

November 27, 2023

Stephen H. Lee, Director  
Louisiana Department of Natural Resources  
Injection and Mining Division  
617 N. 3<sup>rd</sup> Street  
Baton Rouge, Louisiana 70802

**Re: First Response to 3<sup>rd</sup> Supplement to Compliance Order No. IMD 2022-027  
Westlake US 2, LLC – Well 6X (SN 57788) & Well 7B (SN 67270)**

Dear Mr. Lee,

This response letter is submitted on behalf of Westlake US 2, LLC (“Westlake”) who received the 3<sup>rd</sup> Supplement to Compliance Order No. IMD 2022-027 on October 25, 2023. The order listed certain findings of fact, and orders requiring responses at various due dates. This is the First Response to satisfy certain Orders requiring a response by no later than thirty (30) days after receipt of the Supplement (agreed to be November 27, 2023). Additional Responses will be submitted at later dates.

Orders & Responses:

1. Until further notice, Westlake must submit daily reports of all measurable micro seismic events, including magnitude and three-dimensional (3D) location information, to Conservation’s Injection and Mining Division (“IMD”).

*Westlake Response:*

*On October 26, 2023 Westlake submitted a response via email titled “Response to ThirdOrder\_#1\_MicroseismicReport”. An email confirmation from the IMD was received on November 9, 2023 indicating response was accepted and approved.*

2. Westlake must as soon as possible, but in no event later than seven (7) days after receipt of this Supplement, collect a brine sample from brine to be injected into PPG Well No. 007B and analyze for Hydrogen, Carbon, and Oxygen stable isotopes.

*Westlake Response:*

*Westlake tasked ERM with collecting a brine sample from Caverns 18, 21, 22, and Starks Tie-in, and those samples were collected on October 30, 2023. Results were submitted by Scott Himes via email on 11-13-2023.*

3. Westlake must as soon as possible, but in no event later than thirty (30) days after receipt of this Supplement, submit all of the following to IMD:
  - a. An identification of the potential path(s) of migration for liquids from within Cavern 6 and 7 to the outside of the salt stock;

*Westlake Response:*

*On November 15, 2023, Westlake submitted a clarification and request for extension related to this Order, due to a wholesome response to this Order needing to reference certain fault plane maps that had a previously agreed upon due date to the IMD of November 29, 2023. IMD responded with an acceptance and approval of the extension request to November 29, 2023.*

*Westlake will submit a response to this item by November 29, 2023 which will include certain geological and fault plane related figures, as well as an updated estimation of a surface expression impact zone.*

- b. All available historical sonar data prior to 1993 for PPG Caverns Nos. 2, 4, 5, 6, and 7;

*Westlake Response:*

*Historical hardcopy sonars files have been collected and scanned in as .pdf documents. The electronic files are voluminous. Westlake is transmitting a thumb drive with the files to IMD via first class mail return receipt requested today.*

- c. InSAR reports with an expanded subsidence area of interest which incorporates all Westlake caverns;

*Westlake Response:*

*See Attachment A for the updated TSX and SNT report templates derived from the most recent November 21<sup>st</sup> data set/image and incorporating the requested additional areas of interest.*

- d. A plan to sample and monitor all residential and domestic water wells within two (2) miles of the wellhead of PPG Well No. 007B;

*Westlake Response:*

*A search of the SONRIS database shows 95 total registered wells within a 2-mile radius of PPG Well No. 007B. By process of elimination the list of active residential or domestic wells was reduced to 4 water wells for sampling. Industrial, irrigation, rig supply, monitor, and observation wells were eliminated as wells for potential sampling. The wells eliminated for sample consideration are shown on Table 1 within Attachment B. Additional wells which are not in the SONRIS database but were identified during the water well survey, or by visual inspection, and are potentially residential or domestic wells were added to Table 1 within Attachment B. The final list of 8 wells proposed for sampling is provided on Table 1 within Attachment B, and the wells are shown on Figure 1 within Attachment B. One of the wells (019-17636Z) is known as the Cottages well and is already included in the monthly sampling program.*

*Prior to sampling each water well, access will be requested from the landowner to enter their property and sample the well. The request for access will be sent within 10 days of the approval of this sampling plan, and several property owners have already been contacted. Following receipt of access, each well will be inspected and tested for operation. If the well is operational, the well will be purged for several minutes, and samples will be collected as close to the well as possible, and before any treatment by filters or softeners. If the well is not operational it will not be sampled unless it can be repaired. Pumps, motors, or other equipment will not be removed from inoperable wells.*

*Samples will be analyzed by a Louisiana accredited environmental laboratory for analysis of the following parameters:*

- *Metals (As, Ba, Cd, Ca, Cr, Fe, Pb, Mg, Mn, Hg, K, Se, Ag, Na, Sr, Zn),*
- *Chloride, Bromide, Sulfate*
- *Bicarbonate, Carbonate*
- *Total Dissolved Solids (TDS),*
- *Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), and*
- *Total Petroleum Hydrocarbon (TPH) fractions*

*The initial sampling is anticipated to be completed by the end of January 2024, depending upon property access and well condition. Additional sampling is not proposed at this time. In the event that constituents of concern are observed in the groundwater, additional sampling of the residential wells will be conducted on a semi-annual basis.*

*If additional residential or domestic wells are identified, they will be sampled as soon as reasonably possible.*

- e. A plan to install tiltmeters on all accessible Westlake cavern wellheads by the end of the calendar year 2023, including specifications of the tiltmeters used and a data reporting schedule;

*Westlake Response:*

- *Westlake is developing an integrated deformation plan for Sulphur Mines dome that includes InSAR, precision differential GPS, and tiltmeters which will allow for the near real-time measurement of micro-deformation around the western half of the salt dome. The plan is in development with expert vendors and outside consultants in micro-deformation (including Halliburton). One of the initial conclusions from consultation with that team is that simply installing tiltmeters on each Westlake wellhead would not provide the level of data accuracy or clarity that is needed to evaluate micro-deformation. Westlake has tasked these experts to recommend a system/plan of overlapping technologies which will allow*

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*Westlake and UIC to determine whether there is any deformation of the surface or subsurface sediments which likely indicates an issue with the integrity of the caverns in order to allow safe operation on the Sulphur Mines dome. We anticipate the plan will be developed before the end of 2023 and installation in Q1 2024, following approval by IMD/DNR.*

*Therefore, in response to this Order, Westlake requests an extension for the submittal of an official plan regarding the installation of tilt meters to December 26, 2023.*

- *Additionally, Westlake requests an extension for the installation of tilt meters to be completed generally in Q1 2024.*

- f. An area-wide decommissioning plan for Westlake's facility at the Sulphur Mines Salt Dome;

*Westlake Response:*

*See Attachment C.*

- g. A itemized delineation with a map of all existing infrastructure and utilities located at Westlake's Sulphur Mines Salt Dome facility;

*Westlake Response:*

*See Attachment D.*

- h. A feasibility study for the incorporation of thermography cameras (forward-looking infrared cameras or other comparable devices) into daily observational scope;

*Westlake Response:*

*See Attachment E.*

- i. A plan to construct a containment structure around the potential affected area at the surface; and

*Westlake Response:*

*See Attachment Fa (Westlake Containment Structure Plan) and Attachment Fb (Updated Impact Zone Estimate).*

- j. A plan to collect and sample gas over known or suspected bubble sites or sites where gas is present using a gas cap or other mechanical capturing device.

*Westlake Response:*

*Over the past several months, numerous attempts have been made to collect gas samples from known or suspected bubble sites (both submerged and not submerged). The success of these sampling efforts has been mixed. There are challenges that must be overcome to successfully acquire a gas sample from the*



*bubble site sites.*

### **Submerged Bubble Sites**

*Gas from several of the submerged bubble sites has been successfully collected. However, there are others that have proved more problematic. Several different “gas traps” have been tried at the submerged bubble sites to collect the gas for sampling. The common problem is introducing water into the gas sampling container.*

*Some of the submerged bubble sites have a steady stream of gas with a relatively high flow rate, and it is relatively easy to identify the main conduit. At these locations an inverted funnel has been used to divert the gas into the gas sampling container without assistance from a pump.*

*At other locations, the pressure of the gas at the bubble site is too low to fill the sample container unaided. Attempts have been made to trap the gas, or pump the gas, but all have failed to be viable. The low flow rate, and low relative pressure of the gas limits the ability to accumulate enough gas to collect a sample. Allowing the gas to flow into a chamber and accumulate has not worked effectively because as soon as the gas chamber equilibrates with the low pressure of the bubble site the gas stops flowing from the bubble site. Attempting to use a pump to assist the gas flow has failed because the pump pulls in water.*

*Dissolved gas samples were selected to evaluate the isotopic composition of the gas dissolved in the water where the gas could not be isolated effectively. While the dissolved gas sample cannot specifically determine the composition of the gas, it can effectively determine the stable isotopic ratios of the gases. However, introducing heat or agitation to the sampling process to free the dissolved gas would introduce naturally occurring gases into the sample and is essentially the same as collecting a water sample for dissolved gas analysis.*

*The best option is to divert the gas directly into the sampling container, when possible.*

### **Non-Submerged Bubble Sites**

*The most difficult issue associated with dry bubble sites is locating them. During the last two quarterly events a DP-IR methane detection meter has been used to locate, or attempt to locate, the dry bubble sites. The success of finding the bubble sites is also mixed. Some of the bubble sites are easily identified which have a primary conduit where the gas is being expressed at the surface, such as the PPG-7A bubble site. Others are more diffuse, and a primary conduit is not present, such as the area around SN 110159. At SN 110159 bubble site, the DP-*

*IR is used to screen the ground surface in the area where the bubble site is known to exist. The location with the highest detection of methane is selected as the sampling location, which might not be the exact location as the previous sample. At these diffuse locations the methane levels are quite low, and there are no visible bubbles or holes at the surface, even when water is poured over the area. During the 3rd Quarter 2023 sampling event, several previously submerged bubble sites were dry. The same technique was used to locate the bubble sites, and some of them were found. However, there was no gas methane detected bubble sites Nos. 9 and 19. The locations were scanned where the markers were located, but no methane was detected on the DP-IR, and no sample was collected. Identifying the correct location to sample has proven difficult.*

*The volume of gas venting at the location can also be problematic. When gas is flowing out of a primary conduit it is typically flowing at a rate that can be successfully sampled without pumping, as the majority of the gas entering the sampling containers is gas flowing from the conduit. When the bubble site are more diffuse at the surface, with no apparent conduit, it is more difficult to get a good quality sample. These samples have to be pulled into the sampling container via a pump (or vacuum) because there is not enough flow or pressure to fill the gas containers. Pulling the gas into the sample container introduces ambient soil gas which reduces the quality of the gas sample.*

*Attempts to isolate the gas sample have yielded mixed results. Unsaturated soil is generally composed of three phases - solids, liquid (water), and gas. Typical soil gas is comprised of nitrogen, oxygen, carbon dioxide, and potentially other naturally-occurring gases as a result of biodegradation or other physical and chemical properties of the soil. Deeper gas seeping up through the soil column is mixed with the naturally present soil gases. Where a conduit is present, deep gas can flow to the surface with minimal mixing. However, if there is no apparent conduit, the deep gas will disperse and mix with the naturally present soil gas and might not have a surface expression. Collecting samples of the soil gas will have interference with the ambient soil gas. Selectively limiting the deep bubble site gas from the native soil gas is impossible.*

#### **Gas Sampling Plan**

*For the submerged bubble sites, if gas flow is sufficient a gas sample will be collected by diverting the sample directly into the sample container. For bubble sites with low flow, a process of forcing gas into a container will be attempted, based on work done by T. Langenegger, et al. (2019, What the bubble knows: Lake methane dynamics revealed by sediment gas bubble composition, Limnology and Oceanography, vol. 64, pp. 1526–1544). This process used a*

*weighted funnel to agitate the sediments to release the gas, captured by the funnel and diverted into a vial or bottle attached to the funnel (Figure 2 within Attachment G). The trapped gas will be transferred to the sample container. Until this process can be vetted and refined, a dissolved gas sample will also be collected.*

*Gas at several submerged bubble sites (#11, #13, #14, #15, #16) has not been sampled because there are no apparent bubbles at those locations. During the December 2023 quarterly sampling, bubbles sites #13 and #14 will be sampled for gas, even if no bubbles are apparent. Sites #11, #15, and #16 are all within 20 feet of #12, which is sampled quarterly. Only one sample will be collected at bubble site #12 to account for the other three sites.*

*For the non-submerged bubble sites, the site identification and sampling process will continue as it had been performed previously. The DP-IR will be used to identify the bubble site location. The upper approximately 1-inch of soil will be removed using a small shovel or scoop, then a small, inverted funnel will be placed at the identified bubble site, approximately one inch below the surface, and sealed with clean modeling clay at the surface. If the gas is flowing at a relatively high rate the gas container will be filled unassisted. If the flow of gas is low, the funnel and tubing will be purged a minimum of 3 times prior to filling the gas container.*

*To help identify native soil gas, a background soil sample will also be collected. The location of the proposed background soil gas sample is shown on Figure 3 within Attachment G.*

4. Westlake must as soon as possible, but in no event later than thirty (30) days after receipt of this Supplement, install metering devices for each groundwater extraction well to measure rates and volumes of freshwater withdrawal on a per-well basis.

*Westlake Response:*

*See Attachment H.*

5. Westlake must as soon as possible, but in no event later than sixty (60) days after receipt of this Supplement, submit all of the following to IMD:
  - a. An assessment for the use of an alternate source of freshwater, such as surface water, in lieu of withdrawing from the Chicot Aquifer for Westlake's operations at its Sulphur Mines Salt Dome cavern facility; and

*Westlake Response:*

*Westlake will submit a response to this Order at a later date.*

- b. A plan for back-filling for cavern stability.

*Westlake Response:*

*Westlake will submit a response to this Order at a later date.*

6. Westlake must as soon as possible, but in no event later than ninety (90) days after receipt of this Supplement:

- a. Install artificial reflectors in areas of poor satellite point coverage within the boundary of the InSAR survey area; and

*Westlake Response:*

*A final plan is being developed and will be submitted to IMD for review/approval at a later date.*

*Westlake would like to inform the IMD of the following:*

- *In an effort to expedite this effort and comply with IMD's Order, Westlake has committed to ordering a number of corner reflectors due to the long lead time required to construct them.*
- *The quantity of that order is sufficient to meet a preliminary plan that Westlake and their experts have agreed upon in concept.*
- *The specific locations for the corner reflectors have not yet been determined.*
- *The delivery date of those reflectors is estimated for January 1, 2024.*
- *Westlake plans to submit a response to this Order in mid-December which will include the proposed plan for the new InSAR corner reflector locations.*
- *If Westlake receives approval of that plan by the IMD by January 1, 2024 then the corner reflectors can be installed by late-January 2024.*
- *It is important to note that the first report from this new InSAR data set would not be available until mid-May 2024 due to the time and image count required for initial amplitude analysis and development of a suitable image stack for processing. This applies to the higher frequency TSX/PAZ data collection. A longer timeline may be required for the initial delivery of the SNT reflector data.*

- b. Submit to IMD a plan to protect and/or remediate the public freshwater supplied by the Chicot Aquifer in the event of the introduction of constituents of concern into the aquifer sands.

