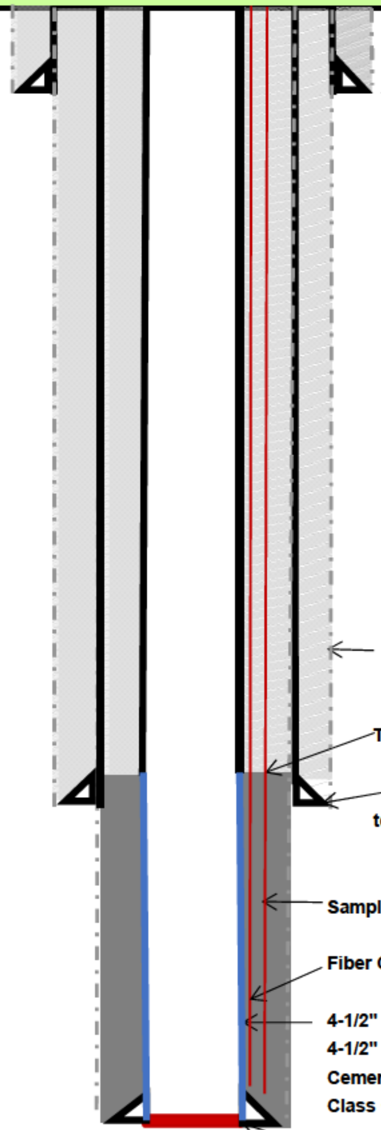
CONCEPTUAL WELL CONSTRUCTION DIAGRAM
RIDGE TRACT CCS WELL #2
PELICAN RENEWABLES, INC.
SAN JOAQUIN COUNTY, CALIFORNIA

SCS ENGINEERS

Wichita, KS	August 2025

All Measurements are from surface with assumed ground elevation of 0'.

Installation



Proposed WBD	OD	ID
17-1/2" Hole to 80', 13-3/8" Conductor Casing, 54.5#, J-55, STC cemented at 80'	13.375"	12.615"
12-1/4" Hole to 4,200' which will be below the base of UDSW at ~4,100'		
Top of CorrosaCem CO_2 resistant cement (or functional equiv.) @ ~4,000'		
9-5/8" Surface Casing, 40#, J-55 LT&C. Casing will be cemented from 4,200' to surface (Below base of the USDW)	9.625"	8.921"
Sampling tube Strapped on 4-1/2" Casing to ~7,150' for collecting fluid samples		
Fiber Optic Sensor Line Strapped on 4-1/2" Casing to ~7,150' for measuring temp & pressure		
4-1/2" Long String, 11.6#, J-55, LT&C casing from surface to ~4,000 4-1/2" Long String, 25 Cr (or functional equiv.) pipe from ~4,000 to ~ 7,150' Cement: CorrosaCem CO_2 resistant cement (or functional equiv.) from ~4,000 to ~7,150', Class G cement from surface to 4,000'	4.500"	4"
8-3/4" hole to ~7,150'.		

Prepared By: Irani Engineering	Date: 2-17- 2025
Updated By: SCS Engineers	Date: 7-21- 2025

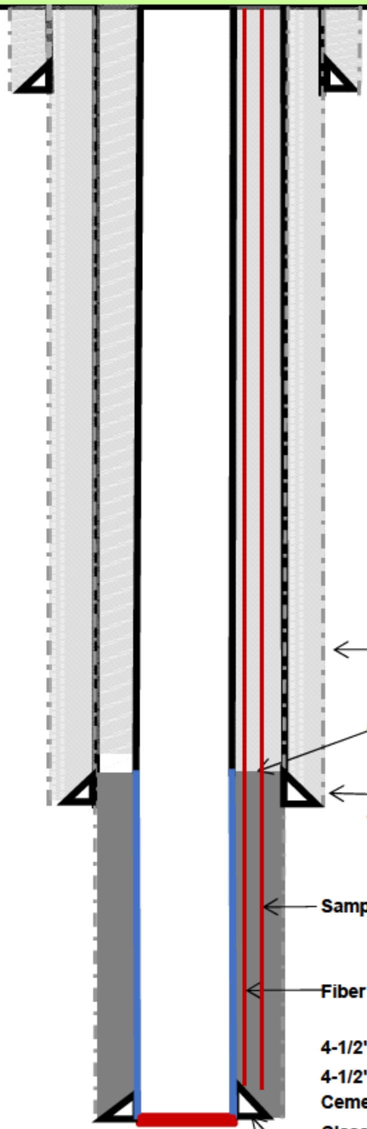
FIGURE 5-3

CONCEPTUAL WELL CONSTRUCTION DIAGRAM
MOKELUMNE RIVER FORMATION MONITORING WELL - PAD #1
PELICAN RENEWABLES, INC.
SAN JOAQUIN COUNTY, CALIFORNIA

SCS ENGINEERS

Wichita, KS | August 2025

All Measurements are from surface with assumed ground elevation of 0'.



Prepared By: Irani Engineering	Date: 2-17- 2025
Updated By: SCS Engineers	Date: 7-21- 2025

FIGURE 5-4
CONCEPTUAL WELL CONSTRUCTION DIAGRAM
MOKELUMNE RIVER FORMATION MONITORING WELL - PAD #2
PELICAN RENEWABLES, INC.
SAN JOAQUIN COUNTY, CALIFORNIA

SCS ENGINEERS

Wichita, KS | August 2025

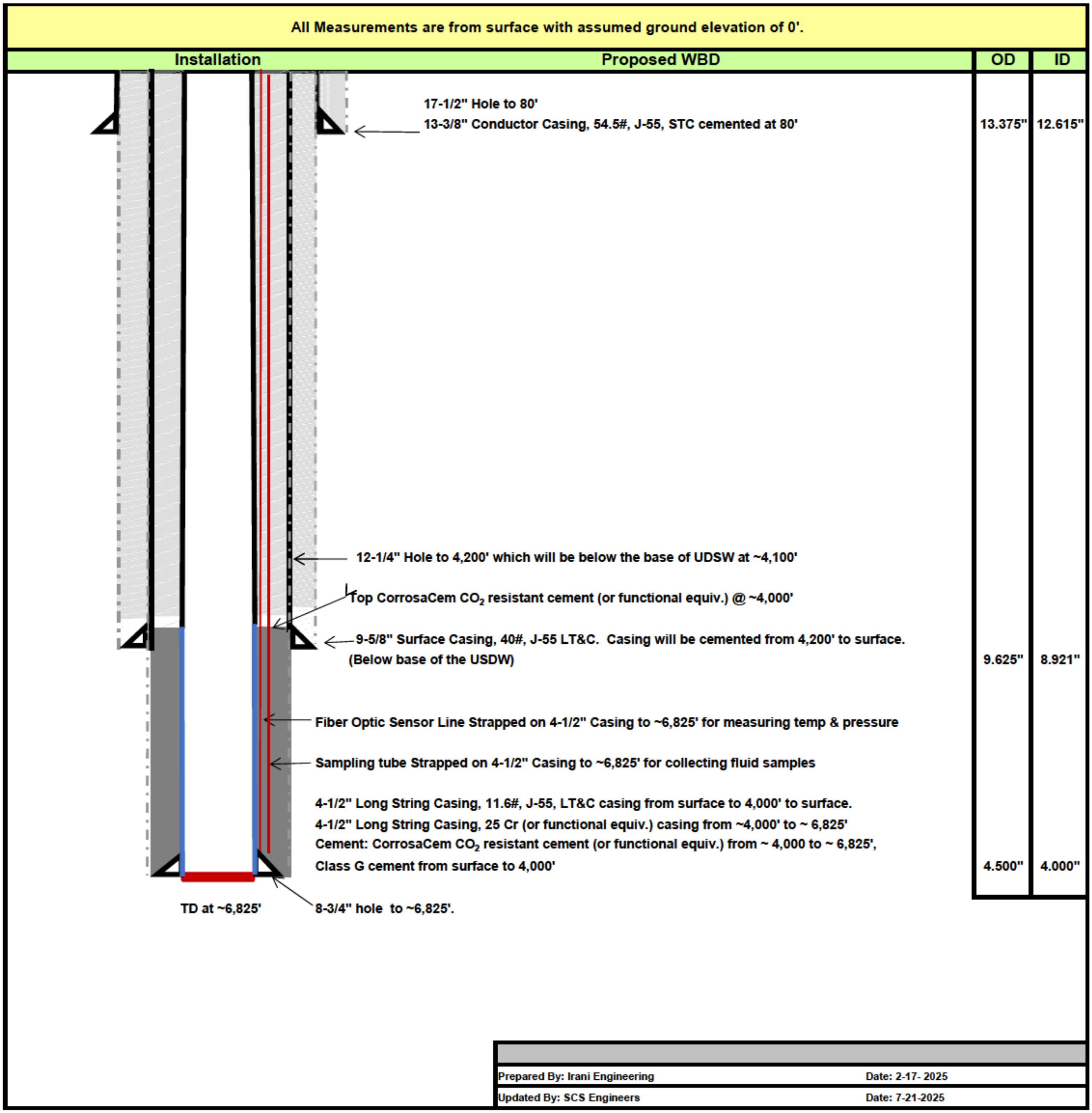


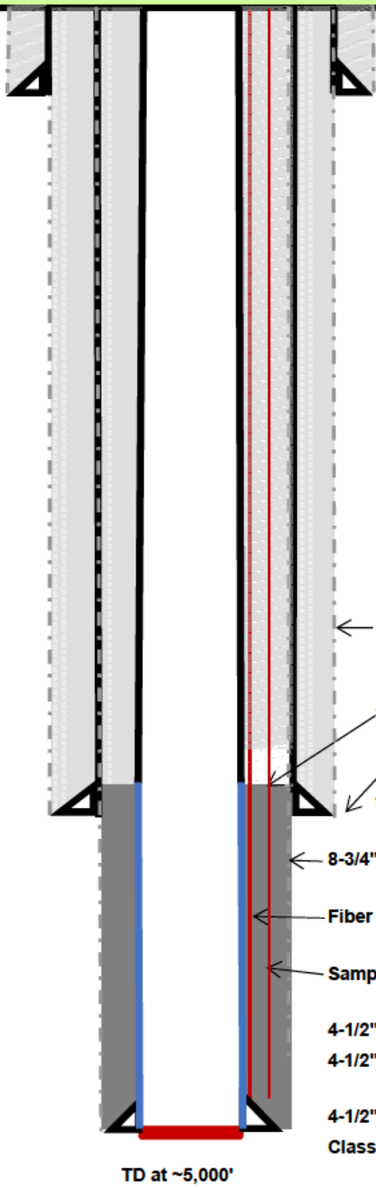
FIGURE 5-5
CONCEPTUAL WELL CONSTRUCTION DIAGRAM
MOKELUMNE RIVER FORMATION MONITORING WELL - PAD #3
PELICAN RENEWABLES, INC.
SAN JOAQUIN COUNTY, CALIFORNIA

SCS ENGINEERS

Wichita, KS	August 2025

All Measurements are from surface with assumed ground elevation of 0'.

Installation



Proposed WBD	OD	ID
17-1/2" Hole to 80', 13-3/8" Conductor Casing , 54.5#, J-55, STC cemented at 80'.	13.375"	12.615"
12-1/4" Hole, which will be below the base of UDSW at ~4,100'		
Top CorrosCem CO_2 resistant cement (or equiv.) @ ~3,500'		
9-5/8" Surface Casing, 40#, J-55 LT&C, cemented from 4,200' to surface.(Below base of the USDW)	9.625"	8.921"
8-3/4" hole to ~5,000'.		
Fiber Optic Sensor Line Strapped on 4-1/2" Casing to ~5,000' for measuring temp & pressure		
Sampling tube Strapped on 4-1/2" Casing to ~5,000' for collecting fluid sample		
4-1/2" Long String Casing, 11.6#, J-55, LT&C casing from surface to 3,500' 4-1/2" Long String Casing, 25 Cr (or functional equiv.) casing from ~3,500 - ~5,000'		
4-1/2" Cementing: CorrosaCem CO_2 resistant cement (or functional equiv.) from 3,500' - 5,000, Class G from surface to 3,500'	4.500"	4"

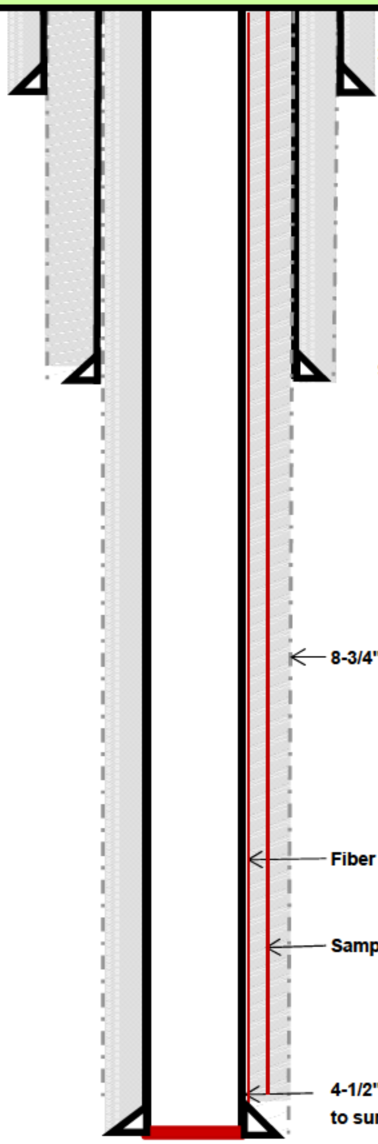
Prepared By: Irani Engineering	Date: 2-13- 2025
Updated By: SCS Engineers	Date: 7-23- 2025

FIGURE 5-6
PROPOSED DOMENGINE
GROUNDWATER MONITORING WELL SCHEMATIC
GMW-1D, GMW-2D, GMW-3D (ALL PADS)
PELICAN RENEWABLES, INC.
SAN JOAQUIN COUNTY, CALIFORNIA

SCS ENGINEERS

Wichita, KS | August 2025

All Measurements are from surface with assumed ground elevation of 0'.