*Westlake Response:*

*Westlake will submit a response to this Order at a later date.*

7. Westlake must submit all laboratory analyses and reports of field samples to IMD within forty-eight (48) hours of receipt. All samples must comply with

appropriate quality assurance/quality control standards in accordance with Statewide Order No. 29-B (Subpart 1 of LAC 434:XIX) and/or the Risk Evaluation / Corrective Action Program (RECAP).

*Westlake Response:*

*Westlake will comply with this Order.*

8. On or before December 1, 2023, Westlake must install the proposed monitor wells in accordance with the revised and approved monitor well installation plan submitted in response to the Second Supplement to Compliance Order No. IMD 2022-027.

*Westlake Response:*

*On November 27, 2023, Westlake submitted a clarification and request for extension related to this Order via email from Troy Charpentier. Walker-Hill and ERM began construction of the nine (9) monitor wells on November 16, 2023. It is believed that the wells will be completed by January 31, 2024. Westlake will keep the IMD informed of construction progress and expected timeline.*

If there are any questions, please contact Josh Bradley (Westlake US 2, LLC), Coleman Hale (Lonquist & Co., LLC), and Troy Charpentier (Kean Miller LLP).

Sincerely,



R. Coleman Hale  
Vice President  
Lonquist & Co., LLC

#### Attachment List

- A. Updated Report Templates – TSX & SNT InSAR Subsidence Monitoring Reports (November 21, 2023 Data Sets)
- B. Response to Order 3d – Table 1 & Figure 1
- C. Area-Wide Decommissioning Plan
- D. Itemized Delineation Map
- E. Thermography Camera Feasibility Study
- Fa. Containment Structure Plan
- Fb. Updated Impact Zone Estimate
- G. Response to Order 3j – Figure 2 & 3
- H. Groundwater Extraction Well Metering

**LONQUIST**

FIELD

SERVICE

## **ATTACHMENT A**

**Updated Report Templates  
TSX & SNT InSAR Subsidence Monitoring Reports  
November 21, 2023 Data Sets**



**LONQUIST**

**FIELD**

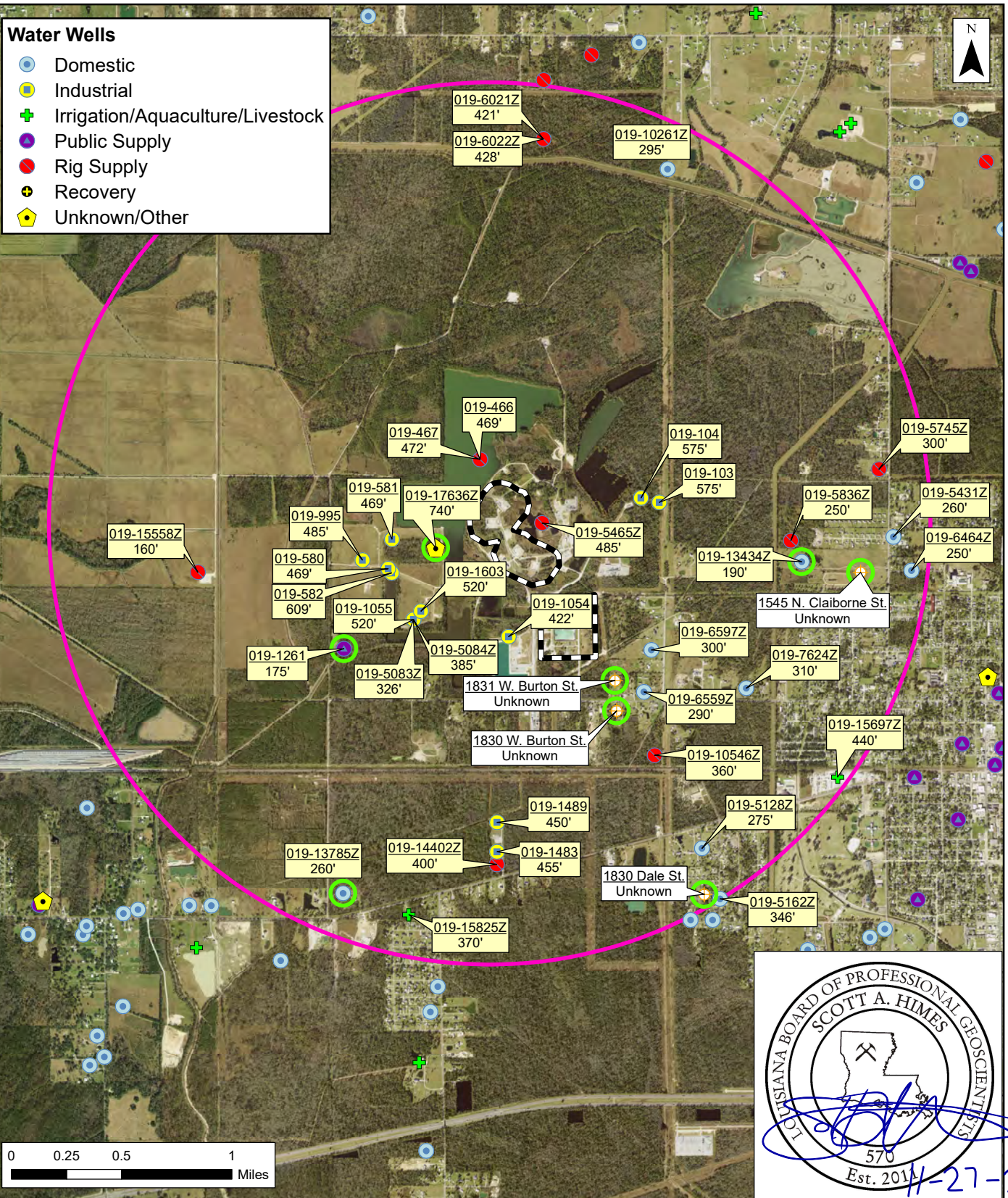
**SERVICE**

## **ATTACHMENT B**

**Response to Order 3d - Table 1 & Figure 1  
Regarding a Plan to Sample All Residential & Domestic Water Wells  
Within Two Miles of PPG No. 007B**

### Water Wells

- Domestic
- Industrial
- + Irrigation/Aquaculture/Livestock
- Public Supply
- Rig Supply
- ⊕ Recovery
- ⬠ Unknown/Other



### Legend

- Proposed Sample
- Westlake Property
- 2-mile Radius from PPG Well No. 007B

### Notes:

Water wells obtained from LDNR SONRIS database.  
 Monitor & observation wells not shown.  
 2021 Aerial imagery via USGS Earth Explorer (NAIP).

Source: ESRI - ArcGIS Online; NAD 1983 UTM Zone 15N

**Figure 1**  
**Water Wells - 2-mile Radius**  
 Sulphur Dome  
 Westlake US 2, LLC  
 Calcasieu Parish, Louisiana





Table 1  
Registered Water Wells  
Sulphur Dome  
Calcasieu Parish, Louisiana

Water Well ID	Owners Name	Depth	Aquifer	Use Description	Well Status	Latitude	Longitude	Notes
019-102	Union Sulphur	575	500-ft Sand	abandoned observation	Abandoned	-93.4030556	30.25222222	unable to locate
019-103	Union Sulphur	575	500-ft Sand	industrial chemical manufacturing	Destroyed	-93.4022222	30.255	Found well still has motor, unsure if it is this well
019-104	Union Sulphur	575	500-ft Sand	industrial chemical manufacturing	Destroyed	-93.4036111	30.25527778	Found pad, unsure if it is this well, cemented 9/10/1952
019-466	Westlake US 2 LLC	469	500-ft Sand	oil/gas well rig supply	Active	-93.4158333	30.25777778	unable to locate, P&A?
019-467	Westlake US 2 LLC	472	500-ft Sand	oil/gas well rig supply	Active	-93.4158333	30.25777778	unable to locate, P&A?
019-580	Westlake US 2 LLC	469	500-ft Sand	industrial chemical manufacturing	Active	-93.4227778	30.25055556	Active Westlake #11 well
019-581	Eagle US 2 LLC	469	500-ft Sand	P&A industrial	P&A	-93.4225	30.2525	P&A 10/17/1984
019-582	Westlake US 2 LLC	609	700-ft Sand	industrial chemical manufacturing	Active	-93.4225	30.25027778	Active Westlake #13 well
019-964	U S Geol Survey	360	500-ft Sand	abandoned observation	Destroyed	-93.4275	30.2275	Still present, casing bent
019-995	Westlake US 2 LLC	485	500-ft Sand	industrial chemical manufacturing	Active	-93.4247222	30.25111111	Active Westlake #12 well
019-1054	Westlake US 2 LLC	422	500-ft Sand	industrial chemical manufacturing	Active	-93.4136111	30.24611111	unable to locate
019-1055	Westlake US 2 LLC	520	500-ft Sand	industrial	Active	-93.4208333	30.24722222	Active Westlake #19 well
019-1261	Sulphur Police	175	200-ft Sand	institution public supply	Active	-93.4269444	30.24555556	visible on aerial imagery, contacted Sulphur Police for access
019-1483	Petrologistics	455	500-ft Sand	industrial	Active	-93.4144444	30.23194444	Active Boardwalk #2 well
019-1489	Petrologistics	450	500-ft Sand	industrial	Active	-93.4144444	30.23388889	Active Boardwalk #1 well
019-1603	Westlake Chemical Corporation	520	500-ft Sand	industrial chemical manufacturing	Active	-93.4202778	30.24777778	Active Westlake #40 well
019-5083Z	Westlake US 2 LLC	326	500-ft Sand	P&A industrial	P&A	-93.4208333	30.24722222	Test hole P&A 11/16/1979
019-5084Z	Westlake US 2 LLC	385	500-ft Sand	P&A industrial	P&A	-93.4208333	30.24722222	P&A 11/15/1979
019-5128Z	Anderson, Evlyn	275	500-ft Sand	domestic	Destroyed	-93.3988889	30.23222222	Unable to verify, small shed on property
019-5162Z	Thibodeaux, C	346	500-ft Sand	domestic	Destroyed	-93.3975	30.22888889	House is torn down, no well visible
019-5431Z	Guillet, James	260	200-ft Sand	domestic	Destroyed	-93.3844444	30.25277778	unable to verify, no well visible
019-5465Z	Union Texas Pet	485	500-ft Sand	P&A rig supply	P&A	-93.4111111	30.25361111	P&A 7/6/1984
019-5745Z	Sierra Prod	300	500-ft Sand	P&A rig supply	P&A	-93.3855556	30.25722222	P&A 5/9/1985
019-5836Z	Amoco Prod Co	250	200-ft Sand	P&A rig supply	P&A	-93.3922222	30.2525	P&A 9/27/1985
019-6021Z	Forman Petro	421	500-ft Sand	oil/gas well rig supply	Destroyed	-93.4111111	30.27888889	not visible on aerial imagery
019-6022Z	Forman Petro	428	500-ft Sand	P&A rig supply	P&A	-93.4111111	30.27888889	P&A 8/15/1986
019-6464Z	Bradley Moreaux	250	200-ft Sand	domestic	Destroyed	-93.3830556	30.25055556	no well visible
019-6559Z	Ronald Broussard	290	500-ft Sand	domestic	Inactive	-93.4033333	30.24222222	Found apparent well, no power or pump/motor, capped
019-6597Z	Forest, Carl	300	500-ft Sand	P&A domestic	P&A	-93.4027778	30.24527778	P&A 1/1/1990
019-6936Z	Southland Corp	13	Chicot Conf. Unit	excavated monitor	P&A	-93.3844444	30.24194444	P&A 1/5/1999
019-6937Z	Southland Corp	13	Chicot Conf. Unit	P&A monitor	P&A	-93.3844444	30.24194444	P&A 4/10/2001
019-6938Z	Southland Corp	13	Chicot Conf. Unit	P&A monitor	P&A	-93.3844444	30.24194444	P&A 4/10/2001
019-6939Z	Southland Corp	13	Chicot Conf. Unit	P&A monitor	P&A	-93.3844444	30.24194444	P&A 4/10/2001
019-6940Z	Southland Corp	13	Chicot Conf. Unit	P&A monitor	P&A	-93.3844444	30.24194444	P&A 4/10/2001
019-7249Z	Vista Chemical	170	200-ft Sand	P&A monitor	P&A	-93.3969444	30.25138889	P&A 10/24/1989
019-7449Z	Southland Corp	15	Chicot Conf. Unit	P&A monitor	P&A	-93.3844444	30.24194444	P&A 4/10/2001
019-7624Z	Ricky Ketchum	310	500-ft Sand	domestic	Destroyed	-93.3955556	30.24277778	Unable to verify, resident said there was a well. Not visible on aerial.
019-8278Z	Meridian Oil	6	Chicot Conf. Unit	P&A monitor	P&A	-93.4097222	30.25722222	P&A 7/27/1992
019-8279Z	Meridian Oil	6	Chicot Conf. Unit	P&A monitor	P&A	-93.4127778	30.24222222	P&A 7/27/1992
019-8280Z	Meridian Oil	6	Chicot Conf. Unit	P&A monitor	P&A	-93.3963889	30.25694444	P&A 7/27/1992
019-8281Z	Meridian Oil	6	Chicot Conf. Unit	P&A monitor	P&A	-93.4125	30.25666667	P&A 7/27/1992
019-8282Z	Meridian Oil	6	Chicot Conf. Unit	P&A monitor	P&A	-93.4177778	30.24833333	P&A 7/27/1992
019-8283Z	Meridian Oil	10	Chicot Conf. Unit	monitor	Active	-93.4141667	30.25638889	unable to locate
019-8284Z	Meridian Oil	15	Chicot Conf. Unit	monitor	Active	-93.4138889	30.24722222	Found, still active
019-8285Z	Meridian Oil	15	Chicot Conf. Unit	monitor	Active	-93.4122222	30.24472222	unable to locate
019-8286Z	Meridian Oil	10	Chicot Conf. Unit	monitor	Active	-93.4094444	30.25833333	Found, damaged
019-8287Z	Meridian Oil	15	Chicot Conf. Unit	monitor	Active	-93.4091667	30.2575	Found, still active
019-8288Z	Meridian Oil	10	Chicot Conf. Unit	monitor	Active	-93.4105556	30.25583333	unable to locate
019-8289Z	Meridian Oil	15	Chicot Conf. Unit	monitor	Active	-93.4163889	30.25222222	Found, damaged
019-8290Z	Meridian Oil	10	Chicot Conf. Unit	monitor	Active	-93.4113889	30.255	Found, still active
019-8291Z	Meridian Oil	15	Chicot Conf. Unit	monitor	Active	-93.4161111	30.25027778	unable to locate
019-8292Z	Meridian Oil	15	Chicot Conf. Unit	monitor	Active	-93.4116667	30.24388889	Found, still active
019-8293Z	Meridian Oil	10	Chicot Conf. Unit	monitor	P&A	-93.4091667	30.25138889	P&A 2/9/2015
019-8294Z	Meridian Oil	15	Chicot Conf. Unit	monitor	Active	-93.415	30.24916667	Found, still active
019-8295Z	Meridian Oil	25	Chicot Conf. Unit	monitor	Active	-93.4141667	30.25027778	Found, P&A, casing filled with grout
019-8296Z	Meridian Oil	10	Chicot Conf. Unit	monitor	Active	-93.4233333	30.25222222	unable to locate
019-8297Z	Meridian Oil	15	Chicot Conf. Unit	monitor	Active	-93.4130556	30.24805556	unable to locate
019-8298Z	Meridian Oil	15	Chicot Conf. Unit	monitor	P&A	-93.4127778	30.24611111	P&A 2/9/2015
019-8299Z	Meridian Oil	18	Chicot Conf. Unit	monitor	Active	-93.4116667	30.24638889	Found, still active
019-8300Z	Meridian Oil	25	Chicot Conf. Unit	monitor	Active	-93.4158333	30.2525	Found, damaged
019-8301Z	Meridian Oil	37	Chicot Conf. Unit	monitor	Active	-93.4133333	30.25166667	unable to locate
019-8355Z	Meridian Oil	25	Chicot Conf. Unit	monitor	Active	-93.4147222	30.25111111	unable to locate
019-10242Z	Circle K	15	Chicot Conf. Unit	P&A monitor	P&A	-93.3844444	30.24194444	P&A 4/10/2001
019-10243Z	Circle K	15	Chicot Conf. Unit	P&A monitor	P&A	-93.3844444	30.24194444	P&A 4/10/2001

Table 1  
Registered Water Wells  
Sulphur Dome  
Calcasieu Parish, Louisiana

Water Well ID	Owners Name	Depth	Aquifer	Use Description	Well Status	Latitude	Longitude	Notes
019-10261Z	Douget, Delford	295	500-ft Sand	P&A domestic	P&A	-93.4016667	30.27694444	P&A 5/15/1996
019-10546Z	American Explor	360	500-ft Sand	P&A rig supply	P&A	-93.4025	30.23833333	P&A 2/25/1997
019-13434Z	Albert Andrepont	190	200-ft Sand	domestic	Active	-93.3913889	30.25111111	assumed active, responded to water well survey
019-13785Z	Randal Hart	260	200-ft Sand	domestic	Active	-93.4261111	30.22916667	Records indicated well is inside shed
019-14402Z	Longquest Field	400	TBD	P&A rig supply	P&A	-93.4144444	30.23111111	P&A 9/12/2007
019-15558Z	Duncan Oil, Inc	160	200-ft Sand	oil/gas well rig supply	P&A	-93.4372222	30.25027778	unable to verify
019-15697Z	Century Group	440	500-ft Sand	irrigation	Active	-93.3891667	30.23694444	Still present, no power, pump/motor, capped. Sanded up
019-15825Z	Jonah Richard	370	500-ft Sand	irrigation	Active	-93.4211111	30.22777778	unable to verify, records indicate well is capped.
019-16342Z	Robert Lee Boudreaux	16	Chicot Conf. Unit	monitor	Active	-93.3930556	30.24888889	active monitor
019-16343Z	Robert Lee Boudreaux	16	Chicot Conf. Unit	monitor	Active	-93.3922222	30.24888889	active monitor
019-16344Z	Robert Lee Boudreaux	15	Chicot Conf. Unit	monitor	Active	-93.3905556	30.24888889	active monitor
019-16345Z	Ken Lyons	16	Chicot Conf. Unit	monitor	Active	-93.4016667	30.24916667	active monitor
019-16346Z	Travis Marbuger	16	Chicot Conf. Unit	monitor	Active	-93.4041667	30.24861111	active monitor
019-16347Z	Ken Lyons	16	Chicot Conf. Unit	monitor	Active	-93.3988889	30.24888889	active monitor
019-16348Z	Ken Lyons	16	Chicot Conf. Unit	monitor	Active	-93.3958333	30.24888889	active monitor
019-16680Z	Ken Lyons	13	Chicot Conf. Unit	monitor	Active	-93.4013889	30.24916667	active monitor
019-16681Z	Robert Lee Boudreaux	13	Chicot Conf. Unit	monitor	Active	-93.3927778	30.24916667	active monitor
019-16682Z	Robert Lee Boudreaux	13	Chicot Conf. Unit	monitor	Active	-93.3916667	30.24861111	active monitor
019-16683Z	Robert Lee Boudreaux	44	Chicot Conf. Unit	monitor	Active	-93.3916667	30.24861111	active monitor
019-16684Z	Travis Marbuger	44	Chicot Conf. Unit	monitor	Active	-93.4041667	30.24861111	active monitor
019-16685Z	Robert Lee Boudreaux	46	Chicot Conf. Unit	monitor	Active	-93.3877778	30.24888889	active monitor
019-16686Z	Travis Marbuger	10	Chicot Conf. Unit	monitor	Active	-93.4027778	30.24888889	active monitor
019-16873Z	Eagle US 2 LLC	15	Chicot Conf. Unit	monitor	Active	-93.3930556	30.24888889	active monitor
019-16874Z	Eagle US 2 LLC	14	Chicot Conf. Unit	monitor	Active	-93.3916667	30.24888889	active monitor
019-16875Z	Eagle US 2 LLC	14	Chicot Conf. Unit	monitor	Active	-93.3897222	30.24888889	active monitor
019-17053Z	Eagle US 2 LLC	15.5	Chicot Conf. Unit	monitor	Active	-93.3955556	30.24888889	active monitor
019-17054Z	Eagle US 2 LLC	17	Chicot Conf. Unit	monitor	Active	-93.3961111	30.24888889	active monitor
019-17055Z	Eagle US 2 LLC	16	Chicot Conf. Unit	monitor	Active	-93.4008333	30.24888889	active monitor
019-17056Z	Eagle US 2 LLC	16	Chicot Conf. Unit	monitor	Active	-93.3977778	30.24888889	active monitor
019-17636Z	Sulphur Dome LLC	740	700-ft Sand	null	Active	-93.4191667	30.25194444	Cottages well, currently sampled monthly

#### Additional Wells

Water Well ID	Owners Name	Depth	Aquifer	Use Description	Well Status	Latitude	Longitude	Notes
-	Unknown	Unknown	Unknown	Unknown	Unknown	30.250428	-93.386913	1545 N. Claiborne St., same property as 019-13434Z.
-	Unknown	Unknown	Unknown	Unknown	Unknown	30.243254	-93.405524	1831 W. Burton St., responded to water well survey
-	Unknown	Unknown	Unknown	Unknown	Unknown	30.241250	-93.405388	1830 W. Burton St., responded to water well survey
-	Unknown	Unknown	Unknown	Unknown	Unknown	30.229181	-93.398690	1830 Dale St., house torn down

Notes:

Gray shaded wells were eliminated from sampling consideration.

**LONQUIST**

FIELD

SERVICE

## **ATTACHMENT C**

### **Area-Wide Decommissioning Plan**

# Sulphur Brine Field

## No.7 Decommissioning

*Submitted by:*

**Westlake**



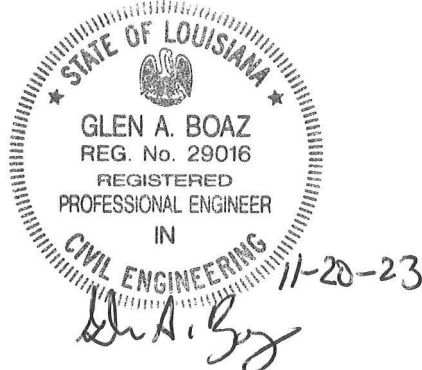
*Prepared by:*



*1907 Ruth Street  
Sulphur, Louisiana 70665  
(337) 583-4662  
Fax (337) 583-1836*

ReCon Engineering Project No. 23261173

November 24, 2023





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<b>2.0 Introduction .....</b>	<b>1</b>
<b>3.0 Anticipated Impact Zone .....</b>	<b>2</b>
<b>4.0 Decommissioning Plan.....</b>	<b>3</b>
<b>4.1 Equipment and Infrastructure .....</b>	<b>3</b>
<b>4.2 Isolation and Demolition.....</b>	<b>4</b>
<b>4.3 Operating Unaffected Wells .....</b>	<b>5</b>

## APPENDIX

Decommissioning Plan Layout  
No.7 Brine Well P&ID 01A-10094  
Interconnecting Piping P&ID 01A-10097  
Oil Storage Tank P&ID 01A-10105

## **1.0 BACKGROUND**

Order 3.f. of the Third Supplement to Compliance Order No. IMD 2022-027 issued by the State of Louisiana Department of Natural Resources Office of Conservation requires Westlake US 2, LLC (Westlake) to submit a plan to decommission Westlake's facility at the potential affected area on the Sulphur Mines Salt Dome in the case of a surface expression caused by a failure of Cavern 7.

In response to the order, a decommissioning plan has been developed. The plan consists of the following components:

- Isolation and demolition of piping inside of the No.7 Brine Well pad. This includes the 4" multipurpose line as well as the 2" pad oil line.
- Isolation and demolition of the header piping outside the east containment wall of the No.7 Brine Well Site. This includes a 10" brine line, 10" high pressure water line, 4" multipurpose line and 2" pad oil line.
- A plan for operating wells outside the predicted impact zone.

## **2.0 INTRODUCTION**

This plan describes the basis of the decommissioning plan, infrastructure demolition, and operating outside the affected area:

- Anticipated impact zone
- Equipment and Infrastructure
- Isolation and Demolition
- Operating Unaffected Wells

Each of these items is addressed in greater detail in the sections that follow in this Decommissioning Plan.

### 3.0 ANTICIPATED IMPACT ZONE

Much of the site in question is currently owned by Sulphur Dome, LLC and Westlake Corporation. Westlake leases some of the site to solution mine brine used in the production of Chlor-Alkali at the Westlake South facility.

The impact zone was identified in the Lonquist "Surface Expression Impact Zone Estimate – Sulphur Mines Salt Dome - Cavern No.006 & No.007 (November 2, 2023)" document. See Figure 4 page 6 of 41 of indicated document. The initial impact zone has been identified to have a diameter of 678 feet with the epicenter located 488 feet due west of No.7 Brine Well. The final impact zone is indicated to have a diameter of 1841 feet.

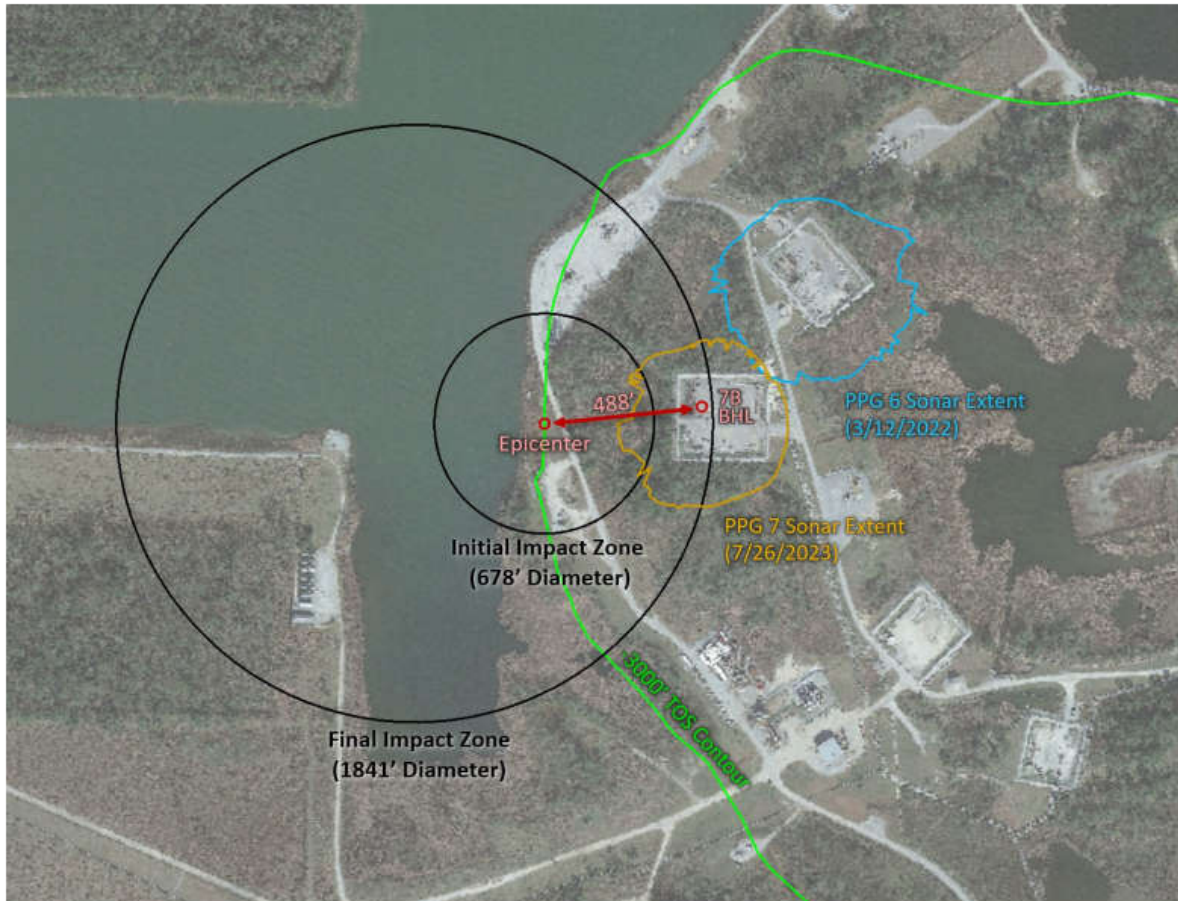


Figure 1 – Impact Zone Diagram (Obtained from Lonquist document dated 11/2/2023)

## 4.0 DECOMMISSIONING PLAN

### 4.1 EQUIPMENT AND INFRASTRUCTURE

To minimize environmental impacts in the event of a surface expression only necessary equipment remains within the predicted final impact zone. See P&ID 01A-10094 appendix page 8 and figure 2 below. Equipment inside the No.7 Brine Well Pad is as follows:

- 4" Multipurpose Piping
- 2" Pad Oil Piping
- Two Temporary Pumps
- Well and Oil Pressure Indicators
- No.7 Brine Well Head Valving/Piping



Figure 2 – No. 7 Brine Well Pad Aerial Photograph



## 4.2 ISOLATION AND DEMOLITION

In the event of a surface expression isolation of the predicted affected areas would be achieved utilizing valving indicated on P&ID 01A-10097 appendix page 9, P&ID 01A-10105 appendix page 10 and figure 3 below. The electrical feeder supplying power to No.7 Brine Well can be isolated at Motor Control Center 2 near No.2 Brine Well.