Installation	Proposed WBD	OD	ID
	20" Hole to 80' 16" Conductor Casing cemented at 80'.	16"	
	12-1/4" Hole to 400',		
	9-5/8" Surface Casing - 36#, J-55, ST&C at 400'. Cement to surface.	9.625"	8.921"
	8-3/4" Hole to 4,000' which will be above the base of UDSW at ~4,100'		
	Fiber Optic Sensor Line Strapped on 4-1/2" Casing to ~4,000' for measuring temp & pressure		
	Sampling tube Strapped on 4-1/2" Casing to ~4,000' for collecting fluid samples		
	4-1/2" Long String Casing, 11.6#, J-55, LT&C casing will be cemented to surface with Class G cement.	4.5"	4"

TD at ~4,150' (within the Nortonville)

Prepared By: Irani Engineering	Date: 2/12/2025
Updated By: SCS Engineers	Date: 7/21/2025

FIGURE 5-7

PROPOSED MARKLEY
GROUNDWATER MONITORING WELL SCHEMATIC
GMW-1M, GMW-2M, GMW-3M (ALL PADS)
PELICAN RENEWABLES, INC.
SAN JOAQUIN COUNTY, CALIFORNIA

SCS ENGINEERS

Wichita, KS	August 2025

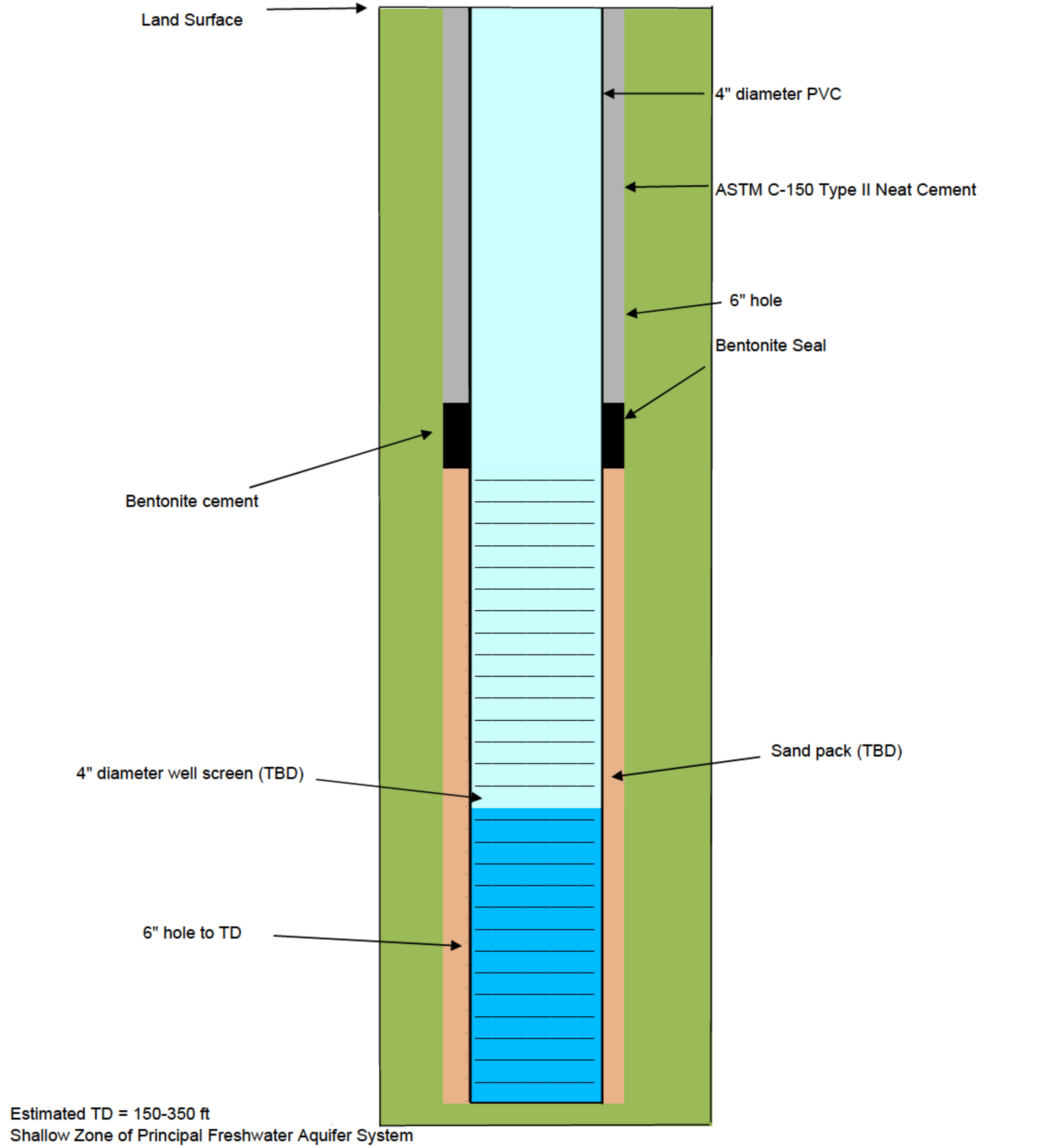


FIGURE 5-8
PROPOSED GROUNDWATER MONITORING WELL SCHEMATIC
GMW-1S, GMW-2S, GMW-3S
PELICAN RENEWABLES, INC.
SAN JOAQUIN COUNTY, CALIFORNIA

SCS ENGINEERS

Wichita, KS	May 2025

APPENDIX B

Calculation Summary
Rates-3 Calculation

Unit Set: Custom

Automatic Chemistry Model
,Aqueous (H+ ion) Databanks:
,,Corrosion (AQ)
,,Aqueous (H+ ion)
,Second Liquid phase
,Redox selected
,Using K-fit Polynomials
,,T-span: 25.0 - 225.0
,,P-span: 1.0 - 1500.0

Single Point
No secondary survey selected

Polarization Curve Range
,Range,,-2.0 to 2.0 V (SHE)
,Step size,0.01 V (SHE)
,No. steps,400

Metal: Stainless steel
,Duplex stainless 2205

Flow Type: Static
Scales included - passivating films included.

Calc. elapsed time: 72.205 sec
,

Stream Inflows
Row Filter Applied: Only Non Zero Values

,Input,Output
Species,mg/L,mg/L
H2O,9.89864e5,9.77718e5
H2S,0.0824111,0.0824111
NH3,66.9809,66.9809
B2O3,1094.52,1094.52
BaO,0.327274,0.327274
CaO,90.5911,90.5911
CO2,1493.64,1493.64
Cs2O,0.127187,0.127187
FeO,0.369502,0.369502
K2O,147.002,147.002
KI,53.6165,53.6165
Li2O,4.64817,4.64817
MgO,204.739,204.739
Na2O,400.269,400.269
Na(C2H3O2),1944.56,1944.56
NaBr,75.4904,75.4904

NaCl,20435.1,20435.1
NaF,15.6872,15.6872
Rb2O,0.338919,0.338919
SiO2,162.543,162.543
SO3,133.749,133.749
SrO,22.3912,22.3912
BaSO4,22.7785,22.7785
CaCO3,642.218,642.218
FeCO3,57.1848,57.1848
FeS,2.10828,2.10828
SrCO3,16.4411,16.4411

Calculated Rates

Corrosion Rate,4.83074e-4,mm/yr
Corrosion Potential,-0.503354,V (SHE)
Repassivation Potential*,-0.0141513,V (SHE)
Corrosion Current Density,4.57508e-4,A/sq-m
*Calculated at repassivation current density = 1.0e-2 A/sq-m

,Rate may be reduced because of saturation with the following solids:,

,Species,Scaling Tendency,
,BaSO4 (Barite),1.0
,CaCO3 (Calcite),1.0
,FeCO3 (Siderite),1.0
,SrCO3 (Strontianite),1.0

,Rate may ,also be reduced because of substantial saturation indices of:

,Species,Scaling Tendency,
,CaCO3 (Aragonite),0.782726
,CaF2 (Fluorite),0.126919
Stream Parameters
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

Mixture Properties
Stream Amount,1.00000,L
Temperature,169.000,°F
Pressure,4489.00,psia

Aqueous Properties
pH,6.73601,
Ionic Strength (x-based),7.42116e-3,mol/mol
Ionic Strength (m-based),0.418298,mol/kg
ORP,-0.221684,V (SHE)
Osmotic Pressure,342.545,psia
Specific Electrical Conductivity,77606.1,µmho/cm
"Electrical Conductivity, molar",0.0170504,m2/ohm-mol
"Viscosity, absolute",0.397821,cP
"Viscosity, relative",1.06890,
Standard Liquid Volume,0.996451,L

"Volume, Std. Conditions",0.989022,L
"Total Dissolved Solids, Estimated",27121.9,mg/L
Hardness,627.748,mg/L as CaCO3

Solid Properties
Standard Liquid Volume,3.80790e-4,L

Thermodynamic Properties
,Unit,Total,Aqueous,Solid
Density,g/ml,1.00480,1.00422,2.74173
Enthalpy,J,-1.54977e7,-1.54868e7,-10946.0

Total and Phase Flows (Amounts)
column Filter Applied: Only Non Zero Values

,Total,Aqueous,Solid
,mol,mol,mol
Mole (True),55.0547,55.0448,9.87129e-3
Mole (App),54.7260,54.7161,9.87129e-3
,g,g,g
Mass,1004.80,1003.88,0.924148
,L,L,cm3
Volume,1.00000,0.999663,0.337068

Scaling Tendencies
Row Filter Applied: Values > 1.0e-4

Solids,Post-Scale,Pre-Scale
SiO2 (Quartz),1.00000,6.51295
CaCO3 (Calcite),1.00000,1.00000
BaSO4 (Barite),1.00000,11.5705
SrCO3 (Strontianite),1.00000,1.00000
FeS (Pyrrhotite),1.00000,1.00000
FeCO3 (Siderite),1.00000,1.00000
Fe2O3 (Hematite),1.00000,1.00000
CaCO3 (Aragonite),0.782726,0.782726
FeO(OH) (Lepidocrocite),0.659164,0.659164
MgF2 (Sellaite),0.232261,0.232261
Fe3O4 (Magnetite),0.226049,0.226049
Fe3Si4O10(OH)2 (Minnesotaite),0.146627,0.146627
Mg3Si2O5(OH)4 (Clinochrysotile),0.146532,0.146532
CaF2 (Fluorite),0.126919,0.781138
SiO2 (Lechatelierite),0.0907183,0.590843
SrSO4 (Celestine),0.0388708,0.0740081
FeS(mackinawite) (Mackinawite),0.0309736,0.0309736
MgCO3 (Magnesite),0.0298156,0.0298156
Fe3Si2O5(OH)4 (Greenalite),0.0219317,0.0219317
B(OH)3,9.80364e-3,0.0100732
MgCO3.3H2O (Nesquehonite),7.41928e-3,7.41928e-3
NaHCO3 (Nahcolite),5.89695e-3,0.0113210
CaSO4 (Anhydrite),3.48136e-3,0.0239970
CaSO4.2H2O (Gypsum),2.09650e-3,0.0137496

NaCl (Halite),1.66780e-3,1.66780e-3
CaSO4.0.5H2O (Bassanite),1.47870e-3,0.0100666
FeS(amorphous) (FeS amorphous),9.35913e-4,9.35913e-4
FeO (Wustite),6.04011e-4,6.04011e-4
Mg(OH)2 (Brucite),4.64677e-4,4.64677e-4
BaCO3 (Witherite),4.41269e-4,4.41269e-4
Fe(OH)2 (Amakinite),3.93881e-4,3.93881e-4
Fe0.947O (Wustite),3.31233e-4,3.31233e-4
Fe(OH)3 (Bernalite),2.27797e-4,2.27797e-4
Sr(HCO3)2,1.79816e-4,1.29656e-3
NaF (Villiaumite),1.77497e-4,1.77497e-4
Na(C2H3O2),1.69557e-4,1.69557e-4

Species Output (True Species)
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

,Total,Aqueous,Solid
,mg/L,mg/L,mg/L
H2O,9.76568e5,9.76897e5,
Cl-1,12395.9,12400.1,
Na+1,8798.81,8801.77,
B(OH)3,1896.5,1897.13,0.0
HCO3-1,1638.65,1639.2,
C2H3O2-1,1176.6,1177.0,
CaCO3 (Calcite),689.933,5.1516,685.014
Na(C2H3O2),246.752,246.835,0.0
CO2,196.891,196.958,
SO4-2,140.245,140.293,
SiO2 (Quartz),136.446,,136.492
K+1,132.842,132.887,
NaHCO3 (Nahcolite),116.177,116.216,0.0
Mg+2,97.9895,98.0225,
NH4+1,66.8442,66.8668,
Br-1,57.8674,57.8869,
FeCO3 (Siderite),56.6872,0.260368,56.4459
MgHCO3+1,51.5084,51.5257,
B(OH)4-1,46.8872,46.903,
Ca+2,41.9618,41.976,
I-1,40.661,40.6747,
Mg(C2H3O2)+1,31.6775,31.6882,
SiO2 (Lechatelierite),25.0134,25.0218,0.0
SrCO3 (Strontianite),22.7554,,22.7631
BaSO4 (Barite),21.5309,,21.5382
NaSO4-1,16.8333,16.839,
Sr+2,13.6084,13.613,
CH3COOH,10.3525,10.356,
Ca(C2H3O2)+1,6.79091,6.7932,
F-1,6.29568,6.2978,
NaB(OH)4,6.17928,6.18136,
NH4(C2H3O2),5.35561,5.35741,
CO3-2,4.7867,4.78831,
MgSO4,4.43677,4.43826,0.0

B2O(OH)5-1,3.09265,3.09369,
B3O3(OH)4-1,2.63582,2.63671,
NH3,2.31806,2.31884,
K(C2H3O2),2.24106,2.24182,
Sr(C2H3O2)+1,2.23722,2.23797,
FeS (Pyrrhotite),2.2053,,2.20604
Li+1,2.12572,2.12644,
NH4SO4-1,2.12044,2.12116,
NaF (Villiaumite),1.63464,1.63519,0.0
MgCO3 (Magnesite),1.42937,1.42985,0.0
KSO4-1,1.41111,1.41158,
Mg(C2H3O2)2,1.41058,1.41106,0.0
NaHSiO3,1.19671,1.19712,
Ca(C2H3O2)2,1.15926,1.15965,0.0
CaH2BO3+1,1.00033,1.00066,
KCl (Sylvite),0.987163,0.987496,0.0
NaBr,0.973287,0.973616,0.0
CaSO4 (Anhydrite),0.776703,0.776965,0.0
Ba+2,0.605407,0.605611,
H3SiO4-1,0.56755,0.567741,
NaCO3-1,0.533199,0.533379,
SrSO4 (Celestine),0.50051,0.500679,0.0
Fe+2,0.408476,0.408614,
NaI,0.383212,0.383341,0.0
Li(C2H3O2),0.297904,0.298004,0.0
Rb+1,0.276576,0.276669,
BaHCO3+1,0.268022,0.268113,
BaCl(+1),0.217936,0.21801,
BF(OH)3-1,0.200691,0.200758,
NH2CO2-1,0.189914,0.189978,
CsCl,0.140492,0.14054,0.0
Fe(C2H3O2)+1,0.0894431,0.0894732,
Ba(C2H3O2)+1,0.0838965,0.0839248,
RbCl,0.0408014,0.0408152,0.0
OH-1,0.0350051,0.0350169,
HS-1,0.0317619,0.0317726,
Na2F+1,0.0262165,0.0262254,
MgOH+1,0.0206557,0.0206626,
LiSO4-1,0.0198032,0.0198099,
H2S,0.0117721,0.0117761,
Cs(C2H3O2),0.0112721,0.0112759,
FeOH+1,0.0107277,0.0107313,
LiH2BO3,9.63774e-3,9.64099e-3,
MgHSiO3+1,9.18484e-3,9.18793e-3,
Fe(C2H3O2)2,8.63796e-3,8.64087e-3,
CaF+1,8.31565e-3,8.31846e-3,
Rb(C2H3O2),6.00098e-3,6.003e-3,
CaCl+1,5.76173e-3,5.76367e-3,
B4O5(OH)4-2,4.96737e-3,4.96904e-3,
Ba(C2H3O2)2,4.54961e-3,4.55114e-3,0.0
MgF+1,4.15085e-3,4.15225e-3,
KI,3.53982e-3,3.54101e-3,0.0
CaHCO3+1,3.09456e-3,3.0956e-3,
SrF+1,2.87505e-3,2.87602e-3,