The extent of damage will be assessed and where applicable lines and equipment are to be cleared in accordance with Westlake procedures and removed from the area. Remaining piping associated with the affected No.7 Brine Well on the well pad along with header piping outside the well pad to the East are to be demolished where safely feasible. All remaining instrumentation associated with the affected No.7 Brine Well inside the existing well pad is to be demolished where safely feasible.



Figure 3 – No. 7 Brine Well Pad Isolation and Demolition Aerial Photograph

### **4.3 OPERATING UNAFFECTED WELLS**

To maintain the integrity of other operating well locations new piping and infrastructure will be installed outside the proposed levee containment system between the No.22 Brine Well and No.6 Brine Well locations. This includes a new 10" Brine or High Pressure Water line, 10" High Pressure Water from Cavity Pumps line, 4" Multipurpose line, and 2" Pad Oil line. See Decommissioning Plan Layout appendix page 7.

To adjust water levels within the planned containment levee system a new brine recirculation pump will be installed on the perimeter of the levee. This pump will utilize brine in the containment pond and incorporate it back into the active system through the existing brine overflow pit and oily/water sump.



## **APPENDIX**



# Decommissioning Plan

Overview of new line route

Legend



No.6 Brine Well

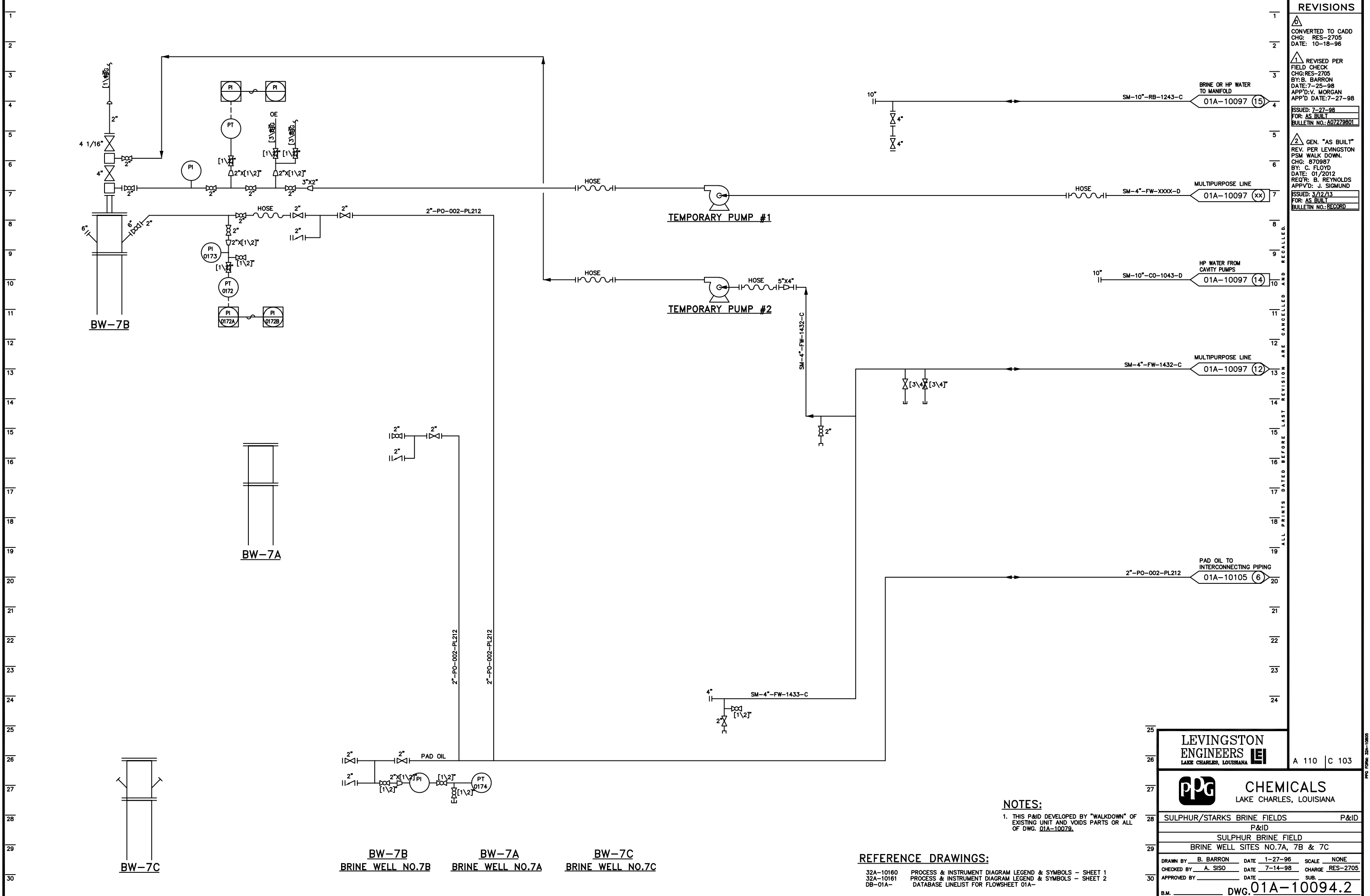
New High Pressure Water, Brine, Multipurpose and Pad Oil lines to be installed connecting site header loop

No.7 Brine Well

No.22 Brine Well







REVISIONS	
1	CONVERTED TO CADD CHG: RES-2705 DATE: 10-18-96
2	REVISED PER FIELD CHECK CHG: RES-2705 BY: B. BARRON DATE: 7-25-98 APP'D: V. MORGAN APP'D DATE: 7-27-98
3	ISSUED: 7-27-98 FOR: AS BUILT BULLETIN NO.: A07279801
4	GEN. "AS BUILT" REV. PER LEVINGSTON PSM WALK DOWN. CHG: 870987 BY: C. FLOYD DATE: 01/2012 REQ'R: B. REYNOLDS APP'D: J. SIGMUND ISSUED: 3/12/13 FOR: AS BUILT BULLETIN NO.: RECORD

NOTES:  
1. THIS P&ID DEVELOPED BY "WALKDOWN" OF  
EXISTING UNIT AND VOIDS PARTS OR ALL  
OF DWG. 01A-10079.

REFERENCE DRAWINGS:

- 32A-10160 PROCESS & INSTRUMENT DIAGRAM LEGEND & SYMBOLS - SHEET 1
- 32A-10161 PROCESS & INSTRUMENT DIAGRAM LEGEND & SYMBOLS - SHEET 2
- DB-01A- DATABASE LINELIST FOR FLOWSHEET 01A-

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LAKE CHARLES, LOUISIANA

A 110 | C 103

SULPHUR/STARKS BRINE FIELDS P&ID

SULPHUR BRINE FIELD

BRINE WELL SITES NO.7A, 7B & 7C

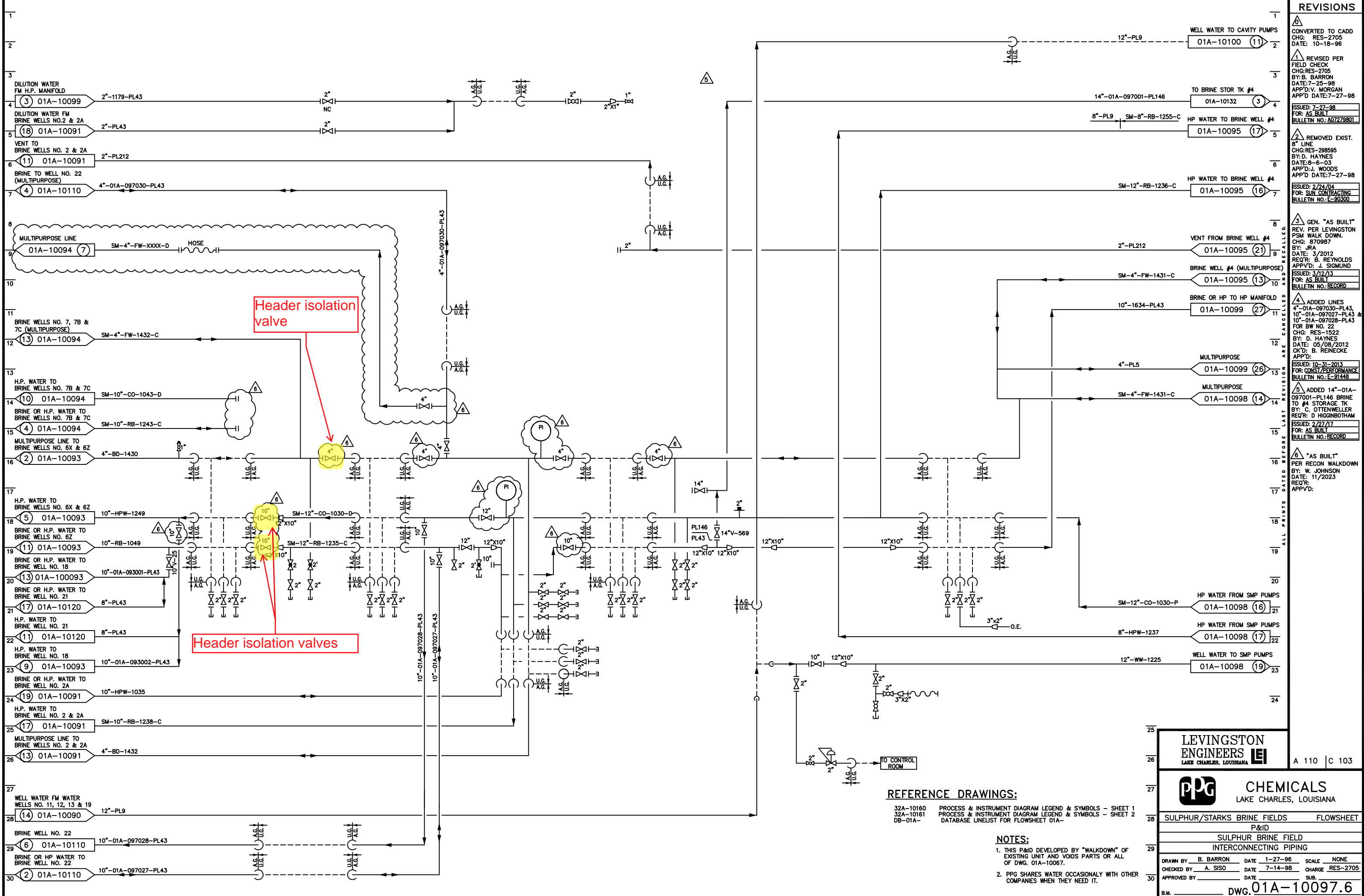
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CHECKED BY A. SISO DATE 7-14-98 CHARGE RES-2705

APPROVED BY DATE SUB.

B.M. DWG. 01A-10094.2

PPG FORM 32A-10003



REVISIONS

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DATE: 10-18-96
- 2. REVISED PER  
FIELD CHECK  
CHG: RES-2705  
BY: B. BARRON  
DATE: 7-25-98  
APP'D: V. MORGAN  
APP'D DATE: 7-27-98
- 3. ISSUED: 7-27-98  
FOR: AS BUILT  
BULLETIN NO.: A07279801
- 4. REMOVED EXIST.  
8" LINE  
CHG: RES-298595  
BY: D. HAYNES  
DATE: 8-6-03  
APP'D: J. WOODS  
APP'D DATE: 7-27-98
- 5. ISSUED: 2/24/04  
FOR: SUN CONTRACTING  
BULLETIN NO.: E-90300
- 6. GEN. "AS BUILT"  
REV. PER LEVINGSTON  
PSM WALK DOWN.  
CHG: 870987  
BY: JRA  
DATE: 3/2012  
REQ'R: B. REYNOLDS  
APPVD: J. SIGMUND
- 7. ISSUED: 3/12/13  
FOR: AS BUILT  
BULLETIN NO.: RECORD
- 8. ADDED LINES  
4"-01A-097030-PL43,  
10"-01A-097027-PL43 &  
10"-01A-097028-PL43  
FOR BW NO. 22  
CHG: RES-1522  
BY: D. HAYNES  
DATE: 05/08/2012  
CK'D: B. REINECKE  
APP'D:
- 9. ISSUED: 10-31-2013  
FOR: CONST/PERFORMANCE  
BULLETIN NO.: E-91448
- 10. ADDED 14"-01A-  
097001-PL146 BRINE  
TO #4 STORAGE TK  
BY: C. OTTENWELLER  
REQ'R: D. HIGGINBOTHAM  
ISSUED: 2/27/17  
FOR: AS BUILT  
BULLETIN NO.: RECORD
- 11. "AS BUILT"  
PER RECON WALKDOWN  
BY: W. JOHNSON  
DATE: 11/2023  
REQ'R:  
APPVD:

REFERENCE DRAWINGS:

- 32A-10180 PROCESS & INSTRUMENT DIAGRAM LEGEND & SYMBOLS - SHEET 1
- 32A-10161 PROCESS & INSTRUMENT DIAGRAM LEGEND & SYMBOLS - SHEET 2
- DB-01A- DATABASE LINELIST FOR FLOWSHEET 01A-

NOTES:

- 1. THIS P&ID DEVELOPED BY "WALKDOWN" OF EXISTING UNIT AND VOIDS PARTS OR ALL OF DWG. 01A-10067.
- 2. PPG SHARES WATER OCCASIONALLY WITH OTHER COMPANIES WHEN THEY NEED IT.

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PPG  
CHEMICALS  
LAKE CHARLES, LOUISIANA

A 110 | C 103

SULPHUR/STARKS BRINE FIELDS FLOWSHEET

P&ID

SULPHUR BRINE FIELD

INTERCONNECTING PIPING

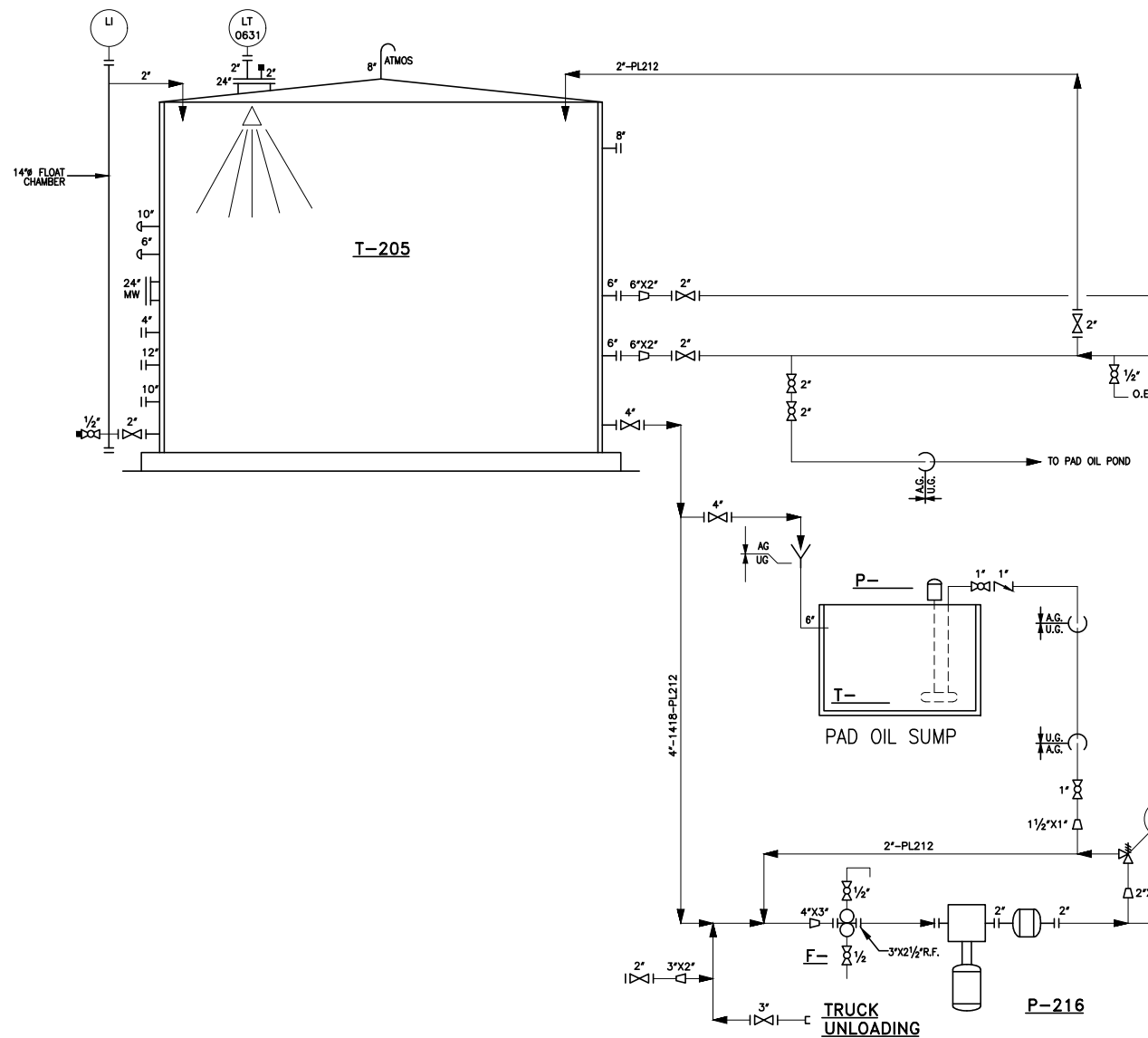
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CHECKED BY A. SISO DATE 7-14-98 CHARGE RES-2705

APPROVED BY DATE SUB.

B.M. DWG. 01A-10097.6

PPG FORM: 32A-10060



Well Pad isolation valve

Header isolation valve

T-205  
PAD OIL TANK

P-216/M-216  
PAD OIL PUMP  
CKT. # -

NOTES:

1. THIS P&ID DEVELOPED BY "WALKDOWN" OF EXISTING UNIT AND VOIDS PARTS OR ALL OF DWG. 01A-10072.

REFERENCE DRAWINGS:

SEE LAYOUT TAB FOR LINELIST  
32A-10150 P&ID LEGEND & SYMBOLS - SHEET 1  
32A-10161 P&ID LEGEND & SYMBOLS - SHEET 2

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2	REVISED PER FIELD CHECK CHG: RES-2705 BY: B. BARRON DATE: 7-25-98 APP'D: V. MORGAN APP'D DATE: 7-27-98
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4	GEN. "AS BUILT" REV. PER LEVINGSTON PSM WALK DOWN. CHG: 866021 BY: C. FLOYD DATE: 03/2012 REQ'R: B. REYNOLDS APP'D: J. SIGMUND
5	ISSUED: 3/12/13 FOR: AS BUILT BULLETIN NO.: RECORD
6	ADDED LINE 2"-01A-097029-PL212 FOR BW NO. 22 CHG: RES-1522 BY: D. HAYNES DATE: 03/31/2014 CK'D: B. REINECKE APP'D:
7	ISSUED: 3-31-2014 FOR: RECORD BULLETIN NO.: E-91448
8	ADDED LINELIST LAYOUT TAB TO P&ID PER EP-49 UPDATE. CHG: RES-911023 BY: J. WATKINS ISSUED: 2/20 FOR: RECORD BULLETIN NO.: RECORD
9	ADDED BOOSTER PUMP TO BW 18 CHG: 30768156 BY: B. ARCEAUX DATE: 04/2020 CHK: D. LABORDE APP'D: J. BRADLEY
10	ISSUED: 05/2020 FOR: CONSTRUCTION BULLETIN NO.:
11	"AS BUILT" PER RECON WALKDOWN BY: W. JOHNSON DATE: 11/2023 REQ'R: APP'D:

LEVINGSTON  
ENGINEERS  
LAKE CHARLES, LOUISIANA



CHEMICALS  
LAKE CHARLES, LOUISIANA

SULPHUR BRINE FIELDS FLOWSHEET  
P&ID  
OIL STORAGE TANK

DRAWN BY: B. BARRON DATE: 1-27-96 SCALE: NONE  
CHECKED BY: A. SISO DATE: 7-14-98 CHARGE: RES-2705  
APPROVED BY: DATE: SUB:  
B.M. DWG. 01A-10105.6

A 110 | C 103

FORM: 33A-10850

**LONQUIST**

FIELD

SERVICE

## **ATTACHMENT D**

### **Itemized Delineation Map**



# Sulphur Brine Field

## No.7 Delineation Equipment and Mapping

*Submitted by:*

**Westlake**



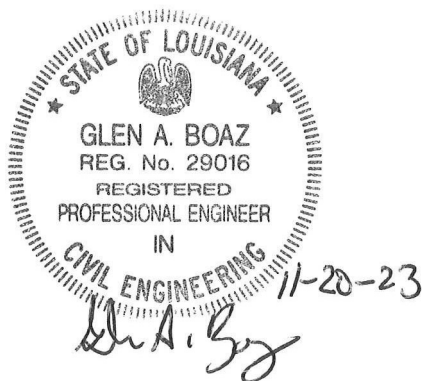
*Prepared by:*



*1907 Ruth Street  
Sulphur, Louisiana 70665  
(337) 583-4662  
Fax (337) 583-1836*

ReCon Engineering Project No. 23261173

November 24, 2023



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## APPENDICES

### Equipment List

Dome Area Delineation AUX-23261173-CS-001

Brine Well Locations AUX-23261173-CS-002

Buildings on the Salt Dome AUX-23261173-CS-003

Motor Control Centers on the Salt Dome AUX-23261173-IE-001

Pick Rack and Cable Tray Locations AUX-23261173-MP-001

## **1.0 BACKGROUND**

Order 3.g. of the Third Supplement to Compliance Order No. IMD 2022-027 issued by the State of Louisiana Department of Natural Resources Office of Conservation requires Westlake US 2, LLC (Westlake) to submit a delineation map of all existing infrastructure and utilities at Westlake's facility at the potential affected area on the Sulphur Mines Salt Dome in the case of a surface expression caused by a failure of Cavern 7.

In response to the order, delineation maps and an equipment list have been developed. This consists of the following:

- Equipment List
- Outline of the salt dome
- Brine Well Locations
- Buildings on the Salt Dome
- Motor Control Centers on the Salt Dome
- Pipe Rack and Cable Tray Locations

## **APPENDIX**

# EQUIPMENT LIST

REV 2

Equipment ID	Taxonomy Type Descr	Equipment Description
	Building	COMMUNICATION BUILDING - SULPJUR
	Building	SWITCHGEAR BUILDING - SULPHUR
	Building	STORAGE BUILDING BETWEEN BW4 AND BW2
	Building	STORAGE BUILDING BETWEEN BW6 AND BW7
55-2975	Pump and Motor	#5 SUMP PUMP - SULPHUR
55-2976	Pump and Motor	#6 SUMP PUMP - SULPHUR
55-6413	Pump and Motor	SUBSIDENCE ELECTRIC POND PUMP
55-7871	Pump and Motor	BRINE TANK SUMP PUMP
55-7952	Pump and Motor	#18 BRINE WELL BOOSTER PUMP - SULPHUR
55-8082	Pump and Motor	#22 BRINE WELL BOOSTER PUMP - SULPHUR
60-4508	Tank or Bin	BRINE TANK SUMP
60-4676	Tank or Bin	DIESEL TANK - SULPHUR
	Tank or Bin	OIL STORAGE TANKS - SULPHUR
62-1116	Transformer, Power or Lighting	LTG XFMR, 37.5 KVA
62-39	Transformer, Power or Lighting	SULPHUR BRINE FIELD POWER TRANSFORMER
	Transformer, Power or Lighting	TX-4
	Transformer, Power or Lighting	TX-7
	Motor Control Center	MCC-2
	Motor Control Center	MCC-4
	Motor Control Center	MCC-6
	Motor Control Center	MCC-7
63-101	Electric Generator	FOR COMMUNICATION BUILDING - SULPJUR
	Wells	BRINE WELL 2
	Wells	BRINE WELL 2A
	Wells	BRINE WELL 6
	Wells	BRINE WELL 7
	Wells	BRINE WELL 18
	Wells	BRINE WELL 20
	Wells	BRINE WELL 21
	Wells	BRINE WELL 22
	Piping Systems	HIGH PRESSURE WATER TO BRINE WELLS
	Piping Systems	MULTIPURPOSE LINE TO BRINE WELLS
	Piping Systems	BRINE TO STORAGE FROM WELLS
	Piping Systems	OIL LINE TO BRINE WELLS
		MICROWAVE TOWER
		PROPANE TANK

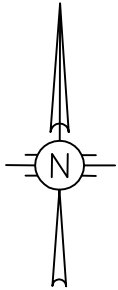




DOME AREA DELINEATION  
SCALE: 1" = 150'

DATE: 11/2023

ISSUE FOR RECORD



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FOR: CONST.	
BULLETIN NO.: CONST.	

ALL PRINTS DATED BEFORE LAST REVISION ARE CANCELLED AND RECALLED.

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	APPROVED:

**Westlake**

North American  
Chlor-Alkali & Derivatives™  
Lake Charles South Complex  
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD CIVIL

DELINEATION MAP

DOME AREA DELINEATION

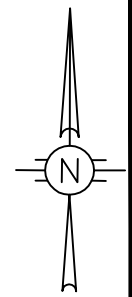
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CHECKED BY: DATE: CHARGE

APPROVED BY: DATE: SHEET 1 OF 5

DWG. AUX-23261173-CS-001





REVISIONS	
ISSUED: CONST.	
FOR: CONST.	
BULLETIN NO.: CONST.	

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**RECON**  
Management • Engineering  
Inspection

PLOTTED  
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SULPHUR, LA  
APPROVED: \_\_\_\_\_

**Westlake**

North American  
Chlor-Alkali & Derivatives™  
Lake Charles South Complex  
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD  
DELINERATION MAP  
BRINE WELL LOCATIONS  
CIVIL

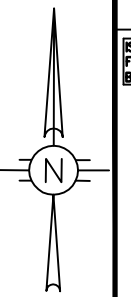
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CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_ CHARGE \_\_\_\_\_  
APPROVED BY \_\_\_\_\_ DATE \_\_\_\_\_ SHEET 2 OF 5

DWG. AUX-23261173-CS-002

BRINE WELL LOCATIONS  
SCALE: 1" = 150'

DATE: 11/2023  
ISSUE FOR RECORD





REVISIONS	
ISSUED: CONST.	
FOR: CONST.	
BULLETIN NO.: CONST.	

ALL PRINTS DATED BEFORE LAST REVISION ARE CANCELLED AND RECALLED.

**RECON**  
Management • Engineering  
Inspection  
SULPHUR, LA  
APPROVED: \_\_\_\_\_

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FILE: AUX-23261173-CS-003.DWG

**Westlake**

North American  
Chlor-Alkali & Derivatives™  
Lake Charles South Complex  
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD

CIVIL

DELINERATION MAP

BUILDINGS ON SALT DOME

DRAWN BY \_\_\_\_\_ DATE \_\_\_\_\_ SCALE AS SHOWN

CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_ CHARGE \_\_\_\_\_

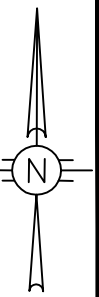
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DWG. AUX-23261173-CS-003

BUILDINGS ON SALT DOME  
SCALE: 1" = 150'

DATE: 11/2023  
ISSUE FOR RECORD





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MOTOR CONTROL CENTERS ON THE SALT DOME  
SCALE: 1" = 100'

DATE: 11/2023  
ISSUE FOR RECORD

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Inspection  
SULPHUR, LA  
APPROVED: \_\_\_\_\_

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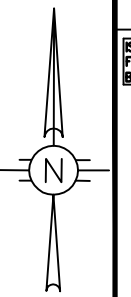
SULPHUR BRINE FIELD		ELECTRICAL
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MOTOR CONTROL CENTERS ON THE SALT DOME		
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DWG. AUX-23261173-IE-001		





PIPE RACK AND CABLE TRAY LOCATIONS  
SCALE: 1" = 100'

DATE: 11/2023  
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SULPHUR BRINE FIELD		MECHANICAL
DELINEATION MAP		
PIPE RACK AND CABLE TRAY LOCATIONS		
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APPROVED BY	DATE	SHEET 5 OF 5

DWG. AUX-23261173-MP-001



**LONQUIST**

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SERVICE

## **ATTACHMENT E**

### **Thermography Camera Feasibility Study**

# Sulphur Brine Field

## Camera Feasibility Study

*Submitted by:*

**Westlake**



*Prepared by:*



*1907 Ruth Street  
Sulphur, Louisiana 70665  
(337) 583-4662  
Fax (337) 583-1836*