HF,2.80907e-3,2.81002e-3,
BaCO3 (Witherite),2.59934e-3,2.60022e-3,0.0
HSO4-1,2.49466e-3,2.4955e-3,
RbSO4-1,1.81055e-3,1.81116e-3,
CaHSiO3+1,1.70894e-3,1.70951e-3,
CsSO4-1,1.62971e-3,1.63026e-3,
Fe(CO3)2-2,1.36567e-3,1.36613e-3,
FeHCO3+1,1.24274e-3,1.24316e-3,
Fe(NH3)+2,7.85012e-4,7.85277e-4,
CaOH+1,7.74987e-4,7.75249e-4,
FeHS+1,7.66686e-4,7.66945e-4,
FeCl+1,5.80558e-4,5.80754e-4,
CsBr,4.00706e-4,4.00841e-4,0.0
BF2(OH)2-1,3.45669e-4,3.45785e-4,
H+1,2.51578e-4,2.51663e-4,
RbI,2.38307e-4,2.38387e-4,0.0
MgSiO2(OH)2,1.63157e-4,1.63212e-4,
SrOH+1,1.26338e-4,1.26381e-4,
CsI,1.12152e-4,1.1219e-4,0.0
BaF+1,6.80397e-5,6.80627e-5,
Fe2O3 (Hematite),6.73424e-5,,6.73651e-5
LiOH,2.55027e-5,2.55113e-5,0.0
Fe(NH3)2+2,5.13024e-6,5.13197e-6,
CaSiO2(OH)2,4.39043e-6,4.39191e-6,
Fe(OH)3 (Bernalite),3.27787e-6,3.27897e-6,0.0
H2SiO4-2,1.58965e-6,1.59018e-6,
S-2,1.1728e-6,1.17319e-6,
H2,8.87089e-7,8.87388e-7,
Fe(OH)4-1,7.10441e-7,7.10681e-7,
FeCl2 (Lawrencite),6.69056e-7,6.69282e-7,0.0
HF2-1,4.85219e-7,4.85383e-7,
BaOH+1,4.82125e-7,4.82287e-7,
FeS(HS)-1,2.54704e-7,2.5479e-7,
KHSO4 (Mercallite),2.29191e-7,2.29268e-7,0.0
Fe(OH)2+1,2.36932e-8,2.37012e-8,
HCl,1.72006e-8,1.72064e-8,
Fe(NH3)3+2,9.71152e-9,9.71479e-9,
HFeO2-1,2.66864e-9,2.66954e-9,
BF3OH-1,1.0856e-9,1.08597e-9,
C4H8O4,3.75201e-10,3.75327e-10,
FeOH+2,4.56934e-11,4.57088e-11,
CaCl2 (Hydrophilite),3.81272e-12,3.81401e-12,0.0
HI,4.64656e-13,4.64813e-13,
(HF)2,6.76511e-14,6.76739e-14,
Fe(NH3)4+2,5.46891e-14,5.47076e-14,
HBr,2.40075e-14,2.40156e-14,
BF4-1,1.98173e-14,1.9824e-14,
Fe+3,1.13509e-15,1.13548e-15,
FeF2+1,3.31617e-16,3.31729e-16,
FeF+2,2.95449e-16,2.95549e-16,
FeCl+2,3.7461e-17,3.74737e-17,
FeCl2+1,1.365e-17,1.36546e-17,
FeSO4+1,1.07543e-17,1.07579e-17,
FeF3,1.45969e-18,1.46018e-18,0.0

Cs+1,8.15317e-19,8.15592e-19,
FeI+2,6.77732e-19,6.77961e-19,
Fe(NH3)5+2,3.02378e-19,3.0248e-19,
FeCl3 (Molysite),8.0892e-20,8.09193e-20,0.0
FeBr+2,5.40424e-20,5.40607e-20,
H2SO4,9.00477e-21,9.00781e-21,
FeI2+1,1.0241e-21,1.02445e-21,
SiF4,2.78008e-22,2.78102e-22,
SiF6-2,1.19769e-22,1.1981e-22,
FeCl4-1,8.63008e-23,8.63299e-23,
HBF4,3.81237e-24,3.81366e-24,
SO3,1.93633e-24,1.93699e-24,
Fe(NH3)6+2,1.64629e-24,1.64684e-24,
HSiF6-1,8.50715e-28,8.51002e-28,
Fe2(OH)2+4,1.05541e-28,1.05576e-28,
H2SiF6,2.19062e-35,2.19136e-35,
FeO4-2,8.16507e-45,8.16782e-45,
O2,1.01549e-55,1.01583e-55,
SiCl4,1.13337e-71,1.13376e-71,
Total (by phase),1.00481e6,1.00422e6,924.46

Element Balance
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

,Total,Aqueous,Solid
,mg/L,mg/L,mg/L
H(+1),1.0942e5,1.09457e5,0.0
K(+1),134.662,134.707,0.0
Na(+1),8906.01,8909.01,0.0
N(-3),55.088,55.1065,0.0
Ba(+2),13.6961,1.02753,12.6732
Ca(+2),321.908,47.7166,274.3
Fe(+2),29.1916,0.591083,28.6104
Mg(+2),123.465,123.506,0.0
Fe(+3),4.91495e-5,2.04867e-6,4.71174e-5
F(-1),7.09798,7.10037,0.0
O(-2),8.70901e5,8.70757e5,437.89
Cl(-1),12396.5,12400.7,0.0
Br(-1),58.6233,58.6431,0.0
Li(+1),2.15939,2.16011,0.0
C(+4),491.98,402.236,89.91
S(+6),56.6965,53.7564,2.95914
S(-2),0.846524,0.0421617,0.804648
Si(+4),75.9785,12.2027,63.8014
Sr(+2),28.6918,15.1913,13.5102
H(0),8.87089e-7,8.87388e-7,0.0
O(0),1.01549e-55,1.01583e-55,0.0
B(+3),339.904,340.019,0.0
Rb(+1),0.309912,0.310016,0.0
Cs(+1),0.119966,0.120006,0.0
I(-1),40.9883,41.0022,0.0
Fe(+6),3.80488e-45,3.80617e-45,0.0

ACETATEION,1399.6,1400.07,0.0

Element Distribution

,Total,Total,Aqueous,Solid
,mol,mole %,% of Total,% of Total
H(+1),108.555,66.2529,100.0,0.0
K(+1),3.44418e-3,2.10205e-3,100.0,0.0
Na(+1),0.387387,0.236429,100.0,0.0
N(-3),3.93297e-3,2.40037e-3,100.0,0.0
Ba(+2),9.97313e-5,6.08679e-5,7.49982,92.5002
Ca(+2),8.03205e-3,4.90211e-3,14.818,85.182
Fe(+2),5.22707e-4,3.19018e-4,2.02415,97.9758
Mg(+2),5.07981e-3,3.1003e-3,100.0,0.0
Fe(+3),8.80074e-10,5.37126e-10,4.16683,95.8332
F(-1),3.73609e-4,2.28021e-4,100.0,0.0
O(-2),54.4334,33.2217,99.9497,0.0502632
Cl(-1),0.349659,0.213404,100.0,0.0
Br(-1),7.33672e-4,4.47774e-4,100.0,0.0
Li(+1),3.1111e-4,1.89876e-4,100.0,0.0
C(+4),0.0409604,0.0249989,81.731,18.269
S(+6),1.76812e-3,1.07911e-3,94.7825,5.21751
S(-2),2.63994e-5,1.61121e-5,4.97889,95.0211
Si(+4),2.70525e-3,1.65107e-3,16.0553,83.9447
Sr(+2),3.27458e-4,1.99853e-4,52.9285,47.0715
H(0),8.80074e-10,5.37126e-10,100.0,0.0
O(0),6.34703e-60,3.87371e-60,100.0,0.0
B(+3),0.0314434,0.0191905,100.0,0.0
Rb(+1),3.62607e-6,2.21305e-6,100.0,0.0
Cs(+1),9.02641e-7,5.50899e-7,100.0,0.0
I(-1),3.22984e-4,1.97123e-4,100.0,0.0
Fe(+6),6.81305e-50,4.15813e-50,100.0,0.0
ACETATEION,0.023704,0.014467,100.0,0.0

"Common Representations, Liquid-1 (mg/L)"

SiO2,26.1056

Calculation Summary
Rates Calculation

Unit Set: Custom

Automatic Chemistry Model
,MSE (H3O+ ion) Databanks:
,,Corrosion (MSE)
,,MSE (H3O+ ion)
,Second Liquid phase
,Redox selected
,Using Helgeson Direct

Single Point
No secondary survey selected

Polarization Curve Range
,Range,,-2.0 to 2.0 V (SHE)
,Step size,0.01 V (SHE)
,No. steps,400

Metal: Stainless steel
,Duplex stainless 2507

Flow Type: Static
Scales included - passivating films included.

There are species for which the kinetic data has not been calibrated:

,C2H6O
,CH3OH
,C2H4O
,CH3COCH3

It is not known if this will affect the calculation accuracy.
,

Stream Inflows
Row Filter Applied: Only Non Zero Values

,Input,Output
Species,mol,mol
H2O,5.52031,5.52031
H2S,2.36646e-4,2.36646e-4
NH3,3.93297e-4,3.93297e-4
B2O3,1.57217e-3,1.57217e-3
BaO,2.13572e-7,2.13572e-7
CaO,1.62047e-4,1.62047e-4
CO2,15.6063,15.6063
Cs2O,4.51320e-8,4.51320e-8
FeO,5.15869e-7,5.15869e-7
K2O,1.56060e-4,1.56060e-4
KI,3.22984e-5,3.22984e-5

Li2O,1.55555e-5,1.55555e-5
MgO,5.07981e-4,5.07981e-4
MnO,1.00084e-6,1.00084e-6
Na2O,6.45811e-4,6.45811e-4
Na(C2H3O2),2.37040e-3,2.37040e-3
NaBr,7.33672e-5,7.33672e-5
NaCl,0.0349659,0.0349659
NaF,3.73609e-5,3.73609e-5
Rb2O,1.81303e-7,1.81303e-7
SiO2,2.70525e-4,2.70525e-4
SO3,1.67052e-4,1.67052e-4
SrO,2.16923e-5,2.16923e-5
BaSO4,9.75956e-6,9.75956e-6
CaCO3,6.41157e-4,6.41157e-4
FeCO3,4.93534e-5,4.93534e-5
FeS,2.40153e-6,2.40153e-6
SrCO3,1.10534e-5,1.10534e-5
N2,0.126084,0.126084
C2H6O,1.57605e-3,1.57605e-3
CH3OH,1.57605e-3,1.57605e-3
C2H4O,1.57605e-3,1.57605e-3
CH3COOH,1.57605e-4,1.57605e-4
NO2,3.15211e-5,3.15211e-5
CH4,3.15211e-4,3.15211e-4
CH3COCH3,3.15211e-4,3.15211e-4

Calculated Rates

Corrosion Rate,6.15729e-4,mm/yr
Corrosion Potential,-0.372533,V (SHE)
Repassivation Potential*,6.43576e-3,V (SHE)
Corrosion Current Density,6.00130e-4,A/sq-m
*Calculated at repassivation current density = 1.0e-2 A/sq-m

,Rate may be reduced because of saturation with the following solids:,

,Species,Scaling Tendency,
,BaSO4 (Barite),1.0

,Rate may ,also be reduced because of substantial saturation indices of:

,Species,Scaling Tendency,
,SiO2 (lechatelierite),0.121829
,SrSO4 (Celestine),0.109062
Stream Parameters
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

Mixture Properties
Stream Amount,21.3006,mol
Temperature,169.000,°F
Pressure,4489.00,psia

Liquid 1 Properties
pH,4.57146,
Ionic Strength (x-based),7.22639e-3,mol/mol
Ionic Strength (m-based),0.415644,mol/kg
Dielectric Constant,53.8795,
ORP,0.144731,V (SHE)
Osmotic Pressure,830.954,psia
Specific Electrical Conductivity,76851.9,µmho/cm
"Viscosity, absolute",0.396231,cP
Thermal Conductivity,582.717,cal/hr m °C
Surface Tension,0.0644654,N/m
Interfacial Tension LLE,4.90015e-4,N/m
Standard Liquid Volume,0.101478,L
"Volume, Std. Conditions",0.100142,L
"Total Dissolved Solids, Estimated",25142.9,mg/L
Hardness,143.096,mg/L as CaCO3

Solid Properties
Standard Liquid Volume,1.35540e-7,L

Liquid 2 Properties
pH,3.00784,
Ionic Strength (x-based),1.81124e-4,mol/mol
Ionic Strength (m-based),0.738439,mol/kg
Dielectric Constant,2.11103,
Specific Electrical Conductivity,494.492,µmho/cm
"Viscosity, absolute",0.405675,cP
Surface Tension,0.0493929,N/m
Thermal Conductivity,544.994,cal/hr m °C
Standard Liquid Volume,0.586143,L
"Volume, Std. Conditions",0.870582,L

Thermodynamic Properties
,Unit,Total,Liquid-1,Solid,Liquid-2
Density,g/ml,0.796408,1.01943,4.47972,0.771238
Enthalpy,J,-7.85428e6,-1.55597e6,-13.1935,-6.29830e6

Total and Phase Flows (Amounts)
column Filter Applied: Only Non Zero Values

,Total,Liquid-1,Solid,Liquid-2
,mol,mol,mol,mol
Mole (True),21.3315,5.48846,8.98903e-6,15.8430
Mole (App),21.3013,5.45519,8.98903e-6,15.8461
,g,g,g,g
Mass,792.610,102.885,2.09798e-3,689.723
,L,L,cm3,L
Volume,0.995231,0.100924,4.68328e-4,0.894306

Scaling Tendencies
Row Filter Applied: Values > 1.0e-4

Solids,Post-Scale,Pre-Scale
BaSO4 (Barite),1.00000,10.6994
H2O,0.474293,0.474293
SiO2 (lechatelierite),0.121829,0.121830
SrSO4 (Celestine),0.109062,0.115065
SrCO3 (Strontianite),0.0282819,0.0282532
CaCO3 (Calcite),0.0279105,0.0278769
CaCO3 (Aragonite),0.0221169,0.0220903
NaHCO3 (Nahcolite),9.57316e-3,9.56830e-3
CaSO4 (Anhydrite),6.26105e-3,6.60443e-3
CaF2 (Fluorite),4.07444e-3,4.07954e-3
CaSO4.2H2O (Gypsum),3.72046e-3,3.92450e-3
CaSO4.0.5H2O (Bassanite),1.86378e-3,1.96599e-3
CaSO4.0.5H2O (Bassanite),1.75614e-3,1.85245e-3
NaCl (Halite),1.74675e-3,1.74638e-3
B(OH)3,1.24937e-3,1.25064e-3
NaCl.2H2O (hydrohalite),7.25245e-4,7.25091e-4
CH3COOH,2.00791e-4,2.00582e-4
HBO2 (Metaborite),1.81154e-4,1.81339e-4
BaCO3 (Witherite),1.06382e-4,1.07774e-3

Species Output (True Species)
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

,Total,Liquid-1,Solid,Liquid-2
,mol,mol,mol,mol
CO2,15.6014,0.111154,,15.4903
H2O,5.51244,5.29674,0.0,0.215703
N2,0.126084,8.01971e-5,,0.126004
Na+1,0.0386634,0.0386634,,1.87215e-9
Cl-1,0.0347695,0.0333632,,1.4063e-3
HCO3-1,5.19814e-3,4.99336e-3,,2.04779e-4
B(OH)3,2.17161e-3,4.37119e-4,0.0,1.73449e-3
CH3COOH,1.64487e-3,5.4305e-4,0.0,1.10182e-3
C2H4O,1.57605e-3,6.60433e-5,,1.51001e-3
C2H6O,1.57604e-3,1.66251e-4,,1.40979e-3
CH3OH,1.57584e-3,6.24366e-4,,9.51473e-4
C2H3O2-1,5.56008e-4,5.23001e-4,,3.30074e-5
MgB(OH)3+2,4.4502e-4,2.55401e-7,,4.44764e-4
NH2CO2-1,3.90227e-4,6.60263e-11,,3.90226e-4
K+1,3.43779e-4,3.43778e-4,,1.74033e-9
CaB(OH)3+2,3.31263e-4,1.46851e-7,,3.31116e-4
CH4,3.15211e-4,3.42785e-7,,3.14868e-4
CH3COCH3,3.15211e-4,3.62529e-5,,2.78958e-4
Ca(C2H3O2)+1,3.02459e-4,3.72702e-6,,2.98732e-4
SiO2 (lechatelierite),2.705e-4,8.43065e-5,0.0,1.86194e-4
H2S,2.39e-4,3.38415e-6,,2.35616e-4
B(OH)3Cl-1,1.94661e-4,1.94661e-4,,4.27119e-55
Ca+2,1.24242e-4,1.24242e-4,,1.05816e-18
SO4-2,1.04728e-4,1.04727e-4,,1.83631e-10
Br-1,7.33672e-5,6.92616e-5,,4.10559e-6
Fe+2,5.22708e-5,5.23579e-13,,5.22708e-5

NaMgSO4+1,4.93817e-5,4.5468e-7,,4.8927e-5
Sr+2,3.26051e-5,3.26051e-5,,3.96701e-19
I-1,3.22984e-5,3.04789e-5,,1.81951e-6
CaF+1,3.209e-5,4.12365e-7,,3.16776e-5
NO2,3.15211e-5,5.36057e-8,,3.14675e-5
Li+1,3.10143e-5,3.10142e-5,,1.05115e-10
Na(C2H3O2),2.42093e-5,2.42093e-5,0.0,9.58722e-12
CaSO4 (Anhydrite),1.26229e-5,3.16661e-6,0.0,9.45624e-6
Mg+2,1.17722e-5,1.17722e-5,,2.92313e-20
BaSO4 (Barite),8.98903e-6,,8.98903e-6,
F-1,3.58625e-6,3.38735e-6,,1.98902e-7
NH4+1,3.06963e-6,3.01622e-6,,5.34107e-8
H3O+1,2.12637e-6,2.12637e-6,,2.67016e-15
MgF+1,1.43141e-6,1.7656e-8,,1.41376e-6
NaB(OH)3Cl,1.25052e-6,3.02616e-7,,9.47904e-7
Mn+2,9.5189e-7,7.56526e-10,,9.51133e-7
Ba+2,6.38677e-7,6.38677e-7,,1.21474e-27
KMgSO4+1,3.67023e-7,3.75278e-9,,3.6327e-7
Rb+1,3.62607e-7,4.47263e-9,,3.58134e-7
NaB(OH)3HSO4,3.5997e-7,9.44017e-8,,2.65568e-7
Ba(C2H3O2)+1,3.45133e-7,4.25709e-9,,3.40876e-7
CaCO3 (Calcite),2.88596e-7,8.7863e-8,0.0,2.00733e-7
K0.75Li0.25Cl,2.85881e-7,7.49571e-8,,2.10924e-7
HF,2.32167e-7,2.30956e-7,,1.21085e-9
HSO4-1,2.1548e-7,2.15418e-7,,6.16886e-11
CaClCH3OH+1,2.13362e-7,1.77297e-9,,2.1159e-7
SrSO4 (Celestine),1.40025e-7,3.67141e-8,0.0,1.03311e-7
Cs+1,9.02631e-8,1.11194e-9,,8.91512e-8
CO3-2,8.83946e-8,8.83525e-8,,4.21571e-11
B(OH)4-1,7.44221e-8,7.14438e-8,,2.97827e-9
K(C2H3O2),5.72028e-8,5.72028e-8,,1.05464e-43
NaB(OH)4,5.68968e-8,1.86226e-8,,3.82742e-8
HS-1,4.78186e-8,4.4943e-8,,2.87567e-9
MnCl+1,2.8776e-8,3.00145e-10,,2.84758e-8
Si(OH)3F.2H2O,2.08334e-8,5.46248e-9,,1.5371e-8
MnHCO3+1,2.0171e-8,2.48802e-10,,1.99222e-8
Li(C2H3O2),1.91602e-8,5.02326e-9,0.0,1.41369e-8
B2O3,1.90759e-8,3.28773e-9,0.0,1.57882e-8
Ca(C2H3O2)2,1.75396e-8,1.75396e-8,,3.76213e-32
C2H7O+1,1.39467e-8,1.68324e-10,,1.37783e-8
LiSO4-1,5.87051e-9,5.53971e-9,,3.30806e-10
MgCO3,4.56661e-9,1.19735e-9,0.0,3.36926e-9
HSiO3-1,4.10106e-9,3.94255e-9,,1.58509e-10
CaB(OH)4+1,3.74917e-9,4.62447e-11,,3.70292e-9
CaOH+1,2.74456e-9,4.0515e-11,,2.70405e-9
MgSO4,2.02191e-9,4.86523e-10,0.0,1.53539e-9
MgOH+1,1.87893e-9,2.3176e-11,,1.85576e-9
OH-1,1.62496e-9,1.55616e-9,,6.87992e-11
CaCl2 (Hydrophilite),1.44267e-9,1.44267e-9,0.0,4.13081e-20
NH4OH,8.93501e-10,6.0133e-10,,2.92171e-10
Na(C2H3O2).CH3OH,8.07587e-10,2.02074e-10,0.0,6.05513e-10
MgClCH3OH+1,4.9285e-10,1.53207e-12,,4.91318e-10
SrCO3 (Strontianite),3.73803e-10,9.801e-11,0.0,2.75793e-10
B2(OH)7-1,3.61545e-10,3.42948e-10,,1.85973e-11

NH3,3.37352e-10,2.45458e-10,,9.18947e-11
SrOH+1,2.99882e-10,3.64526e-12,,2.96237e-10
BaCO3 (Witherite),2.80144e-10,7.34528e-11,0.0,2.06691e-10
KB(OH)4,2.79481e-10,5.45393e-11,,2.24942e-10
CH5O+1,2.64656e-10,1.64837e-12,,2.63007e-10
LiCl,1.47167e-10,1.46754e-10,0.0,4.13777e-13
MgF2 (Sellaite),1.26334e-10,3.31244e-11,0.0,9.32096e-11
LiB(OH)4,5.68633e-11,1.43837e-11,0.0,4.24796e-11
HCl,5.5203e-11,1.28757e-12,,5.39154e-11
KB(OH)3HSO4,4.78826e-11,1.25547e-11,,3.53279e-11
C4H8O4,3.28896e-11,8.3037e-12,,2.45859e-11
B3O3(OH)4-1,3.17508e-11,3.07322e-11,,1.0186e-12
LiB(OH)3HSO4,2.15735e-11,5.6565e-12,,1.5917e-11
CH3COOH2+1,1.97546e-11,2.71329e-13,,1.94833e-11
NaHF2,1.53971e-11,4.03708e-12,0.0,1.136e-11
BaOH+1,8.74632e-12,1.25533e-13,,8.62078e-12
MnCO3 (Rhodochrosite),5.42466e-12,1.42233e-12,0.0,4.00233e-12
Na2SO4.NaHSO4,3.07818e-12,3.07816e-12,0.0,1.89727e-17
Ba(C2H3O2)2,2.58856e-12,6.78714e-13,0.0,1.90985e-12
Mn(OH)+1,1.64084e-12,2.02392e-14,,1.6206e-12
Cs(C2H3O2),9.73341e-13,9.26878e-13,0.0,4.64632e-14
Fe(C2H3O2)+1,8.66902e-13,1.06929e-14,,8.56209e-13
FeCO2+2,8.58876e-13,8.58876e-13,,6.78964e-111
CH3OH.HCl,6.23536e-13,1.63701e-13,,4.59834e-13
K(C2H3O2).CH3OH,5.21676e-13,1.3663e-13,0.0,3.85046e-13
CH3O-1,3.75671e-13,3.54482e-13,,2.11888e-14
LiOH,3.53507e-13,3.09874e-13,0.0,4.36332e-14
FeCl+1,3.9663e-14,4.87219e-16,,3.91758e-14
CH3CH2O-1,2.73982e-14,2.58213e-14,,1.57689e-15
NaOH,1.21031e-14,1.16051e-14,0.0,4.97975e-16
FeF+1,7.21433e-15,8.96418e-17,,7.12469e-15
FeOH+1,3.84263e-15,4.73975e-17,,3.79523e-15
NaB2O2(OH)4-1,3.80245e-15,3.59823e-15,,2.04225e-16
FeH(CO3)2-1,2.83879e-15,2.67876e-15,,1.60026e-16
Mn(CO3)2-2,1.74796e-15,1.74677e-15,,1.19767e-18
HBr,1.11306e-15,1.41722e-16,,9.71334e-16
S-2,8.42013e-16,8.40826e-16,,1.18712e-18
Fe(C2H3O2)3-1,8.35662e-16,7.88554e-16,,4.71073e-17
FeHS+1,6.30719e-16,7.7797e-18,,6.22939e-16
Fe(C2H3O2)2,5.29531e-16,1.38841e-16,,3.90689e-16
H2SiO4-2,4.40879e-16,4.4058e-16,,2.9923e-19
HI,3.33757e-16,8.75062e-17,,2.46251e-16
KB2O2(OH)4-1,2.01023e-16,1.89675e-16,,1.13472e-17
FeO+1,1.61144e-16,1.98766e-18,,1.59157e-16
H2SO4,1.32049e-16,1.32048e-16,,1.18959e-21
H2,1.18445e-16,2.91032e-17,,8.93415e-17
FeS (Pyrrhotite),7.52811e-17,1.97385e-17,0.0,5.55426e-17
FeOH+2,6.92445e-17,5.61662e-20,,6.91884e-17
NaOH.Na2SO4,5.4827e-17,5.4827e-17,,7.38294e-25
FeSO4,5.28453e-17,1.38556e-17,0.0,3.89897e-17
Fe(NH3)+2,4.90173e-17,3.50824e-20,,4.89822e-17
NaOHCO3-2,3.15891e-17,3.15675e-17,,2.16443e-20
LiB2O2(OH)4-1,4.74029e-18,4.47308e-18,,2.67216e-19
FeF+2,1.76811e-18,1.44486e-21,,1.76667e-18

Fe+3,1.59234e-18,1.18045e-22,,1.59222e-18
HFeO2,1.31134e-18,3.43831e-19,,9.67514e-19
Fe(C2H3O2)+2,1.02303e-18,8.29812e-22,,1.0222e-18
LiCl.Li2CO3,1.01853e-18,2.20296e-19,,7.98232e-19
FeCl+2,6.71634e-19,6.85993e-22,,6.70948e-19
Li2CO3.Na2CO3,4.11102e-19,8.99853e-20,0.0,3.21117e-19
LiOHCO3-2,3.57558e-19,3.57313e-19,,2.44967e-22
B4O5(OH)4-2,2.1558e-19,2.15446e-19,,1.34235e-22
MnO (Manganese oxide),1.90524e-19,4.99549e-20,0.0,1.40569e-19
Fe(C2H3O2)2+1,1.34283e-19,1.65634e-21,,1.32627e-19
B5O6(OH)4-1,1.02905e-19,9.76069e-20,,5.29858e-21
MgCl2,1.78878e-20,3.23582e-21,0.0,1.4652e-20
SO3F-1,7.10821e-21,6.70751e-21,,4.00699e-22
FeO,1.46818e-21,3.84953e-22,,1.08323e-21
H2F+1,1.17835e-21,1.45345e-23,,1.16381e-21
SiF4.2H2O,1.58947e-22,4.16755e-23,,1.17272e-22
SiF6-2,9.31836e-23,9.31198e-23,,6.38551e-26
FeO2-1,3.83616e-23,3.61991e-23,,2.16249e-24
FeHSO4+2,2.17713e-23,1.7625e-26,,2.17537e-23
Fe(NH3)2+2,1.67036e-23,1.1955e-26,,1.66916e-23
FeCl2+1,3.17682e-24,7.02826e-26,,3.10654e-24
HSiF6.2H2O-1,1.51448e-25,1.42911e-25,,8.5369e-27
NaF.3HF,1.45456e-26,3.81382e-27,0.0,1.07318e-26
HMnO2-1,9.67607e-27,9.13062e-27,,5.45452e-28
HFeO2-1,4.31306e-28,4.06993e-28,,2.43133e-29
SO3,3.15929e-28,3.15357e-28,,5.7148e-31
SiF4,1.32927e-29,3.48532e-30,,9.80742e-30
Fe(NH3)3+2,1.71011e-30,1.22395e-33,,1.70889e-30
HSO3F,2.49657e-32,6.54593e-33,,1.84198e-32
Fe(C2H3O2)3,1.39009e-32,3.64477e-33,,1.02561e-32
MnO2-2,1.64042e-33,1.63929e-33,,1.12399e-36
Fe2(OH)2+4,4.72049e-36,1.02619e-40,,4.72038e-36
NaF.4HF,2.1071e-37,5.52476e-38,0.0,1.55463e-37
Fe(NH3)4+2,5.34382e-40,3.82465e-43,,5.33999e-40
SiF6.SiF4.2H2O(2-),1.45019e-44,1.4492e-44,,9.93863e-48
O2,2.06318e-46,1.24977e-48,,2.05068e-46
Fe(NH3)5+2,1.67109e-49,1.19602e-52,,1.66989e-49
Fe3(OH)2(C2H3O2)6+1,1.12563e-49,1.38843e-51,,1.11175e-49
FeO4-2,1.34028e-53,1.33936e-53,,9.18337e-57
(HF)6,8.76766e-56,2.27151e-56,,6.49616e-56
Fe(NH3)6+2,5.22189e-59,3.73738e-62,,5.21815e-59
HBO2 (Metaborite),4.35754e-75,1.14253e-75,0.0,3.21501e-75
Total (by phase),21.3315,5.48846,8.98903e-6,15.843

Element Balance
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

,Total,Liquid-1,Solid,Liquid-2
,mol,mol,mol,mol
H(+1),11.0456,10.6017,0.0,0.443862
K(+1),3.44418e-4,3.43895e-4,0.0,5.23464e-7
Na(+1),0.0387387,0.0386885,0.0,5.01813e-5

N(-3),3.93297e-4,3.01714e-6,0.0,3.9028e-4
Ba(+2),9.97313e-6,6.43008e-7,8.98903e-6,3.41093e-7
Ca(+2),8.03205e-4,1.31804e-4,0.0,6.71401e-4
Fe(+2),5.22708e-5,1.39742e-12,0.0,5.22708e-5
Mg(+2),5.07981e-4,1.25055e-5,0.0,4.95476e-4
Mn(+2),1.00084e-6,1.30692e-9,0.0,9.99537e-7
Fe(+3),2.3689e-16,2.39243e-18,0.0,2.34497e-16
F(-1),3.73609e-5,4.05386e-6,0.0,3.33071e-5
O(-2),36.7424,5.53653,3.59561e-5,31.2059
Cl(-1),0.0349659,0.0335582,0.0,1.4077e-3
Br(-1),7.33672e-5,6.92616e-5,0.0,4.10559e-6
Li(+1),3.1111e-5,3.10437e-5,0.0,6.73626e-8
C(+4),15.607,0.116148,0.0,15.4909
S(+6),1.76812e-4,1.08705e-4,8.98903e-6,5.91176e-5
S(-2),2.39048e-4,3.42909e-6,0.0,2.35619e-4
Si(+4),2.70525e-4,8.43159e-5,0.0,1.86209e-4
Sr(+2),3.27458e-5,3.26419e-5,0.0,1.03883e-7
N(0),0.252169,1.60394e-4,0.0,0.252008
H(0),2.3689e-16,5.82065e-17,0.0,1.78683e-16
O(0),4.12636e-46,2.49953e-48,0.0,4.10137e-46
B(+3),3.14434e-3,6.32676e-4,0.0,2.51167e-3
N(+4),3.15211e-5,5.36057e-8,0.0,3.14675e-5
Rb(+1),3.62607e-7,4.47263e-9,0.0,3.58134e-7
Cs(+1),9.02641e-8,1.11286e-9,0.0,8.91512e-8
I(-1),3.22984e-5,3.04789e-5,0.0,1.81951e-6
Fe(+6),1.34028e-53,1.33936e-53,0.0,9.18337e-57
MeO(-1),1.57605e-3,6.24368e-4,0.0,9.51686e-4
EtO(-1),1.57605e-3,1.66252e-4,0.0,1.4098e-3
ACETATEION,2.52801e-3,1.09409e-3,0.0,1.43392e-3
CH4,3.15211e-4,3.42785e-7,0.0,3.14868e-4
ACETALDEHD,1.57605e-3,6.60433e-5,0.0,1.51001e-3
ACETONE,3.15211e-4,3.62529e-5,0.0,2.78958e-4