ReCon Engineering Project No. 23261173

November 24, 2023



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## APPENDIX

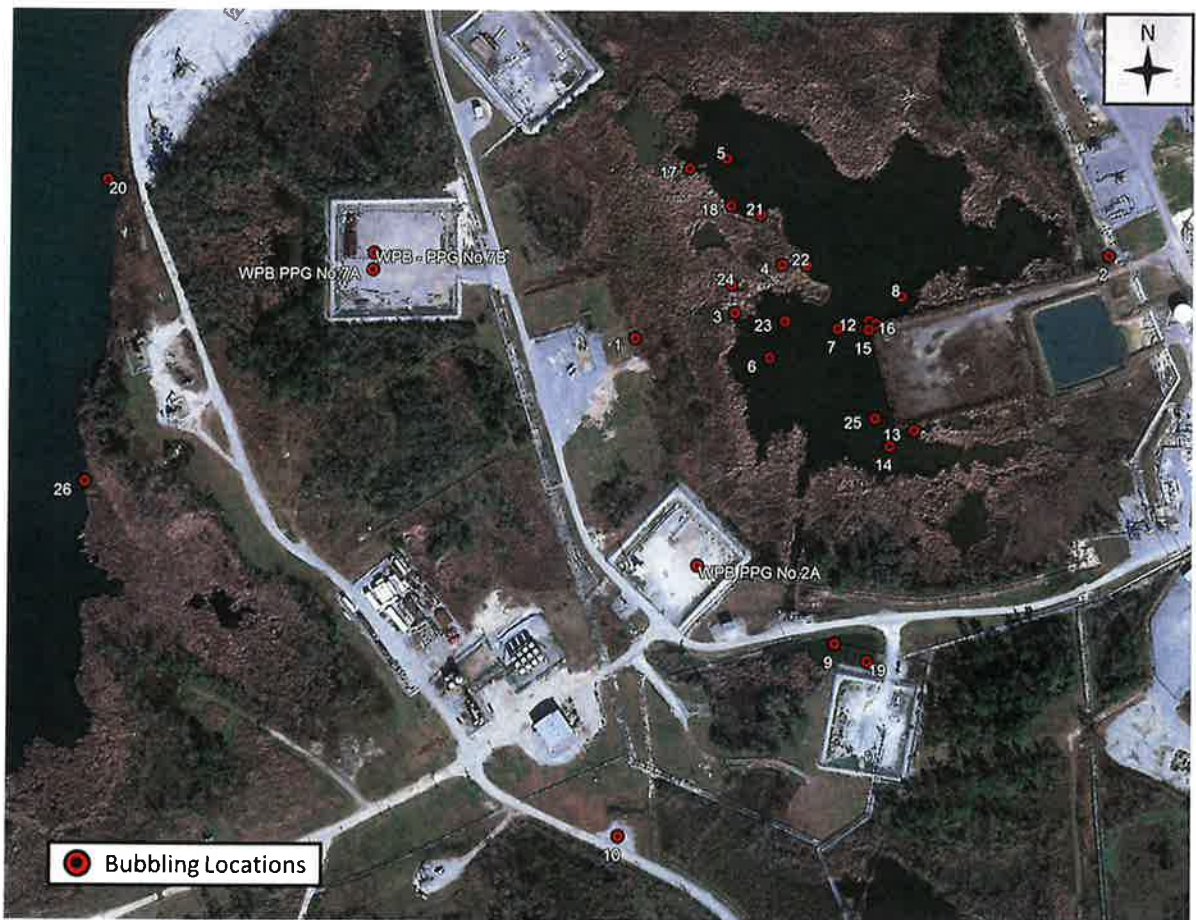
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## 1.0 BACKGROUND

Order 3.h. of the Third Supplement to Compliance Order No. IMD 2022-027 issued by the State of Louisiana Department of Natural Resources Office of Conservation requires Westlake US 2, LLC (Westlake) to submit feasibility study for the incorporation of thermography cameras camera (forward-looking infrared cameras or other comparable devices) into daily observational scope.

## 2.0 INTRODUCTION

This study investigates how feasible it would be for Westlake to incorporate the use of thermographic cameras in their daily observational scope to monitor the locations of interest (provided by Westlake) shown in **Figure 1**.



**Figure 1 – Bubbling Locations**

### **3.0 TECHNOLOGY**

An Optical Gas Imaging (OGI) camera was considered in this study for its ability to detect gas using infrared technology. This type of camera looks for absorption of signature wavelengths of light, indicating the presence of gas.

#### **3.1 PORTABLE VS. STATIONARY**

Portable and stationary options for the camera have their pros and cons:

A portable option would allow for greater flexibility in case procedures need to change over time, but they would require an employee to manually scan for gas on a regular basis. It would also require more maintenance, as the batteries of the device need to be recharged, and data would need to be transferred manually to a computer.

A stationary option would not have these maintenance setbacks, as it has continuous power and data transfer. However, the sensitivity of the stationary OGI camera is less than that of the portable version, and they would need to be mounted in many locations. If new gas leaks are detected, there is no guarantee that the installed cameras would be able to see them.

Overall, a portable OGI camera is the more viable option due to its ease of maintenance and the ability to monitor new leak points should they be discovered.

#### **3.2 PORTABLE OGI CAMERA VERSIONS**

One of the leading manufacturers of OGI cameras is FLIR. Of their catalog of products, two cameras were recommended: the Gx320 and the Gx620. These are their top-of-the-line products for detecting gas leaks. The Gx320 has a smaller screen, but it is more sensitive to gas detection. The Gx620 has a larger screen for better clarity but uses the same sensor array as the Gx320, effectively reducing the sensitivity of the device.

Either option is acceptable. See **Appendix** for camera specifications.

#### **3.3 OGI CAMERA EFFECTIVE RANGE**

The effective range of an OGI camera depends on many factors, several of which the user of the device has no control over. The ability to detect a gas depends on:

- Distance from the camera to the gas
- Temperature differential between the gas and the background radiation
- Composition and concentration of the gas
- Size of the camera lens
- Size of the camera's sensor array
- Size of the camera's viewfinder screen
- Skill and perceptivity of the user



Without being able to test the camera under the specific conditions of this project's scope, it is impossible to truly know the effective range. However, a test was performed by the National Physical Laboratory (NPL) on the FLIR GF320 camera (see Reference **FLIR OGI Operative Envelope Report**), a comparable model to the Gx320, to determine what distances the camera can reliably detect gases, accounting for changes in wind speed and temperature differential between the gas and the background. According to the results from this test, the effective range under normal wind conditions for Sulphur, LA (see Reference **Sulphur Wind Speed**) would be approximately 50 feet.

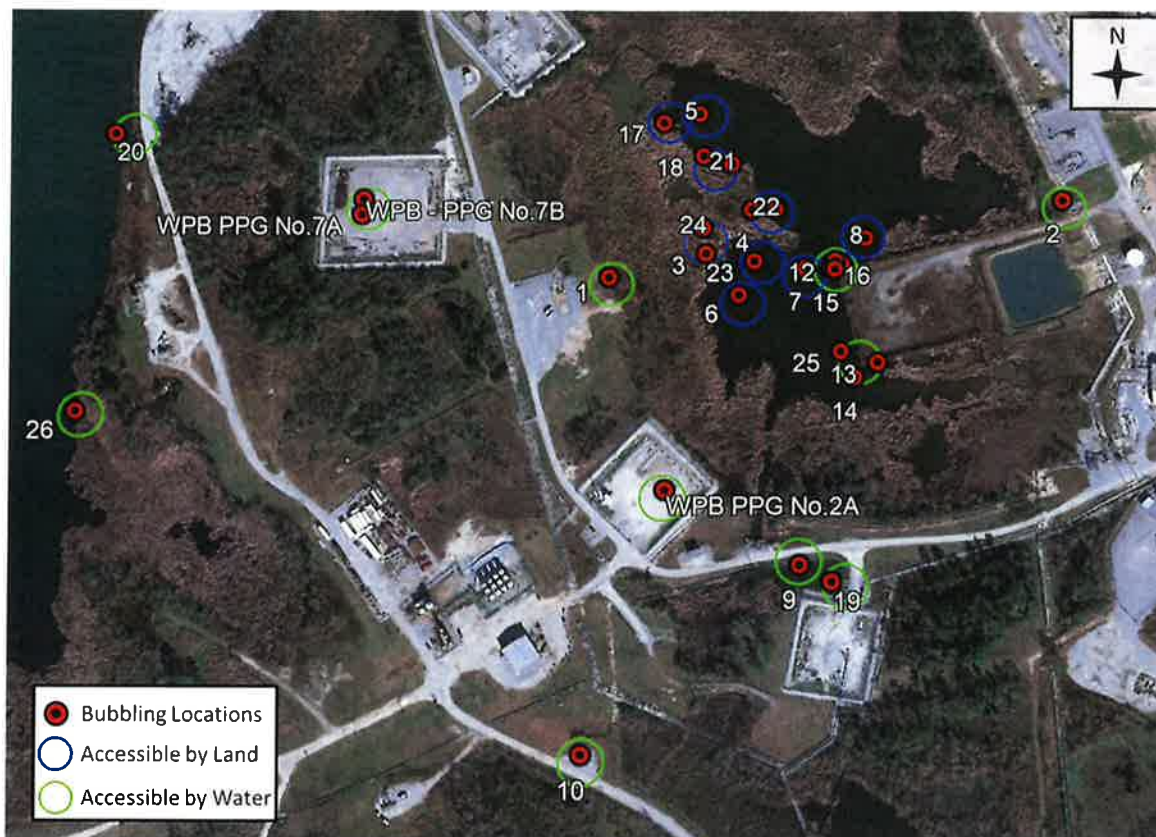
### 3.4 OGI CAMERA SOFTWARE

**FLIR Thermal Studio Pro:** This subscription software is meant to assist in arranging photos and videos from the camera. Additionally, the **FLIR Route Creator** plugin can be purchased to enable the creation of inspection routes, where individual areas of interest are labeled with GPS coordinates. Pictures uploaded with GPS coordinates near these areas are automatically grouped with the associated area.

## 4.0 DAILY MONITORING PROCEDURE

To monitor the gas leaks, a worker will need to perform a 360-degree scan within the effective detection range of the camera from each scan area shown in **Figure 2**. It is recommended that this is performed using the video feature of the camera. If gas is detected, pictures should be taken of the leak source using the camera, recording the time, date, and location.

The scan areas shown in **Figure 2** have been selected to cover multiple gas leaks where possible. Many locations will need to be reached by boat, represented by the blue circles. The locations accessible by land are represented by the green circles.



**Figure 2 – Scan Areas**

Photos and videos from the camera should be uploaded to a computer each day to document and backup the data. The camera should be set to recharge after each use. Considering the operation time per battery of the OGI camera, it is recommended that another battery is purchased, and that both batteries are charged daily.

Time to complete one day of monitoring is estimated to take up to four hours but will likely become faster as the designated worker becomes more familiar with the route. Additional time will be necessary to properly upload and catalog the data acquired. Overall, the full scope of scanning and maintaining the files will likely require an employee to work full time on this task.

## 5.0 REFERENCE

### Sulphur Wind Speed

<https://weatherspark.com/y/10160/Average-Weather-in-Sulphur-Louisiana-United-States-Year-Round>

### FLIR OGI Operative Envelope Report

<https://flir.netx.net/file/asset/12465/original/attachment>

# APPENDIX

## FLIR OGI Camera Specifications

### IMAGING & OPTICAL

<b>Adjustable Viewfinder</b>	Built-in, tiltable OLED, 800 × 480 pixels
<b>Camera f-number</b>	1.59
<b>Color LCD</b>	4", 640 × 480 pixel rotatable, touchscreen LCD
<b>Color Palettes</b>	Arctic, White hot, Black hot, Iron, Lava, Rainbow, Rainbow HC
<b>Detector Pitch</b>	<b>Gx320:</b> 30 µm <b>Gx620:</b> 15 µm
<b>Detector Type</b>	Focal plane array (FPA), cooled InSb
<b>Display Frame Rate</b>	60 Hz
<b>Field of View</b>	<b>14.5° Lens:</b> 14.5° × 10.8° <b>24° Lens:</b> 24° × 18°
<b>Focus</b>	<b>Gx320:</b> Manual <b>Gx620:</b> Auto & Manual
<b>Image Analysis</b>	10 spots, 5 boxes with max/min/average, 1 line (horizontal or vertical), measurement corrections
<b>Image Modes</b>	IR image, visual image, high sensitivity mode (HSM), noise reduction filter
<b>IR Resolution</b>	<b>Gx320:</b> 320 × 240 (76,800 pixels) <b>Gx620:</b> 640 × 480 (307,200 pixels)
<b>Laser Spot</b>	Yes
<b>MPEG Video Recording</b>	Yes
<b>Non-Radiometric IR Video</b>	<b>Gx320:</b> H.264 (AVC) over RTSP (Wi-Fi), MPEG4 over RTSP (Wi-Fi), MJPEG over UVC and RTSP (Wi-Fi) <b>Gx620:</b> Not listed
<b>On Camera Display</b>	Widescreen 800 × 480 pixel LCD, Tiltable 800 × 480 pixel OLED viewfinder
<b>Radiometric IR Video</b>	RTRR (.csq), Over UVC
<b>Radiometric JPG</b>	Yes
<b>Sensor Cooling</b>	Stirling Microcooler (FLIR MC-3)
<b>Spectral Range</b>	3.2 µm to 3.4 µm
<b>Video Recording &amp; Streaming</b>	H.264 to memory card
<b>Zoom</b>	1 – 8× continuous, digital zoom

## MEASUREMENT & ANALYSIS

<b>Accuracy</b>	$\pm 1^{\circ}\text{C}$ ( $\pm 1.8^{\circ}\text{F}$ ) for temperature range $0^{\circ}\text{C}$ to $100^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ to $212^{\circ}\text{F}$ ) or $\pm 2\%$ of reading for temperature range $>100^{\circ}\text{C}$ ( $>212^{\circ}\text{F}$ )	
<b>Area Box</b>	5 (min./max./avg.)	
<b>Delta T</b>	Yes	
<b>Gas Quantification</b>	Quantification onboard camera	
<b>Gas Sensitivity</b>	<b>Gx320:</b>	<b>Gx620:</b>
	$\text{CH}_4$ : $<9.6$ ppm x m	$\text{CH}_4$ : $<29$ ppm x m
	Hydrocarbons (multiple): $<4$ ppm x m ( $\Delta T = 10^{\circ}\text{C}$ , Distance = 1 m)	Hydrocarbons (multiple): $<4$ ppm x m ( $\Delta T = 10^{\circ}\text{C}$ , Distance = 1 m)
<b>Measurement Corrections</b>	Reflected temperature, distance, atmospheric transmission, humidity, external optics	
<b>Profile</b>	1 live line (horiz. or vert.)	
<b>Recording</b>	MultiREC Recording; Record multiple files automatically in customizable order	
<b>Spot Meter</b>	10	
<b>Temperature Range</b>	$-20^{\circ}\text{C}$ to $350^{\circ}\text{C}$ ( $-4^{\circ}\text{F}$ to $662^{\circ}\text{F}$ )	
<b>Thermal Sensitivity</b>	<b>Gx320:</b> $<10$ mK at $30^{\circ}\text{C}$ ( $86^{\circ}\text{F}$ )	
	<b>Gx620:</b> $<20$ mK at $30^{\circ}\text{C}$ ( $86^{\circ}\text{F}$ )	