Element Distribution

,Total,Total,Liquid-1,Solid,Liquid-2
,mol,mole %,% of Total,% of Total,% of Total
H(+1),11.0456,17.3305,95.9815,0.0,4.01846
K(+1),3.44418e-4,5.40391e-4,99.848,0.0,0.151985
Na(+1),0.0387387,0.0607809,99.8705,0.0,0.129538
N(-3),3.93297e-4,6.17082e-4,0.767139,0.0,99.2329
Ba(+2),9.97313e-6,1.56478e-5,6.44741,90.1325,3.42012
Ca(+2),8.03205e-4,1.26023e-3,16.4097,0.0,83.5903
Fe(+2),5.22708e-5,8.20128e-5,2.67342e-6,0.0,100.0
Mg(+2),5.07981e-4,7.97021e-4,2.46179,0.0,97.5382
Mn(+2),1.00084e-6,1.57032e-6,0.130582,0.0,99.8694
Fe(+3),2.3689e-16,3.71679e-16,1.00993,0.0,98.9901
F(-1),3.73609e-5,5.86192e-5,10.8505,0.0,89.1495
O(-2),36.7424,57.6488,15.0685,9.78599e-5,84.9314
Cl(-1),0.0349659,0.0548614,95.9741,0.0,4.02593
Br(-1),7.33672e-5,1.15113e-4,94.404,0.0,5.59595
Li(+1),3.1111e-5,4.88131e-5,99.7835,0.0,0.216523
C(+4),15.607,24.4874,0.744202,0.0,99.2558

S(+6),1.76812e-4,2.77417e-4,61.4807,5.08396,33.4353
S(-2),2.39048e-4,3.75065e-4,1.43448,0.0,98.5655
Si(+4),2.70525e-4,4.24453e-4,31.1675,0.0,68.8325
Sr(+2),3.27458e-5,5.1378e-5,99.6828,0.0,0.31724
N(0),0.252169,0.395652,0.0636059,0.0,99.9364
H(0),2.3689e-16,3.71679e-16,24.5712,0.0,75.4288
O(0),4.12636e-46,6.47425e-46,0.605747,0.0,99.3943
B(+3),3.14434e-3,4.93346e-3,20.1211,0.0,79.8789
N(+4),3.15211e-5,4.94565e-5,0.170063,0.0,99.8299
Rb(+1),3.62607e-7,5.68928e-7,1.23347,0.0,98.7665
Cs(+1),9.02641e-8,1.41624e-7,1.2329,0.0,98.7671
I(-1),3.22984e-5,5.06761e-5,94.3666,0.0,5.63342
Fe(+6),1.34028e-53,2.10289e-53,99.9315,0.0,0.0685183
MeO(-1),1.57605e-3,2.47282e-3,39.6159,0.0,60.3841
EtO(-1),1.57605e-3,2.47282e-3,10.5486,0.0,89.4514
ACETATEION,2.52801e-3,3.96643e-3,43.2787,0.0,56.7213
CH4,3.15211e-4,4.94565e-4,0.108748,0.0,99.8913
ACETALDEHD,1.57605e-3,2.47282e-3,4.19042,0.0,95.8096
ACETONE,3.15211e-4,4.94565e-4,11.5012,0.0,88.4988

"Common Representations, Liquid-1 (mol)"

SiO2,8.43159e-5

Calculation Summary
Rates-1 Calculation

Unit Set: Custom

Automatic Chemistry Model
,MSE (H3O+ ion) Databanks:
,,Corrosion (MSE)
,,MSE (H3O+ ion)
,Second Liquid phase
,Redox selected
,Using Helgeson Direct

Single Point
No secondary survey selected

Polarization Curve Range
,Range,,-2.0 to 2.0 V (SHE)
,Step size,0.01 V (SHE)
,No. steps,400

Metal: Stainless steel
,Duplex stainless 2507

Flow Type: Static
Scales included - passivating films included.

There are species for which the kinetic data has not been calibrated:

,C2H6O
,CH3OH
,C2H4O
,CH3COCH3

It is not known if this will affect the calculation accuracy.
,

Stream Inflows
Row Filter Applied: Only Non Zero Values

,Input,Output
Species,mol,mol
H2O,27.4872,27.4872
H2S,1.32530e-4,1.32530e-4
NH3,1.96649e-3,1.96649e-3
B2O3,7.86085e-3,7.86085e-3
BaO,1.06786e-6,1.06786e-6
CaO,8.10236e-4,8.10236e-4
CO2,8.68527,8.68527
Cs2O,2.25660e-7,2.25660e-7
FeO,2.57935e-6,2.57935e-6
K2O,7.80299e-4,7.80299e-4
KI,1.61492e-4,1.61492e-4

Li2O,7.77776e-5,7.77776e-5
MgO,2.53991e-3,2.53991e-3
MnO,5.00422e-6,5.00422e-6
Na2O,3.22905e-3,3.22905e-3
Na(C2H3O2),0.0118520,0.0118520
NaBr,3.66836e-4,3.66836e-4
NaCl,0.174830,0.174830
NaF,1.86805e-4,1.86805e-4
Rb2O,9.06516e-7,9.06516e-7
SiO2,1.35263e-3,1.35263e-3
SO3,8.35261e-4,8.35261e-4
SrO,1.08462e-4,1.08462e-4
BaSO4,4.87978e-5,4.87978e-5
CaCO3,3.20579e-3,3.20579e-3
FeCO3,2.46767e-4,2.46767e-4
FeS,1.20076e-5,1.20076e-5
SrCO3,5.52672e-5,5.52672e-5
N2,0.0700468,0.0700468
C2H6O,8.75585e-4,8.75585e-4
CH3OH,8.75585e-4,8.75585e-4
C2H4O,8.75585e-4,8.75585e-4
CH3COOH,8.75585e-5,8.75585e-5
NO2,1.75117e-5,1.75117e-5
CH4,1.75117e-4,1.75117e-4
CH3COCH3,1.75117e-4,1.75117e-4

Calculated Rates

Corrosion Rate,6.20716e-4,mm/yr
Corrosion Potential,-0.386710,V (SHE)
Repassivation Potential*,6.07549e-3,V (SHE)
Corrosion Current Density,6.04990e-4,A/sq-m
*Calculated at repassivation current density = 1.0e-2 A/sq-m

,Rate may be reduced because of saturation with the following solids:,

,Species,Scaling Tendency,
,BaSO4 (Barite),1.0

,Rate may ,also be reduced because of substantial saturation indices of:

,Species,Scaling Tendency,
,CaCO3 (Calcite),0.111312
,CaF2 (Fluorite),0.186311
,SiO2 (lechatelierite),0.313385
,SrSO4 (Celestine),0.114202
Stream Parameters
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

Mixture Properties
Stream Amount,36.4563,mol
Temperature,169.000,°F

Pressure,4489.00,psia

Liquid 1 Properties
pH,4.55210,
Ionic Strength (x-based),7.33746e-3,mol/mol
Ionic Strength (m-based),0.421975,mol/kg
Dielectric Constant,53.9748,
ORP,0.125558,V (SHE)
Osmotic Pressure,832.778,psia
Specific Electrical Conductivity,76053.2,µmho/cm
"Viscosity, absolute",0.397119,cP
Thermal Conductivity,582.270,cal/hr m °C
Surface Tension,0.0645255,N/m
Interfacial Tension LLE,7.89977e-4,N/m
Standard Liquid Volume,0.523792,L
"Volume, Std. Conditions",0.516811,L
"Total Dissolved Solids, Estimated",26419.9,mg/L
Hardness,777.856,mg/L as CaCO3

Solid Properties
Standard Liquid Volume,7.03505e-7,L

Liquid 2 Properties
pH,3.49282,
Ionic Strength (x-based),8.43024e-4,mol/mol
Ionic Strength (m-based),3.43165,mol/kg
Dielectric Constant,2.14516,
Specific Electrical Conductivity,2172.70,µmho/cm
"Viscosity, absolute",0.449747,cP
Surface Tension,0.0531844,N/m
Thermal Conductivity,517.998,cal/hr m °C
Standard Liquid Volume,0.306670,L
"Volume, Std. Conditions",0.457716,L

Thermodynamic Properties
,Unit,Total,Liquid-1,Solid,Liquid-2
Density,g/ml,0.902477,1.02002,4.47972,0.771615
Enthalpy,J,-1.13355e7,-8.03730e6,-68.4794,-3.29816e6

Total and Phase Flows (Amounts)
column Filter Applied: Only Non Zero Values

,Total,Liquid-1,Solid,Liquid-2
,mol,mol,mol,mol
Mole (True),36.6124,28.3216,4.66565e-5,8.29079
Mole (App),36.4597,28.1619,4.66565e-5,8.29774
,g,g,g,g
Mass,892.320,531.273,0.0108893,361.037
,L,L,cm3,L
Volume,0.988746,0.520846,2.43080e-3,0.467898

Scaling Tendencies

Row Filter Applied: Values > 1.0e-4

Solids,Post-Scale,Pre-Scale
BaSO4 (Barite),1.00000,16.4109
H2O,0.474255,0.474254
SiO2 (lechatelierite),0.313385,0.313393
CaF2 (Fluorite),0.186311,0.186401
SrSO4 (Celestine),0.114202,0.120698
CaCO3 (Calcite),0.111312,0.111312
CaCO3 (Aragonite),0.0882060,0.0882060
CaSO4 (Anhydrite),0.0295266,0.0311373
SrCO3 (Strontianite),0.0250448,0.0250512
CaSO4.2H2O (Gypsum),0.0175426,0.0184995
NaHCO3 (Nahcolite),8.79858e-3,8.79858e-3
CaSO4.0.5H2O (Bassanite),8.78907e-3,9.26852e-3
CaSO4.0.5H2O (Bassanite),8.28148e-3,8.73323e-3
B(OH)3,4.15766e-3,4.15946e-3
NaCl (Halite),1.66652e-3,1.66652e-3
MgF2 (Sellaite),1.41688e-3,1.41688e-3
NaCl.2H2O (hydrohalite),6.91825e-4,6.91825e-4
HBO2 (Metaborite),6.02895e-4,6.03156e-4
MnCO3 (Rhodochrosite),4.39532e-4,4.39532e-4
CH3COOH,3.74444e-4,3.74444e-4
NaMgF3 (Neighborite),1.27329e-4,1.27329e-4
MgCO3,1.22442e-4,1.22442e-4
BaCO3 (Witherite),8.99649e-5,1.39730e-3

Species Output (True Species)
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

,Total,Liquid-1,Solid,Liquid-2
,mol,mol,mol,mol
H2O,27.449,27.336,0.0,0.113055
CO2,8.66206,0.567434,,8.09463
Na+1,0.193316,0.193316,,3.32016e-10
Cl-1,0.171475,0.168998,,2.4775e-3
N2,0.0700468,4.41619e-4,,0.0696052
HCO3-1,0.0247876,0.0244348,,3.5278e-4
B(OH)3,0.0104421,7.44823e-3,0.0,2.99385e-3
CH3COOH,6.25679e-3,5.18558e-3,0.0,1.07121e-3
C2H3O2-1,4.89563e-3,4.78757e-3,,1.08061e-4
B(OH)3Cl-1,3.34722e-3,3.34722e-3,,2.53e-54
Ca+2,2.86088e-3,2.86088e-3,,3.70385e-19
NH2CO2-1,1.92e-3,9.25893e-10,,1.92e-3
K+1,1.71938e-3,1.71938e-3,,3.04959e-10
MgB(OH)3+2,1.54634e-3,5.71129e-5,,1.48923e-3
SiO2 (lechatelierite),1.35226e-3,1.10033e-3,0.0,2.51929e-4
C2H4O,8.75585e-4,2.62938e-4,,6.12647e-4
C2H6O,8.75583e-4,4.69957e-4,,4.05627e-4
CH3OH,8.75536e-4,7.57425e-4,,1.18111e-4
Mg+2,8.25264e-4,8.25264e-4,,3.1496e-20
SO4-2,5.81002e-4,5.81001e-4,,1.68186e-9

Ca(C2H3O2)+1,5.66595e-4,1.48244e-4,,4.18351e-4
CaB(OH)3+2,3.75238e-4,1.1205e-5,,3.64033e-4
Br-1,3.66836e-4,3.592e-4,,7.63552e-6
Fe+2,2.61354e-4,1.7779e-10,,2.61354e-4
Na(C2H3O2),2.16626e-4,2.16626e-4,0.0,8.66094e-12
CH3COCH3,1.75117e-4,9.81219e-5,,7.69952e-5
CH4,1.75117e-4,1.88238e-6,,1.73235e-4
Sr+2,1.63476e-4,1.63476e-4,,3.10448e-20
I-1,1.61492e-4,1.58105e-4,,3.3875e-6
Li+1,1.5535e-4,1.5535e-4,,1.86101e-11
NaMgSO4+1,1.52137e-4,3.22691e-5,,1.19868e-4
H2S,1.44305e-4,1.77967e-5,,1.26509e-4
CaF+1,1.10442e-4,2.9779e-5,,8.06632e-5
CaSO4 (Anhydrite),9.93161e-5,7.61584e-5,0.0,2.31577e-5
F-1,5.71838e-5,5.60045e-5,,1.17932e-6
BaSO4 (Barite),4.66565e-5,,4.66565e-5,
NH4+1,4.64729e-5,4.64436e-5,,2.93041e-8
NO2,1.75117e-5,2.84467e-7,,1.72272e-5
MgF+1,1.48353e-5,3.88649e-6,,1.09488e-5
H3O+1,1.15416e-5,1.15416e-5,,5.17803e-16
NaB(OH)3Cl,6.45164e-6,4.90173e-6,,1.54991e-6
Mn+2,4.36514e-6,2.20887e-7,,4.14425e-6
HF,3.96976e-6,3.96762e-6,,2.13523e-9
Ba+2,3.07149e-6,3.07149e-6,,9.36794e-29
NaB(OH)3HSO4,2.23456e-6,1.73675e-6,,4.97807e-7
CaCO3 (Calcite),2.19804e-6,1.7796e-6,0.0,4.18443e-7
Rb+1,1.81303e-6,4.7497e-7,,1.33806e-6
Ca(C2H3O2)2,1.25906e-6,1.25906e-6,,2.73418e-31
HSO4-1,1.22924e-6,1.22911e-6,,1.35267e-10
K(C2H3O2),1.20971e-6,1.20971e-6,,2.1459e-43
B(OH)4-1,1.16617e-6,1.14879e-6,,1.73802e-8
KMgSO4+1,1.15208e-6,2.63498e-7,,8.88578e-7
K0.75Li0.25Cl,4.66782e-7,3.62656e-7,,1.04126e-7
Cs+1,4.51144e-7,1.17998e-7,,3.33146e-7
CO3-2,4.2742e-7,4.27114e-7,,3.06082e-10
MnCl+1,3.7446e-7,8.69158e-8,,2.87544e-7
NaB(OH)4,3.48292e-7,2.87484e-7,,6.08077e-8
Si(OH)3F.2H2O,3.12343e-7,2.42669e-7,,6.96746e-8
B2O3,2.77203e-7,1.87789e-7,0.0,8.94142e-8
MnHCO3+1,2.64114e-7,6.91915e-8,,1.94923e-7
SrSO4 (Celestine),2.52632e-7,1.96277e-7,0.0,5.6355e-8
HS-1,2.32196e-7,2.26994e-7,,5.20153e-9
Ba(C2H3O2)+1,1.37255e-7,3.59575e-8,,1.01298e-7
MgCO3,9.55765e-8,7.42561e-8,0.0,2.13204e-8
Li(C2H3O2),5.68744e-8,4.41849e-8,0.0,1.26895e-8
HSiO3-1,4.97105e-8,4.89947e-8,,7.15826e-10
CaClCH3OH+1,4.80473e-8,9.42249e-9,,3.86248e-8
MgSO4,4.69917e-8,3.55517e-8,0.0,1.144e-8
CaCl2 (Hydrophilite),3.15327e-8,3.15327e-8,0.0,9.29789e-20
LiSO4-1,3.03529e-8,2.97191e-8,,6.33845e-10
MgF2 (Sellaite),3.03162e-8,2.35535e-8,0.0,6.76267e-9
B2(OH)7-1,1.88816e-8,1.85201e-8,,3.61548e-10
CaB(OH)4+1,1.25466e-8,3.2869e-9,,9.25968e-9
NH4OH,9.3271e-9,8.88773e-9,,4.39375e-10

OH-1,7.71558e-9,7.59651e-9,,1.19071e-10
MgOH+1,5.75497e-9,1.50766e-9,,4.24731e-9
B3O3(OH)4-1,5.52962e-9,5.46249e-9,,6.71258e-11
NH3,3.7672e-9,3.62883e-9,,1.38369e-10
CaOH+1,2.89228e-9,8.60365e-10,,2.03192e-9
C2H7O+1,1.93065e-9,4.98047e-10,,1.43261e-9
KB(OH)4,1.20059e-9,8.50719e-10,,3.49869e-10
LiCl,7.20906e-10,7.20699e-10,0.0,2.06525e-13
SrCO3 (Strontianite),5.7034e-10,4.43113e-10,0.0,1.27226e-10
Na(C2H3O2).CH3OH,5.49857e-10,4.21225e-10,0.0,1.28632e-10
MnCO3 (Rhodochrosite),4.86067e-10,3.77639e-10,0.0,1.08428e-10
BaCO3 (Witherite),4.08198e-10,3.1714e-10,0.0,9.10572e-11
FeCO2+2,3.09344e-10,3.09344e-10,,4.90961e-110
KB(OH)3HSO4,2.95289e-10,2.29419e-10,,6.58706e-11
LiB(OH)4,2.94047e-10,2.2611e-10,0.0,6.79377e-11
MgClCH3OH+1,2.88943e-10,2.53416e-11,,2.63601e-10
NaHF2,2.79561e-10,2.17199e-10,0.0,6.23621e-11
C4H8O4,1.92193e-10,1.47689e-10,,4.45039e-11
Cs(C2H3O2),1.76218e-10,1.75321e-10,0.0,8.9712e-13
LiB(OH)3HSO4,1.35002e-10,1.04887e-10,,3.0115e-11
SrOH+1,6.5851e-11,1.64238e-11,,4.94272e-11
HCl,3.59157e-11,6.82314e-12,,2.90926e-11
Fe(C2H3O2)+1,2.46479e-11,6.45716e-12,,1.81908e-11
Mn(OH)+1,2.15162e-11,5.63672e-12,,1.58795e-11
Na2SO4.NaHSO4,1.71171e-11,1.71171e-11,0.0,1.0749e-17
CH5O+1,1.35957e-11,2.12263e-12,,1.14731e-11
Ba(C2H3O2)2,1.31372e-11,1.02067e-11,0.0,2.93053e-12
CH3COOH2+1,9.56477e-12,2.70144e-12,,6.86334e-12
BaOH+1,1.91793e-12,5.58229e-13,,1.3597e-12
Fe(C2H3O2)3-1,1.54723e-12,1.51475e-12,,3.24782e-14
LiOH,9.45518e-13,9.24507e-13,0.0,2.10112e-14
FeH(CO3)2-1,8.07962e-13,7.91002e-13,,1.69601e-14
FeCl+1,6.26065e-13,1.63537e-13,,4.62528e-13
Mn(CO3)2-2,4.27759e-13,4.27305e-13,,4.53272e-16
CH3O-1,4.20976e-13,4.12136e-13,,8.83916e-15
FeF+1,3.72875e-13,9.82197e-14,,2.74655e-13
K(C2H3O2).CH3OH,3.62219e-13,2.81271e-13,0.0,8.09479e-14
CH3OH.HCl,2.64515e-13,2.05528e-13,,5.89871e-14
Fe(C2H3O2)2,1.92133e-13,1.49274e-13,,4.28595e-14
NaB2O2(OH)4-1,1.82789e-13,1.79134e-13,,3.65497e-15
CH3CH2O-1,7.14141e-14,6.98842e-14,,1.52995e-15
FeOH+1,5.85816e-14,1.5347e-14,,4.32347e-14
NaOH,5.50511e-14,5.48116e-14,0.0,2.39534e-16
FeHS+1,9.90748e-15,2.59552e-15,,7.31196e-15
KB2O2(OH)4-1,9.56106e-15,9.3601e-15,,2.00965e-16
FeS (Pyrrhotite),8.0923e-15,6.28714e-15,0.0,1.80516e-15
FeSO4,6.50952e-15,5.05739e-15,0.0,1.45212e-15
H2SiO4-2,5.34396e-15,5.33835e-15,,5.60969e-18
S-2,4.18447e-15,4.17556e-15,,8.91462e-18
HBr,1.30333e-15,7.66939e-16,,5.36394e-16
FeO+1,1.24259e-15,3.25527e-16,,9.17058e-16
H2SO4,7.9556e-16,7.95559e-16,,7.93286e-22
H2,7.63942e-16,5.82181e-16,,1.81761e-16
Fe(NH3)+2,7.47196e-16,3.45683e-17,,7.12628e-16

HI,6.09807e-16,4.73771e-16,,1.36037e-16
NaOH.Na2SO4,2.58428e-16,2.58428e-16,,3.54297e-25
LiB2O2(OH)4-1,2.28785e-16,2.23982e-16,,4.80248e-18
B5O6(OH)4-1,1.98152e-16,1.94354e-16,,3.79804e-18
FeOH+2,1.87053e-16,9.68584e-18,,1.77368e-16
NaOHCO3-2,1.36821e-16,1.36676e-16,,1.44982e-19
B4O5(OH)4-2,1.24262e-16,1.24142e-16,,1.2002e-19
HFeO2,6.91914e-17,5.37568e-17,,1.54346e-17
MnO (Manganese oxide),1.70965e-17,1.32828e-17,0.0,3.81374e-18
FeF+2,1.6169e-17,8.43158e-19,,1.53259e-17
Fe(C2H3O2)+2,5.15404e-18,2.66882e-19,,4.88715e-18
Fe(C2H3O2)2+1,3.60126e-18,9.43443e-19,,2.65782e-18
Fe+3,2.23739e-18,2.27915e-20,,2.2146e-18
FeCl+2,1.8866e-18,1.22223e-19,,1.76438e-18
SiF6-2,1.69517e-18,1.69338e-18,,1.7965e-21
LiOHCO3-2,1.55521e-18,1.55356e-18,,1.64781e-21
LiCl.Li2CO3,1.26657e-18,9.26665e-19,,3.39908e-19
Li2CO3.Na2CO3,4.54812e-19,3.34067e-19,0.0,1.20745e-19
MgCl2,3.18879e-19,2.19124e-19,0.0,9.97552e-20
FeO,1.53169e-19,1.19001e-19,,3.41676e-20
SO3F-1,1.33886e-19,1.31076e-19,,2.81044e-21
SiF4.2H2O,9.23253e-20,7.17302e-20,,2.05951e-20
FeO2-1,5.53861e-21,5.42234e-21,,1.16262e-22
HSiF6.2H2O-1,2.75568e-21,2.69784e-21,,5.78424e-23
H2F+1,1.00383e-21,2.6298e-22,,7.40855e-22
Fe(NH3)2+2,7.34067e-22,3.39609e-23,,7.00106e-22
FeHSO4+2,6.9435e-23,3.58829e-24,,6.58467e-23
FeCl2+1,3.1115e-23,1.20866e-23,,1.90284e-23
NaF.3HF,3.02343e-24,2.34899e-24,0.0,6.7444e-25
HMnO2-1,2.37569e-24,2.32582e-24,,4.98687e-26
Mn+3,4.27955e-25,5.36185e-27,,4.22593e-25
HFeO2-1,1.23115e-25,1.20531e-25,,2.58434e-27
SiF4,7.72239e-27,5.99974e-27,,1.72264e-27
Mn(OH)4,1.95267e-27,1.51709e-27,,4.35586e-28
SO3,1.90337e-27,1.90302e-27,,3.51574e-31
Mn(OH)3+1,1.68151e-27,4.40514e-28,,1.24099e-27
Fe(NH3)3+2,2.16666e-28,1.00238e-29,,2.06642e-28
Fe(C2H3O2)3,4.75747e-30,3.69621e-30,,1.06125e-30
MnO2-2,4.02613e-31,4.02186e-31,,4.26626e-34
HSO3F,1.7185e-31,1.33515e-31,,3.83349e-32
NaF.4HF,1.48189e-34,1.15132e-34,0.0,3.30568e-35
Fe2(OH)2+4,1.37736e-34,6.10513e-37,,1.37125e-34
Fe(NH3)4+2,1.95191e-37,9.03031e-39,,1.8616e-37
SiF6.SiF4.2H2O(2-),8.89384e-38,8.88441e-38,,9.42633e-41
Fe3(OH)2(C2H3O2)6+1,3.42432e-44,8.97089e-45,,2.52723e-44
Fe(NH3)5+2,1.75974e-46,8.14125e-48,,1.67832e-46
O2,7.37568e-48,4.19009e-49,,6.95667e-48
FeO4-2,2.5027e-52,2.50005e-52,,2.65197e-55
(HF)6,2.24756e-52,1.73992e-52,,5.07644e-53
Fe(NH3)6+2,1.58532e-55,7.33433e-57,,1.51198e-55
MnO4-2,3.66774e-66,3.66385e-66,,3.8865e-69
MnO4-1,8.38887e-72,8.21559e-72,,1.7328e-73
HBO2 (Metaborite),2.49872e-74,1.94133e-74,0.0,5.57393e-75
Total (by phase),36.6124,28.3216,4.66565e-5,8.29079

Element Balance
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

,Total,Liquid-1,Solid,Liquid-2
,mol,mol,mol,mol
H(+1),54.9824,54.7357,0.0,0.2467
K(+1),1.72209e-3,1.72112e-3,0.0,9.67393e-7
Na(+1),0.193693,0.193571,0.0,1.21977e-4
N(-3),1.96649e-3,4.6457e-5,0.0,1.92003e-3
Ba(+2),4.98657e-5,3.10777e-6,4.66565e-5,1.01393e-7
Ca(+2),4.01602e-3,3.12935e-3,0.0,8.86673e-4
Fe(+2),2.61354e-4,4.96337e-10,0.0,2.61354e-4
Mg(+2),2.53991e-3,9.18931e-4,0.0,1.62098e-3
Mn(+2),5.00422e-6,3.77378e-7,0.0,4.62684e-6
Fe(+3),1.52788e-15,3.91174e-16,0.0,1.13671e-15
F(-1),1.86805e-4,9.39279e-5,0.0,9.28768e-5
O(-2),44.9048,28.5818,1.86626e-4,16.3229
Cl(-1),0.17483,0.17235,0.0,2.47948e-3
Br(-1),3.66836e-4,3.592e-4,0.0,7.63552e-6
Li(+1),1.55555e-4,1.55516e-4,0.0,3.94717e-8
C(+4),8.68878,0.591871,0.0,8.0969
S(+6),8.84058e-4,6.9292e-4,4.66565e-5,1.44482e-4
S(-2),1.44538e-4,1.80237e-5,0.0,1.26514e-4
Si(+4),1.35263e-3,1.10063e-3,0.0,2.52e-4
Sr(+2),1.63729e-4,1.63672e-4,0.0,5.65317e-8
N(0),0.140094,8.83238e-4,0.0,0.13921
H(0),1.52788e-15,1.16436e-15,0.0,3.63521e-16
O(0),1.47514e-47,8.38018e-49,0.0,1.39133e-47
B(+3),0.0157217,0.0108723,0.0,4.84942e-3
N(+4),1.75117e-5,2.84467e-7,0.0,1.72272e-5
Rb(+1),1.81303e-6,4.7497e-7,0.0,1.33806e-6
Cs(+1),4.5132e-7,1.18173e-7,0.0,3.33147e-7
I(-1),1.61492e-4,1.58105e-4,0.0,3.3875e-6
Mn(+7),8.38887e-72,8.21559e-72,0.0,1.7328e-73
Mn(+6),3.66774e-66,3.66385e-66,0.0,3.8865e-69
Fe(+6),2.5027e-52,2.50005e-52,0.0,2.65197e-55
MeO(-1),8.75585e-4,7.57435e-4,0.0,1.1815e-4
EtO(-1),8.75585e-4,4.69957e-4,0.0,4.05628e-4
Mn(+3),4.27955e-25,5.36185e-27,0.0,4.22593e-25
Mn(+4),3.63418e-27,1.9576e-27,0.0,1.67658e-27
ACETATEION,0.0119396,0.0103418,0.0,1.59774e-3
CH4,1.75117e-4,1.88238e-6,0.0,1.73235e-4
ACETALDEHD,8.75585e-4,2.62938e-4,0.0,6.12647e-4
ACETONE,1.75117e-4,9.81219e-5,0.0,7.69952e-5

Element Distribution

,Total,Total,Liquid-1,Solid,Liquid-2
,mol,mole %,% of Total,% of Total,% of Total
H(+1),54.9824,50.3828,99.5513,0.0,0.448689