## COMMUNICATION & DATA STORAGE

<b>Communication Interfaces</b>	USB 2.0, Bluetooth via headset, Wi-Fi, HDMI
<b>Image File Format</b>	Standard JPEG, measurement data included. Infrared-only mode
<b>Radio</b>	Operating frequency:
	•Bluetooth + EDR: 2402–2480 MHz
	•WLAN 2.4 GHz: 2412–2462 MHz
	•WLAN 5 GHz: 5150–5250 MHz Note that frequency band 5150–5250 MHz is for indoor use only, see national regulations.
	RF output (EIRP)
<b>Storage Media</b>	• Bluetooth + EDR: $<10$ dBm
	•WLAN: $<17$ dBm
	Antenna
<b>Video Out</b>	•Integrated PIFA antenna (gain: maximum 2.6 dBi)
	Removable SD card
	HDMI, DVI

## GENERAL

<b>Annotations</b>	Voice: 60 seconds with Bluetooth on still images and video Text: Text from predefined list or soft keyboard on touchscreen Image Sketch: Yes, on infrared only
<b>Cloud Services</b>	Via Wi-Fi; FLIR Ignite for direct, secure image uploading, organizing, storage, and sharing (required firmware available)
<b>FLIR Inspection Route</b>	Enabled in the camera
<b>GPS [removable]</b>	Location data automatically added to every still image and first frame in video from built-in GPS
<b>Laser Pointer</b>	Class 2
<b>Package Includes</b>	Infrared camera with lens, battery (2 pcs), battery charger, power supply including multi-plugs, hand strap, neck strap, lens cap, lens cap strap, memory card, HDMI-HDMI cable, USB cable, screwdriver TX20, knob screw (optional screw for the rear cover), printed documentation, hard transport case
<b>Packaging Size</b>	<b>Gx320:</b> 600 mm × 510 mm × 410 mm (23.6 in × 20.1 in × 16.1 in) <b>Gx620:</b> 400 × 190 × 510 mm (15.7 × 7.5 × 20.1 in.)
<b>Size [L x W x H] w Lens</b>	251.6 mm × 164.5 mm × 170.9 mm (9.9 in × 6.48 in × 6.73 in)
<b>Weight [incl lens &amp; batteries]</b>	3 kg (6.18 lb)

## USER INTERFACE

<b>Languages</b>	21
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## POWER

<b>Battery operating time</b>	>2.5 hours at 25°C (68°F) and typical use
<b>Battery Type</b>	Rechargeable Li-ion battery; 7.4 V, charged in camera or separate 2-bay charger
<b>Charging Time</b>	2.5 hours to 95% capacity, charging status indicated by LEDs
<b>Start Up Time</b>	Typically 7 min. at 25°C (77°F)

## ENVIRONMENTAL & CERTIFICATIONS

<b>Certifications</b>	RoHS: 2011/65/EU WEEE: 2012/19/EU RED: 2014/53/EU EMC: ETSI EN 301 489-1 (radio), ETSI EN 301 489-17, EN 55032 (emission), EN 55035 (immunity), EN 61000-4-8 Level 5 (magnetic field), EN 61000-6-2, Immunity Industrial Environment, FCC 47 CFR part 15 B, class B (emission), ICES-003
<b>Encapsulation</b>	IP54 (IEC 60529)
<b>Hazardous Location Compliance</b>	ATEX/IECEx, Ex ic nC op is IIC T4 Gc II 3 G ANSI/ISA-12.12.01-2013, Class I Division 2 CSA 22.2 No. 213, Class I Division 2
<b>Mounting</b>	UNC ¼"-20
<b>Operating Temperature Range</b>	-20°C to 50°C (-4°F to 122°F)
<b>Shock &amp; Vibration</b>	Shock: 25 g (IEC 60068-2-27); Vibration: 2 g (IEC 60068-2-6)
<b>Storage Temperature Range</b>	-30°C to 60°C (-22°F to 140°F)

### **FLIR OGI Camera Example Images**



**Figure 3.a – Normal Video Recording of Gas Emission**



**Figure 3.b – OGI Camera Recording of Gas Emission**



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## **ATTACHMENT Fa**

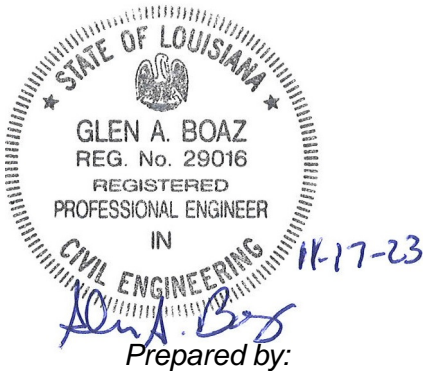
### **Containment Structure Plan**

# Sulphur Brine Field Containment Levee

*Submitted by:*

**Westlake**

# Westlake



**ReCON**  
Management • Engineering  
Inspection

1907 Ruth Street  
Sulphur, Louisiana 70665  
(337) 583-4662  
Fax (337) 583-1836

ReCon Engineering Project No. 23261173

November 17, 2023

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## APPENDIX

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SK-APP1-01	Vicinity Plan
SK-APP1-02	Containment Levee Site Plan
SK-APP1-03	Containment System Plan
SK-APP1-04	Weir Structure and Pump Station
SK-APP1-05	Levee and Weir Structures

## **1.0 BACKGROUND**

Order 3.i. of the Third Supplement to Compliance Order No. IMD 2022-027 issued by the State of Louisiana Department of Natural Resources Office of Conservation requires Westlake US 2, LLC (Westlake) to submit a plan to construct a containment system around the potential affected area at the Sulphur Brine Field in the event of a surface expression caused by a failure of Cavern 7.

In response to the order, a levee containment system plan has been developed and is currently in the review process. The containment system consists of the following components:

- Engineered earthen levees constructed with low permeability compacted clay soils surrounding the possible impact site (see Figure 1). Due to area restrictions, a portion of the levee will utilize steel sheet piles with an impermeable interior liner.
- Two major weir drainage structures will allow transfer of water from one side of the containment levee to the other. Each structure will include three 36-inch diameter drainpipes that run through the levees. Each pipe will have valves which can be manually opened or closed to allow water transfer to the outside of the levee.
- A smaller single pipe weir structure is planned for the east side levee and will drain to the central pond.
- A pump station will be constructed within the containment system to also remove and/or utilize pond water. Two pumps are proposed for the station. One pump will be the primary pump and the other will act as a backup.

## **2.0 INTRODUCTION**

This Plan describes the basis of the containment system layout, drainage structures, levee elevation, materials of construction, etc.:

- Anticipated impact zone;
- Levee location;
- Current runoff receiving streams;
- Elevation of containment levee;
- Containment levee construction materials

Each of these items is addressed in greater detail in the sections that follow in this Containment System Plan

### 3.0 SITE INFORMATION

The majority of the brine field site in question is currently owned by Sulphur Dome, LLC and Westlake. Westlake leases property to mine brine that is used in the Chlor-Alkali process at the Westlake South facility. Other landowners that may be impacted by the levee construction are Brimstone History Society, Apollo Lake Charles, Bell Mineral LLC, Julia B Est. Pollock, Keith Hobgood, and LOLC LLC.

The soils at the site are identified as Guyton, Judice, and Morey by USDA Soil Survey and fall into the Hydraulic Soil Groups C or D. These soils typically have land slopes in the 0 to 1% range and rarely flood. Vegetation consists of grass, naturally growing trees, and ponds. A large portion of the containment system will surround an existing pond.

### 4.0 CONTAINMENT SYSTEM PLAN

#### 4.1 IMPACT ZONE

The impact zone was identified in the Lonquist “Surface Expression Impact Zone Estimate” document updated November 2, 2023. See Figure 4 page 6 of 41 of indicated document. The initial impact zone has been identified to have a diameter of 678 feet with the epicenter located 488 feet due west of Well 7B. The final impact zone is indicated to have a diameter of 1841 feet. Both impact zones are shown with the proposed containment levee location on Appendix 1, drawing SK-APP1-02 and SK-APP1-03.

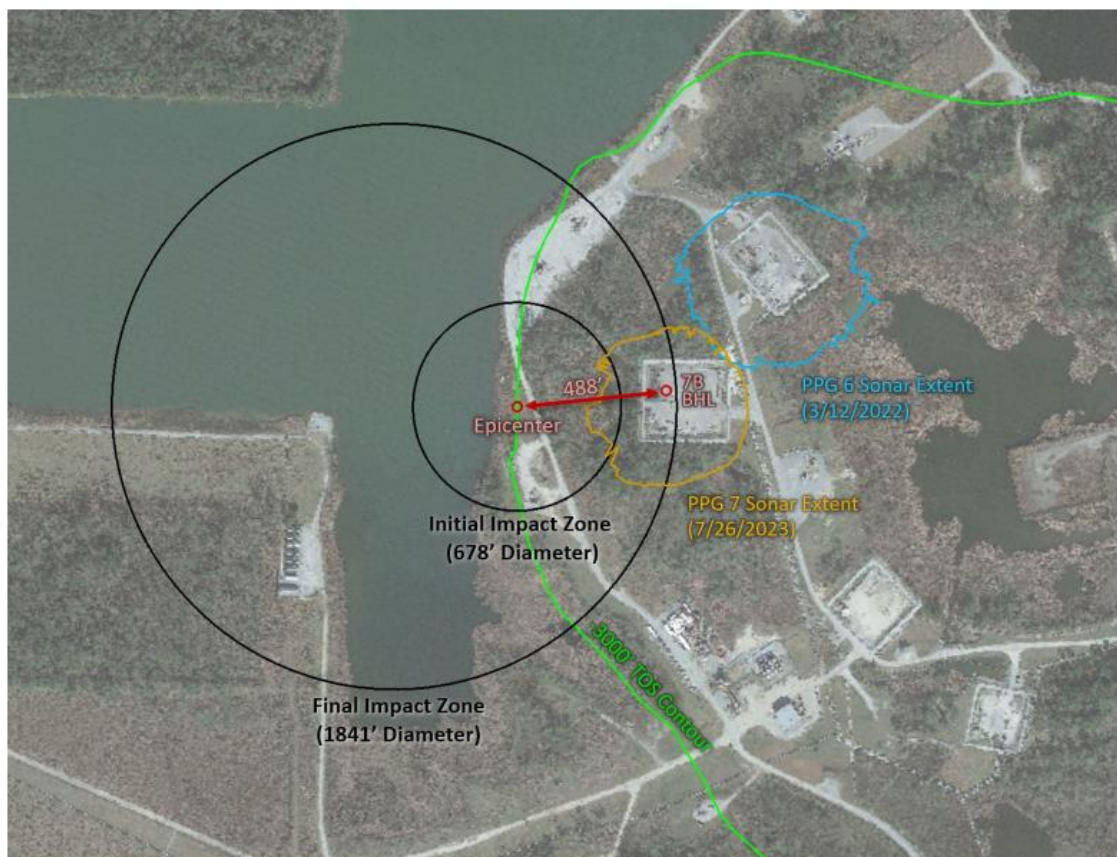


Figure 1 – Impact Zone Diagram (Obtained from Lonquist document dated 11/2/2023)



## 4.2 CONTAINMENT LEVEE LAYOUT

Using the indicated impact zones as the starting point, the containment levee was located to surround the impact zones. Because the impact zones are mostly located at a pond, the entire pond has been included within the containment levee. In addition, well location number 7B is included within the confines of the levee. See SK-APP1-02 in the appendix for levee layout.

The proposed levee layout encompasses an approximate 299 acres and the length of the levee is 18740 feet.

## 4.3 RECEIVING STREAMS

Two stormwater receiving streams have been identified at the Brine Field site as shown in Figure 2. One is a Bayou Choupique drainage lateral that is located at the very south side of the property. It receives mostly stormwater runoff that originates from the west side of the property. The other is a Bayou D'Inde drainage lateral that enters the east side of the property at about the midpoint of the facility and receives storm water from the east side of the property.

Two main drainage weir structures are planned for the Containment Pond. One structure will be located on the southwest side of the pond. This structure will discharge to the Bayou Choupique drainage lateral. The other weir structure will be located at the current drainage culvert on the west side of the pond about mid-way on the property. This culvert currently drains to the ponds located east of the Brine site and then to a Bayou D'Inde drainage ditch. The second drainage weir structure will be located at the current drainage culvert that will be removed.

A third drainage weir will be located on the east side around the wells. This drainage structure is considered minor because it will only drain locally collected runoff and discharge into the central pond.

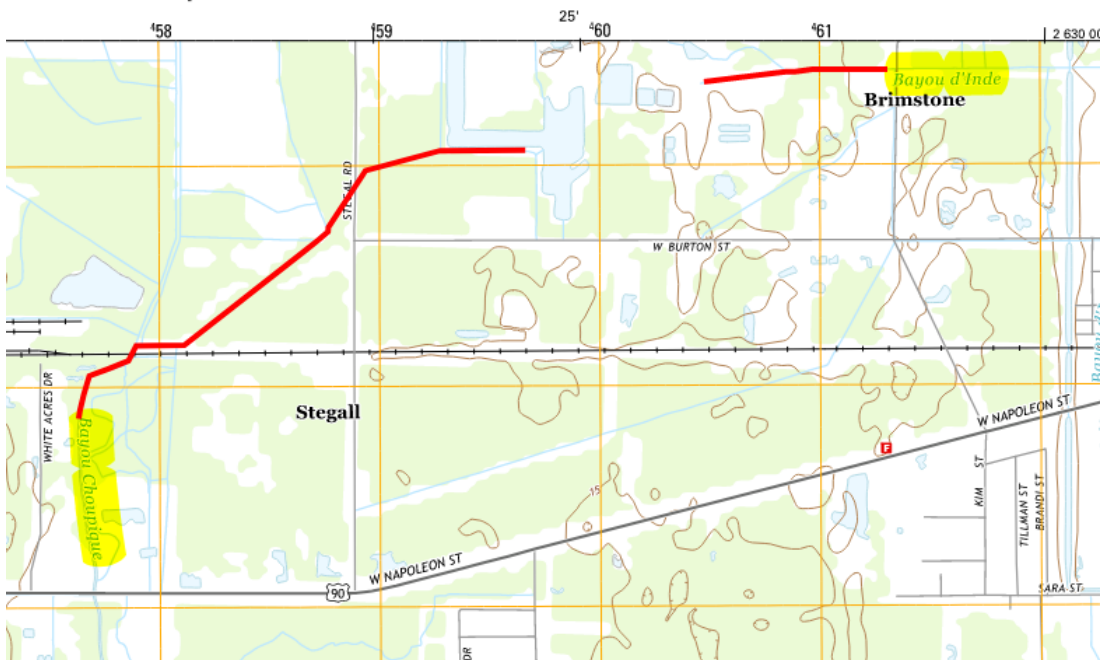


Figure 2 – Topographic Map Indicating Two Receiving Streams

## 4.4 ELEVATION OF CONTAINMENT LEVEE

The water elevation in the pond fluctuates somewhat depending on the amount of rainfall, but typically ranges from 11 to 12 feet MSL. The ground level varies across the site from 8 feet to 17 feet, but averages between 12 and 13 ft.