K(+1),1.72209e-3,1.57803e-3,99.9438,0.0,0.0561755
Na(+1),0.193693,0.17749,99.937,0.0,0.0629743
N(-3),1.96649e-3,1.80198e-3,2.36244,0.0,97.6376
Ba(+2),4.98657e-5,4.56941e-5,6.23229,93.5644,0.203332
Ca(+2),4.01602e-3,3.68006e-3,77.9216,0.0,22.0784
Fe(+2),2.61354e-4,2.39491e-4,1.8991e-4,0.0,99.9998
Mg(+2),2.53991e-3,2.32743e-3,36.1797,0.0,63.8203
Mn(+2),5.00422e-6,4.58559e-6,7.54121,0.0,92.4588
Fe(+3),1.52788e-15,1.40007e-15,25.6023,0.0,74.3977
F(-1),1.86805e-4,1.71177e-4,50.2813,0.0,49.7187
O(-2),44.9048,41.1483,63.6496,4.15603e-4,36.3499
Cl(-1),0.17483,0.160204,98.5818,0.0,1.41823
Br(-1),3.66836e-4,3.36148e-4,97.9185,0.0,2.08145
Li(+1),1.55555e-4,1.42542e-4,99.9746,0.0,0.0253747
C(+4),8.68878,7.96191,6.81191,0.0,93.1881
S(+6),8.84058e-4,8.10102e-4,78.3794,5.27754,16.3431
S(-2),1.44538e-4,1.32446e-4,12.4699,0.0,87.5301
Si(+4),1.35263e-3,1.23947e-3,81.3696,0.0,18.6304
Sr(+2),1.63729e-4,1.50032e-4,99.9655,0.0,0.0345276
N(0),0.140094,0.128374,0.630462,0.0,99.3695
H(0),1.52788e-15,1.40007e-15,76.2075,0.0,23.7925
O(0),1.47514e-47,1.35173e-47,5.68096,0.0,94.319
B(+3),0.0157217,0.0144065,69.1546,0.0,30.8454
N(+4),1.75117e-5,1.60468e-5,1.62444,0.0,98.3756
Rb(+1),1.81303e-6,1.66136e-6,26.1976,0.0,73.8024
Cs(+1),4.5132e-7,4.13565e-7,26.1839,0.0,73.8161
I(-1),1.61492e-4,1.47983e-4,97.9024,0.0,2.09762
Mn(+7),8.38887e-72,7.68709e-72,97.9344,0.0,2.0656
Mn(+6),3.66774e-66,3.36092e-66,99.894,0.0,0.105964
Fe(+6),2.5027e-52,2.29334e-52,99.894,0.0,0.105964
MeO(-1),8.75585e-4,8.02338e-4,86.5061,0.0,13.4939
EtO(-1),8.75585e-4,8.02338e-4,53.6735,0.0,46.3265
Mn(+3),4.27955e-25,3.92154e-25,1.2529,0.0,98.7471
Mn(+4),3.63418e-27,3.33016e-27,53.8664,0.0,46.1336
ACETATEION,0.0119396,0.0109408,86.6181,0.0,13.3819
CH4,1.75117e-4,1.60468e-4,1.07493,0.0,98.9251
ACETALDEHD,8.75585e-4,8.02338e-4,30.03,0.0,69.97
ACETONE,1.75117e-4,1.60468e-4,56.0322,0.0,43.9678

"Common Representations, Liquid-1 (mol)"

SiO2,1.10063e-3

Calculation Summary
Rates-2 Calculation

Unit Set: Custom

Automatic Chemistry Model
,MSE (H3O+ ion) Databanks:
,,Corrosion (MSE)
,,MSE (H3O+ ion)
,Second Liquid phase
,Redox selected
,Using Helgeson Direct

Single Point
No secondary survey selected

Polarization Curve Range
,Range,,-2.0 to 2.0 V (SHE)
,Step size,0.01 V (SHE)
,No. steps,400

Metal: Stainless steel
,Duplex stainless 2507

Flow Type: Static
Scales included - passivating films included.

There are species for which the kinetic data has not been calibrated:

,C2H6O
,CH3OH
,C2H4O
,CH3COCH3

It is not known if this will affect the calculation accuracy.
,

Stream Inflows
Row Filter Applied: Only Non Zero Values

,Input,Output
Species,mol,mol
H2O,49.4541,49.4541
H2S,2.84133e-5,2.84133e-5
NH3,3.53968e-3,3.53968e-3
B2O3,0.0141495,0.0141495
BaO,1.92215e-6,1.92215e-6
CaO,1.45843e-3,1.45843e-3
CO2,1.76421,1.76421
Cs2O,4.06188e-7,4.06188e-7
FeO,4.64282e-6,4.64282e-6
K2O,1.40454e-3,1.40454e-3
KI,2.90686e-4,2.90686e-4

Li2O,1.40000e-4,1.40000e-4
MgO,4.57183e-3,4.57183e-3
MnO,9.00759e-6,9.00759e-6
Na2O,5.81230e-3,5.81230e-3
Na(C2H3O2),0.0213336,0.0213336
NaBr,6.60305e-4,6.60305e-4
NaCl,0.314693,0.314693
NaF,3.36248e-4,3.36248e-4
Rb2O,1.63173e-6,1.63173e-6
SiO2,2.43473e-3,2.43473e-3
SO3,1.50347e-3,1.50347e-3
SrO,1.95231e-4,1.95231e-4
BaSO4,8.78360e-5,8.78360e-5
CaCO3,5.77042e-3,5.77042e-3
FeCO3,4.44181e-4,4.44181e-4
FeS,2.16137e-5,2.16137e-5
SrCO3,9.94809e-5,9.94809e-5
N2,0.0140094,0.0140094
C2H6O,1.75117e-4,1.75117e-4
CH3OH,1.75117e-4,1.75117e-4
C2H4O,1.75117e-4,1.75117e-4
CH3COOH,1.75117e-5,1.75117e-5
NO2,3.50234e-6,3.50234e-6
CH4,3.50234e-5,3.50234e-5
CH3COCH3,3.50234e-5,3.50234e-5

Calculated Rates

Corrosion Rate,6.41479e-4,mm/yr
Corrosion Potential,-0.393479,V (SHE)
Repassivation Potential*,1.51303e-3,V (SHE)
Corrosion Current Density,6.25228e-4,A/sq-m
*Calculated at repassivation current density = 1.0e-2 A/sq-m

,Rate may be reduced because of saturation with the following solids:,

,Species,Scaling Tendency,
,BaSO4 (Barite),1.0

,Rate may ,also be reduced because of substantial saturation indices of:

,Species,Scaling Tendency,
,CaCO3 (Aragonite),0.117065
,CaCO3 (Calcite),0.14773
,CaF2 (Fluorite),0.636575
,SiO2 (lechatelierite),0.383141
,SrSO4 (Celestine),0.122167
Stream Parameters
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

Mixture Properties
Stream Amount,51.6119,mol

Temperature,169.000,°F
Pressure,4489.00,psia

Liquid 1 Properties
pH,4.57800,
Ionic Strength (x-based),7.53801e-3,mol/mol
Ionic Strength (m-based),0.433453,mol/kg
Dielectric Constant,54.0362,
ORP,0.106330,V (SHE)
Osmotic Pressure,832.270,psia
Specific Electrical Conductivity,76860.0,µmho/cm
"Viscosity, absolute",0.398350,cP
Thermal Conductivity,582.053,cal/hr m °C
Surface Tension,0.0644590,N/m
Interfacial Tension LLE,8.70447e-4,N/m
Standard Liquid Volume,0.945769,L
"Volume, Std. Conditions",0.933636,L
"Total Dissolved Solids, Estimated",27483.1,mg/L
Hardness,1162.44,mg/L as CaCO3

Solid Properties
Standard Liquid Volume,1.27360e-6,L

Liquid 2 Properties
pH,3.53665,
Ionic Strength (x-based),5.16226e-3,mol/mol
Ionic Strength (m-based),21.5946,mol/kg
Dielectric Constant,2.76869,
Specific Electrical Conductivity,13103.9,µmho/cm
"Viscosity, absolute",0.470853,cP
Surface Tension,0.0535013,N/m
Thermal Conductivity,509.866,cal/hr m °C
Standard Liquid Volume,0.0275349,L
"Volume, Std. Conditions",0.0450185,L

Thermodynamic Properties
,Unit,Total,Liquid-1,Solid,Liquid-2
Density,g/ml,1.00946,1.02035,4.47972,0.766961
Enthalpy,J,-1.48166e7,-1.45211e7,-123.973,-2.95367e5

Total and Phase Flows (Amounts)
column Filter Applied: Only Non Zero Values

,Total,Liquid-1,Solid,Liquid-2
,mol,mol,mol,mol
Mole (True),51.8934,51.1478,8.44654e-5,0.745433
Mole (App),51.6182,50.8696,8.44654e-5,0.748500
,g,g,g,g
Mass,992.031,959.569,0.0197137,32.4424
,L,L,cm3,L
Volume,0.982732,0.940427,4.40065e-3,0.0423000

Scaling Tendencies
Row Filter Applied: Values > 1.0e-4

Solids,Post-Scale,Pre-Scale
BaSO4 (Barite),1.00000,17.9076
CaF2 (Fluorite),0.636575,0.636575
H2O,0.474265,0.474264
SiO2 (lechatelierite),0.383141,0.383152
CaCO3 (Calcite),0.147730,0.147730
SrSO4 (Celestine),0.122167,0.129121
CaCO3 (Aragonite),0.117065,0.117065
CaSO4 (Anhydrite),0.0385352,0.0406341
SrCO3 (Strontianite),0.0272446,0.0272580
CaSO4.2H2O (Gypsum),0.0228958,0.0241428
CaSO4.0.5H2O (Bassanite),0.0114707,0.0120955
CaSO4.0.5H2O (Bassanite),0.0108083,0.0113970
NaHCO3 (Nahcolite),9.08283e-3,9.08283e-3
MgF2 (Sellaite),8.93993e-3,8.93993e-3
B(OH)3,5.68004e-3,5.68101e-3
MnCO3 (Rhodochrosite),3.22816e-3,3.22816e-3
NaCl (Halite),1.65769e-3,1.65769e-3
NaMgF3 (Neighborite),1.34004e-3,1.34004e-3
HBO2 (Metaborite),8.23635e-4,8.23775e-4
NaCl.2H2O (hydrohalite),6.88186e-4,6.88186e-4
CH3COOH,4.13100e-4,4.13100e-4
MgCO3,3.00087e-4,3.00087e-4
BaCO3 (Witherite),9.14863e-5,1.55084e-3

Species Output (True Species)
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

,Total,Liquid-1,Solid,Liquid-2
,mol,mol,mol,mol
H2O,49.384,49.3741,0.0,9.89145e-3
CO2,1.72213,1.00341,,0.718718
Na+1,0.348009,0.348009,,2.98853e-11
Cl-1,0.306147,0.305965,,1.811e-4
HCO3-1,0.0460138,0.0459863,,2.75158e-5
B(OH)3,0.0186302,0.0182865,0.0,3.43751e-4
N2,0.0140094,1.67808e-3,,0.0123313
CH3COOH,0.0103584,0.0102573,0.0,1.01153e-4
C2H3O2-1,0.0100977,0.0100849,,1.27906e-5
B(OH)3Cl-1,8.53275e-3,8.53275e-3,,2.7045e-55
Ca+2,6.36585e-3,6.36585e-3,,7.7899e-20
Mg+2,3.3856e-3,3.3856e-3,,1.40777e-20
K+1,3.09487e-3,3.09487e-3,,2.79464e-11
SiO2 (lechatelierite),2.43375e-3,2.40805e-3,0.0,2.57008e-5
NH2CO2-1,2.37649e-3,2.54681e-8,,2.37647e-3
NH4+1,1.16285e-3,1.16281e-3,,3.99929e-8
SO4-2,1.15368e-3,1.15368e-3,,4.21252e-10
MgB(OH)3+2,9.90047e-4,3.06843e-4,,6.83203e-4
Br-1,6.60305e-4,6.59526e-4,,7.79168e-7

Fe+2,4.70429e-4,4.39678e-9,,4.70424e-4
Na(C2H3O2),4.57372e-4,4.57372e-4,0.0,8.36568e-13
Ca(C2H3O2)+1,4.2692e-4,3.72309e-4,,5.46106e-5
Sr+2,2.94329e-4,2.94329e-4,,7.56123e-21
I-1,2.90686e-4,2.90335e-4,,3.51043e-7
Li+1,2.79682e-4,2.79682e-4,,1.73386e-12
CaSO4 (Anhydrite),1.80368e-4,1.77837e-4,0.0,2.53075e-6
C2H4O,1.75117e-4,1.58187e-4,,1.69305e-5
C2H6O,1.75117e-4,1.68373e-4,,6.74411e-6
CH3OH,1.75114e-4,1.73832e-4,,1.28175e-6
F-1,1.70381e-4,1.70179e-4,,2.02297e-7
NaMgSO4+1,1.64254e-4,1.37557e-4,,2.66975e-5
CaB(OH)3+2,1.24342e-4,3.32206e-5,,9.11215e-5
CaF+1,1.23268e-4,1.08065e-4,,1.52026e-5
BaSO4 (Barite),8.44654e-5,,8.44654e-5,
H2S,4.95214e-5,3.70697e-5,,1.24517e-5
CH4,3.50234e-5,7.24077e-6,,2.77826e-5
CH3COCH3,3.50234e-5,3.37915e-5,,1.23192e-6
MgF+1,2.98543e-5,2.60421e-5,,3.81213e-6
H3O+1,1.98193e-5,1.98193e-5,,5.68511e-17
NaB(OH)3Cl,1.21016e-5,1.19249e-5,,1.76694e-7
HF,1.13444e-5,1.13441e-5,,2.80591e-10
Mn+2,6.79731e-6,2.64005e-6,,4.15725e-6
Ba+2,5.21281e-6,5.21281e-6,,2.60808e-29
NaB(OH)3HSO4,4.36785e-6,4.31022e-6,,5.76327e-8
CaCO3 (Calcite),4.28052e-6,4.23411e-6,0.0,4.64057e-8
Ca(C2H3O2)2,3.72796e-6,3.72796e-6,,3.66852e-32
NO2,3.50234e-6,9.00994e-7,,2.60135e-6
Rb+1,3.26346e-6,2.84674e-6,,4.16715e-7
K(C2H3O2),3.08867e-6,3.08867e-6,,2.19241e-44
B(OH)4-1,2.98751e-6,2.98496e-6,,2.55542e-9
HSO4-1,2.2565e-6,2.25648e-6,,2.15479e-11
KMgSO4+1,1.31533e-6,1.11886e-6,,1.96477e-7
MnCl+1,1.21941e-6,1.04024e-6,,1.79172e-7
MnHCO3+1,9.8575e-7,8.59879e-7,,1.25872e-7
CO3-2,8.69288e-7,8.69231e-7,,5.65598e-11
Si(OH)3F.2H2O,8.5894e-7,8.47587e-7,,1.13522e-8
Cs+1,8.11147e-7,7.07343e-7,,1.03804e-7
NaB(OH)4,7.42207e-7,7.34941e-7,,7.26612e-9
K0.75Li0.25Cl,6.5385e-7,6.45208e-7,,8.64165e-9
B2O3,6.41529e-7,6.27502e-7,0.0,1.40263e-8
HS-1,5.05657e-7,5.05005e-7,,6.52752e-10
SrSO4 (Celestine),3.81496e-7,3.76454e-7,0.0,5.04207e-9
MgCO3,3.30665e-7,3.26295e-7,0.0,4.37026e-9
MgF2 (Sellaite),2.7002e-7,2.66451e-7,0.0,3.56873e-9
NH4OH,2.3577e-7,2.35224e-7,,5.45572e-10
MgSO4,1.55629e-7,1.53321e-7,0.0,2.30825e-9
HSiO3-1,1.14036e-7,1.13941e-7,,9.42927e-11
NH3,9.64032e-8,9.62313e-8,,1.71885e-10
Li(C2H3O2),9.31386e-8,9.19071e-8,0.0,1.23145e-9
Ba(C2H3O2)+1,7.93549e-8,6.9222e-8,,1.01329e-8
CaCl2 (Hydrophilite),6.90113e-8,6.90113e-8,0.0,9.38257e-21
B2(OH)7-1,6.59515e-8,6.58789e-8,,7.26024e-11
LiSO4-1,5.824e-8,5.81704e-8,,6.95474e-11

B3O3(OH)4-1,2.65499e-8,2.65316e-8,,1.82869e-11
OH-1,1.44797e-8,1.44697e-8,,1.00064e-11
CaB(OH)4+1,1.17235e-8,1.02265e-8,,1.49699e-9
FeCO2+2,8.33657e-9,8.33657e-9,,1.9345e-108
MgOH+1,7.2688e-9,6.34063e-9,,9.28162e-10
MnCO3 (Rhodochrosite),5.03944e-9,4.97283e-9,0.0,6.6604e-11
CaClCH3OH+1,3.16954e-9,2.61101e-9,,5.58529e-10
KB(OH)4,2.21383e-9,2.17195e-9,,4.18799e-11
CaOH+1,2.1984e-9,1.95795e-9,,2.40451e-10
LiCl,1.29497e-9,1.29495e-9,0.0,1.72145e-14
Cs(C2H3O2),1.22955e-9,1.22926e-9,0.0,2.90731e-13
NaHF2,1.04879e-9,1.03493e-9,0.0,1.38615e-11
SrCO3 (Strontianite),8.75826e-10,8.64251e-10,0.0,1.15754e-11
LiB(OH)4,5.90693e-10,5.82523e-10,0.0,8.1699e-12
BaCO3 (Witherite),5.85969e-10,5.78224e-10,0.0,7.7445e-12
KB(OH)3HSO4,5.7535e-10,5.67746e-10,,7.60415e-12
C4H8O4,3.27932e-10,3.23453e-10,,4.4791e-12
LiB(OH)3HSO4,2.65516e-10,2.62007e-10,,3.50921e-12
Fe(C2H3O2)+1,2.13698e-10,1.86411e-10,,2.72874e-11
C2H7O+1,1.93655e-10,1.68618e-10,,2.50376e-11
Na(C2H3O2).CH3OH,1.13265e-10,1.11675e-10,0.0,1.59093e-12
Mn(OH)+1,8.14391e-11,7.104e-11,,1.03991e-11
Fe(C2H3O2)3-1,6.00387e-11,5.99662e-11,,7.25619e-14
SrOH+1,3.49863e-11,3.01921e-11,,4.79427e-12
Na2SO4.NaHSO4,3.31638e-11,3.31638e-11,0.0,9.64991e-19
Ba(C2H3O2)2,2.3277e-11,2.29694e-11,0.0,3.07642e-13
FeH(CO3)2-1,2.27037e-11,2.26763e-11,,2.74394e-14
MgClCH3OH+1,2.01259e-11,1.301e-11,,7.11594e-12
HCl,1.39451e-11,1.16303e-11,,2.31477e-12
Mn(CO3)2-2,6.31446e-12,6.3138e-12,,6.61903e-16
CH3COOH2+1,5.71208e-12,5.04906e-12,,6.63014e-13
Fe(C2H3O2)2,5.10507e-12,5.0376e-12,,6.74715e-14
FeF+1,4.68893e-12,4.09307e-12,,5.95854e-13
FeCl+1,4.66361e-12,4.06603e-12,,5.9758e-13
LiOH,1.52214e-12,1.52029e-12,0.0,1.84598e-15
BaOH+1,1.09283e-12,9.69207e-13,,1.23622e-13
NaB2O2(OH)4-1,6.67922e-13,6.67154e-13,,7.68336e-16
CH5O+1,5.89308e-13,4.59296e-13,,1.30012e-13
FeOH+1,4.60386e-13,4.01599e-13,,5.87872e-14
FeS (Pyrrhotite),2.06054e-13,2.0333e-13,0.0,2.72332e-15
FeSO4,1.37797e-13,1.35976e-13,0.0,1.82127e-15
NaOH,1.03195e-13,1.03174e-13,0.0,2.09338e-17
CH3O-1,1.0074e-13,1.00618e-13,,1.21736e-16
FeHS+1,9.08158e-14,7.92194e-14,,1.15964e-14
K(C2H3O2).CH3OH,7.5194e-14,7.41976e-14,0.0,9.9641e-16
CH3OH.HCl,4.54166e-14,4.48164e-14,,6.00223e-16
KB2O2(OH)4-1,3.47421e-14,3.47001e-14,,4.20463e-17
Fe(NH3)+2,3.45718e-14,1.26654e-14,,2.19065e-14
CH3CH2O-1,2.66898e-14,2.6657e-14,,3.27199e-17
H2SiO4-2,1.3311e-14,1.33096e-14,,1.38485e-18
S-2,9.96796e-15,9.96586e-15,,2.09654e-18
FeO+1,5.47182e-15,4.77312e-15,,6.98704e-16
H2,3.37338e-15,3.32495e-15,,4.84291e-17
B5O6(OH)4-1,1.76454e-15,1.76259e-15,,1.94445e-18

H2SO4,1.38531e-15,1.38531e-15,,1.1068e-22
HBr,1.36711e-15,1.32389e-15,,4.32124e-17
B4O5(OH)4-2,8.82032e-16,8.81948e-16,,8.42925e-20
HFeO2,8.46404e-16,8.35218e-16,,1.11866e-17
LiB2O2(OH)4-1,8.39184e-16,8.3817e-16,,1.01423e-18
HI,8.29122e-16,8.18164e-16,,1.09588e-17
NaOH.Na2SO4,5.16763e-16,5.16763e-16,,3.27245e-26
FeOH+2,3.41857e-16,1.34898e-16,,2.06959e-16
NaOHCO3-2,2.87891e-16,2.8786e-16,,3.01777e-20
MnO (Manganese oxide),1.79757e-16,1.77381e-16,0.0,2.37577e-18
SiF6-2,6.91095e-17,6.91022e-17,,7.24512e-21
FeF+2,4.72329e-17,1.87007e-17,,2.85323e-17
Fe(C2H3O2)2+1,1.93014e-17,1.68368e-17,,2.46462e-18
Fe(C2H3O2)+2,1.03917e-17,4.10058e-18,,6.29109e-18
Fe+3,6.08883e-18,3.07926e-19,,5.78091e-18
FeCl+2,3.57829e-18,1.61614e-18,,1.96215e-18
FeO,3.34381e-18,3.29962e-18,,4.41937e-20
LiOHCO3-2,3.28749e-18,3.28714e-18,,3.44572e-22
LiCl.Li2CO3,1.84343e-18,1.81244e-18,,3.09852e-20
SiF4.2H2O,1.02689e-18,1.01332e-18,,1.3572e-20
MgCl2,9.01571e-19,8.8285e-19,0.0,1.8721e-20
Li2CO3.Na2CO3,7.18419e-19,7.06516e-19,0.0,1.19034e-20
Fe(NH3)2+2,5.00805e-19,1.83469e-19,,3.17336e-19
SO3F-1,3.86537e-19,3.8607e-19,,4.67164e-22
HSiF6.2H2O-1,1.03001e-19,1.02877e-19,,1.2448e-22
FeO2-1,8.96884e-20,8.958e-20,,1.08396e-22
H2F+1,8.1278e-22,7.08995e-22,,1.03785e-22
FeCl2+1,1.72349e-22,1.5922e-22,,1.31283e-23
FeHSO4+2,1.22952e-22,4.84497e-23,,7.45023e-23
HMnO2-1,3.30664e-23,3.30264e-23,,3.99636e-26
NaF.3HF,2.87948e-23,2.84142e-23,0.0,3.80568e-25
HFeO2-1,3.55796e-24,3.55366e-24,,4.3001e-27
Fe(NH3)3+2,2.17956e-24,7.98478e-25,,1.38108e-24
Mn+3,5.64008e-25,3.43814e-26,,5.29626e-25
SiF4,8.58889e-26,8.47537e-26,,1.13516e-27
Mn(OH)4,6.44653e-27,6.36133e-27,,8.5201e-29
SO3,3.3126e-27,3.31257e-27,,2.8432e-32
Mn(OH)3+1,1.99837e-27,1.74319e-27,,2.55174e-28
Fe(C2H3O2)3,7.81427e-29,7.71099e-29,,1.03278e-30
MnO2-2,6.11237e-30,6.11173e-30,,6.40719e-34
HSO3F,3.74797e-31,3.69844e-31,,4.95353e-33
Fe(NH3)4+2,2.89522e-32,1.06066e-32,,1.83456e-32
Fe2(OH)2+4,1.01099e-32,6.77699e-35,,1.00421e-32
NaF.4HF,2.2487e-33,2.21898e-33,0.0,2.97201e-35
SiF6.SiF4.2H2O(2-),2.85688e-35,2.85658e-35,,2.99533e-39
Fe(NH3)5+2,3.8487e-40,1.40997e-40,,2.43874e-40
Fe3(OH)2(C2H3O2)6+1,2.04161e-41,1.78092e-41,,2.60696e-42
Fe(NH3)6+2,5.11244e-48,1.87294e-48,,3.2395e-48
O2,1.31282e-49,7.38098e-50,,5.74724e-50
(HF)6,5.17847e-51,5.10923e-51,,6.92462e-53
FeO4-2,7.77721e-52,7.77639e-52,,8.15233e-56
MnO4-2,5.48934e-66,5.48876e-66,,5.75411e-70
MnO4-1,6.45153e-72,6.44386e-72,,7.67062e-75
HBO2 (Metaborite),4.81873e-74,4.75504e-74,0.0,6.3687e-76

Total (by phase),51.8934,51.1478,8.44654e-5,0.745433

Element Balance
Row Filter Applied: Only Non Zero Values
column Filter Applied: Only Non Zero Values

	Total	Liquid-1	Solid	Liquid-2
	mol	mol	mol	mol
H(+1)	98.9192	98.8911	0.0	0.0280528
K(+1)	3.09976e-3	3.09956e-3	0.0	2.03036e-7
Na(+1)	0.348648	0.348621	0.0	2.69392e-5
N(-3)	3.53968e-3	1.16317e-3	0.0	2.37651e-3
Ba(+2)	8.97582e-5	5.28263e-6	8.44654e-5	1.01411e-8
Ca(+2)	7.22884e-3	7.06533e-3	0.0	1.63514e-4
Fe(+2)	4.70437e-4	1.30164e-8	0.0	4.70424e-4
Mg(+2)	4.57183e-3	3.85791e-3	0.0	7.13921e-4
Mn(+2)	9.00759e-6	4.54522e-6	0.0	4.46237e-6
Fe(+3)	6.74677e-15	5.78489e-15	0.0	9.61881e-16
F(-1)	3.36248e-4	3.17012e-4	0.0	1.92359e-5
O(-2)	53.0672	51.6112	3.37862e-4	1.45569
Cl(-1)	0.314693	0.314512	0.0	1.81465e-4
Br(-1)	6.60305e-4	6.59526e-4	0.0	7.79168e-7
Li(+1)	2.79999e-4	2.79996e-4	0.0	3.47484e-9
C(+4)	1.77052	1.0494	0.0	0.721122
S(+6)	1.59131e-3	1.47735e-3	8.44654e-5	2.94903e-5
S(-2)	5.00271e-5	3.75747e-5	0.0	1.24524e-5
Si(+4)	2.43473e-3	2.40902e-3	0.0	2.57123e-5
Sr(+2)	2.94712e-4	2.94707e-4	0.0	5.05844e-9
N(0)	0.0280187	3.35617e-3	0.0	0.0246626
H(0)	6.74677e-15	6.64991e-15	0.0	9.68583e-17
O(0)	2.62564e-49	1.4762e-49	0.0	1.14945e-49
B(+3)	0.0282991	0.0271807	0.0	1.11835e-3
N(+4)	3.50234e-6	9.00994e-7	0.0	2.60135e-6
Rb(+1)	3.26346e-6	2.84674e-6	0.0	4.16715e-7
Cs(+1)	8.12377e-7	7.08572e-7	0.0	1.03805e-7
I(-1)	2.90686e-4	2.90335e-4	0.0	3.51043e-7
Mn(+7)	6.45153e-72	6.44386e-72	0.0	7.67062e-75
Mn(+6)	5.48934e-66	5.48876e-66	0.0	5.75411e-70
Fe(+6)	7.77721e-52	7.77639e-52	0.0	8.15233e-56
MeO(-1)	1.75117e-4	1.73835e-4	0.0	1.28232e-6
EtO(-1)	1.75117e-4	1.68373e-4	0.0	6.74413e-6
Mn(+3)	5.64008e-25	3.43814e-26	0.0	5.29626e-25
Mn(+4)	8.4449e-27	8.10452e-27	0.0	3.40375e-28
ACETATEION	0.0213511	0.0211826	0.0	1.68566e-4
CH4	3.50234e-5	7.24077e-6	0.0	2.77826e-5
ACETALDEHD	1.75117e-4	1.58187e-4	0.0	1.69305e-5
ACETONE	3.50234e-5	3.37915e-5	0.0	1.23192e-6

Element Distribution

	Total	Total	Liquid-1	Solid	Liquid-2
	mol	mole %	% of Total	% of Total	% of Total

H(+1),98.9192,64.0156,99.9716,0.0,0.0283594
K(+1),3.09976e-3,2.00602e-3,99.9934,0.0,6.55003e-3
Na(+1),0.348648,0.225628,99.9923,0.0,7.72675e-3
N(-3),3.53968e-3,2.2907e-3,32.8609,0.0,67.1391
Ba(+2),8.97582e-5,5.80871e-5,5.8854,94.1033,0.0112983
Ca(+2),7.22884e-3,4.67815e-3,97.738,0.0,2.26197
Fe(+2),4.70437e-4,3.04444e-4,2.76688e-3,0.0,99.9972
Mg(+2),4.57183e-3,2.95867e-3,84.3844,0.0,15.6156
Mn(+2),9.00759e-6,5.82927e-6,50.4599,0.0,49.5401
Fe(+3),6.74677e-15,4.36618e-15,85.7431,0.0,14.2569
F(-1),3.36248e-4,2.17603e-4,94.2793,0.0,5.72073
O(-2),53.0672,34.3425,97.2563,6.36667e-4,2.74311
Cl(-1),0.314693,0.203654,99.9423,0.0,0.0576642
Br(-1),6.60305e-4,4.27317e-4,99.882,0.0,0.118001
Li(+1),2.79999e-4,1.81202e-4,99.9988,0.0,1.24102e-3
C(+4),1.77052,1.1458,59.2707,0.0,40.7293
S(+6),1.59131e-3,1.02981e-3,92.8389,5.30793,1.85321
S(-2),5.00271e-5,3.23751e-5,75.1088,0.0,24.8912
Si(+4),2.43473e-3,1.57564e-3,98.9439,0.0,1.05606
Sr(+2),2.94712e-4,1.90723e-4,99.9983,0.0,1.7164e-3
N(0),0.0280187,0.0181323,11.9783,0.0,88.0217
H(0),6.74677e-15,4.36618e-15,98.5644,0.0,1.43563
O(0),2.62564e-49,1.69919e-49,56.2222,0.0,43.7778
B(+3),0.0282991,0.0183138,96.0481,0.0,3.95189
N(+4),3.50234e-6,2.26654e-6,25.7255,0.0,74.2745
Rb(+1),3.26346e-6,2.11195e-6,87.2309,0.0,12.7691
Cs(+1),8.12377e-7,5.2573e-7,87.2221,0.0,12.7779
I(-1),2.90686e-4,1.88118e-4,99.8792,0.0,0.120764
Mn(+7),6.45153e-72,4.17512e-72,99.8811,0.0,0.118896
Mn(+6),5.48934e-66,3.55243e-66,99.9895,0.0,0.0104823
Fe(+6),7.77721e-52,5.03303e-52,99.9895,0.0,0.0104823
MeO(-1),1.75117e-4,1.13327e-4,99.2677,0.0,0.732265
EtO(-1),1.75117e-4,1.13327e-4,96.1488,0.0,3.85121
Mn(+3),5.64008e-25,3.64998e-25,6.09591,0.0,93.9041
Mn(+4),8.4449e-27,5.46512e-27,95.9695,0.0,4.03054
ACETATEION,0.0213511,0.0138174,99.2105,0.0,0.789495
CH4,3.50234e-5,2.26654e-5,20.6741,0.0,79.3259
ACETALDEHD,1.75117e-4,1.13327e-4,90.3319,0.0,9.66813
ACETONE,3.50234e-5,2.26654e-5,96.4826,0.0,3.51743

"Common Representations, Liquid-1 (mol)"

SiO2,2.40902e-3