The brine site is located outside of any FEMA indicated flood zones and is assigned Zone X, which indicates the site is not in a flood zone. The nearest identified flood zone is located south of the Brine Facility and has an assigned flood elevation of 17 feet.

The top of the containment levee elevation was selected to be set at 17 feet based on the downstream flood elevation set by FEMA. See Figure 3 for the location of Brine site in relation to flood zone that occurs due to a 100 year flooding event with a storm surge in Calcasieu River.

The elevation, 17 feet, works well with the diameter of the drainage weir pipes that are required due to the size of the containment area.

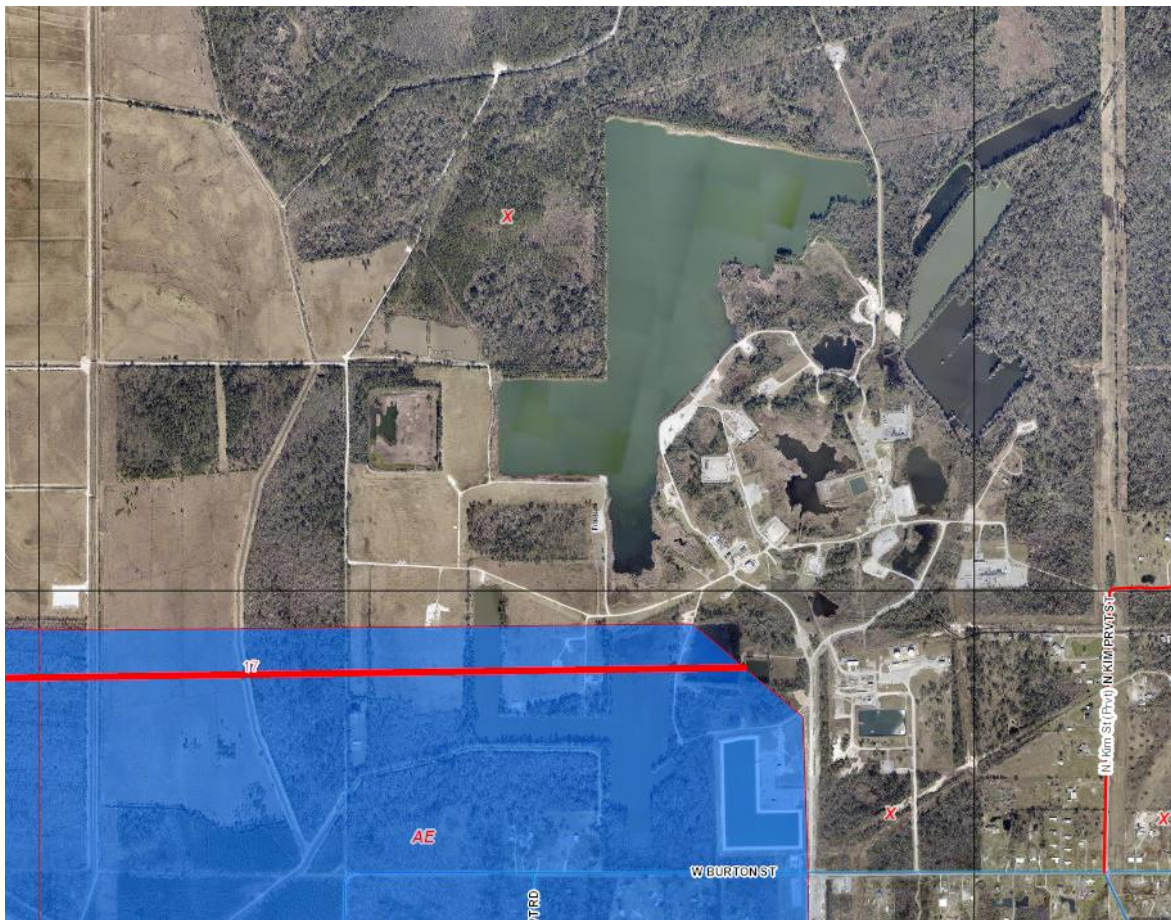


Figure 3 – FEMA 100 Year Flood Zone Map

## 4.5 LEVEE CONFIGURATION

The top of the containment levee will be approximately five feet above the existing pond water elevation that is set at 17 feet MSL. The levee top will be the access road for the containment system and is 14 to 16 feet wide to provide mobility for vehicles and equipment. The top will be surfaced with crushed aggregate placed on top of a geotextile fabric. Side slopes of the fill material will be 2 on 1. The total base width of the levee will vary depending on the existing ground elevations but can approach a width of forty feet. See levee detail in appendix drawing SK-APP1-05.

## 4.6 CONTAINMENT LEVEE CONSTRUCTION MATERIALS

Clay soil material has been selected as the main levee construction material due to its low permeability properties and reliability over long durations. The following table includes the main materials required for construction of the containment levee.

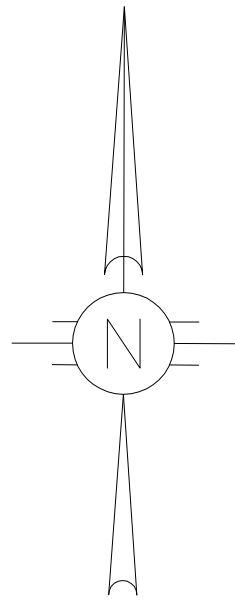
**Construction Materials and Supplies**

ITEM	APPROXIMATE QUANTITY
Clay Soil Material	81,000 cubic yards
Sheet Piles (24 ft long)	1,162 feet
Impermeable flexible barrier	1200 feet by 14 ft wide
Geotextile Fabric	16,500 feet at 16 feet wide
Aggregate	6,500 cubic yards
Weir Structures	2 major and 1 minor (3 total)
Grass Seeding	12 acres

## **APPENDIX 1**



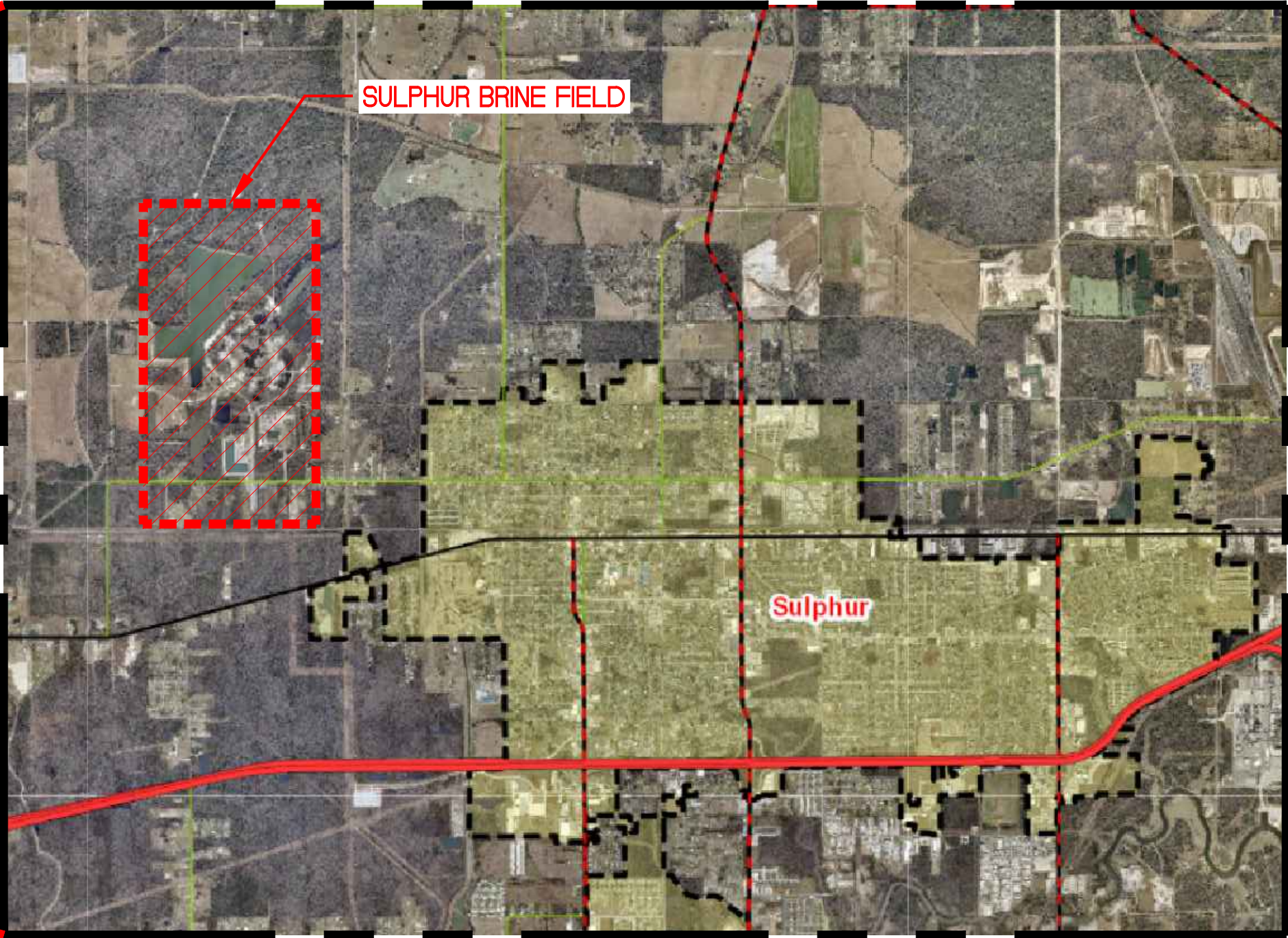
WESTLAKE US2, LLC  
CALCASIEU PARISH, LOUISIANA  
SULPHUR BRINE FIELD  
CONTAINMENT LEVEE



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STATE MAP  
SCALE: N.T.S.



VICINITY MAP  
SCALE: N.T.S.

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- SK-APP1-01 COVER SHEET
- SK-APP1-02 SITE PLAN
- SK-APP1-03 CONTAINMENT SYSTEM ROUTING PLAN
- SK-APP1-04 WEIR STRUCTURE AND PUMPS PLAN
- SK-APP1-05 DETAILS

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	APPROVED:

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Lake Charles South Complex  
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD	CIVIL
CONTAINMENT LEVEE	
COVER SHEET	

DRAWN BY	B. WHITTINGTON	DATE	11/2023	SCALE	AS SHOWN
CHECKED BY		DATE		CHARGE	-
APPROVED BY		DATE		SHEET	1 OF 5

DWG. SK-APP1-01

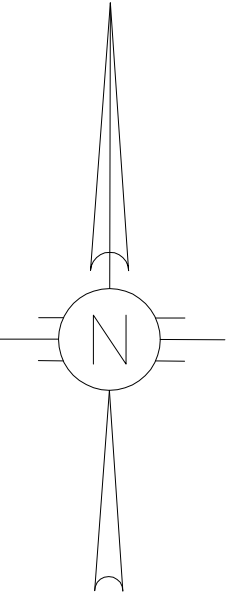
DATE: 11/2023

ISSUE FOR RECORD





CONTAINMENT SYSTEM  
SITE PLAN  
SCALE: N.T.S.



REVISIONS	
ISSUED: CONST.	
FOR: CONST.	
BULLETIN NO.: CONST.	

ALL PRINTS DATED BEFORE LAST REVISION ARE CANCELLED AND RECALLED.

- NOTES:
1. CONTAINMENT SYSTEM TO BE BUILT SURROUNDING EXTERIOR OF MAIN POND AND IMPACT ZONE.
  2. DRAINAGE WEIRS TO BE RECONSTRUCTED SOUTH OF MAIN POND CONNECTING TO DRAINAGE DITCH AND NORTHEAST AT THE NORTHEAST SIDE OF POND.
  3. PUMPS WILL BE INSTALLED SOUTH OF MAIN POND.

- LEGEND:
- CONTAINMENT LEVEE
  - IMPACT ZONE ESTIMATE
  - \*\* FROM LONGQUIST REPORT DATED NOVEMBER 2, 2023

**ReCON**

Management • Engineering  
Inspection

SULPHUR, LA

APPROVED:

PLOTTED:  
11/17/2023 9:31 AM

JOB NO: 23261173

FILE: SK-APP1-02.DWG

**Westlake**

North American  
Chlor-Alkali & Derivatives™  
Lake Charles South Complex  
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD	CIVIL
CONTAINMENT LEVEE	
SITE PLAN	

DRAWN BY	B. WHITTINGTON	DATE	11/2023	SCALE	AS SHOWN
CHECKED BY		DATE		CHARGE	
APPROVED BY		DATE		SHEET	2 OF 5

DWG. SK-APP1-02

DATE: 11/2023

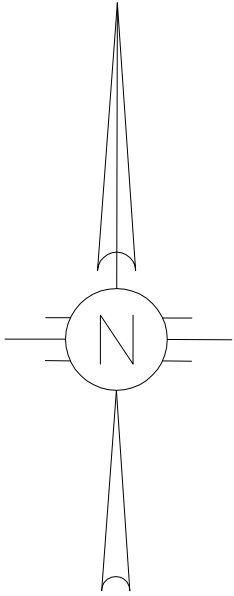
ISSUE FOR RECORD

FORM NO. 32A10808





CONTAINMENT LEVEE AND IMPACT ZONE  
SCALE: 1" = 300'



REVISIONS	
ISSUED: CONST.	
FOR: CONST.	
BULLETIN NO.: CONST.	

NOTES:

1. TWO WEIR STRUCTURES ARE TO BE CONSTRUCTED TO CONTROL POND STORM WATER RUNOFF.
2. STRUCTURE 1 DISCHARGES TO BAYOU CHOUPIQUE DRAINAGE LATERAL AND WEIR STRUCTURE 2 DISCHARGES TO POND LOCATED TO THE EAST WITH FINAL OUTFALL TO BAYOU D'INDE.

CONTAINMENT LEVEE NOTES:

APPROX. AREA WITHIN LEVEE: 298.3 ACRES  
APPROX. AREA TO BE CLEARED FOR LEVEE: 16.1 ACRES  
APPROX. LENGTH OF LEVEE: 18,740'  
APPROX. LENGTH OF SHEET PILE: 1,162'

LEGEND:

- CONTAINMENT LEVEE  
--- IMPACT ZONE ESTIMATE FROM LONQUIST  
\*\* FROM LONQUIST REPORT DATED NOVEMBER 2, 2023

**ReCON**  
Management • Engineering  
Inspection  
SULPHUR, LA  
APPROVED: \_\_\_\_\_

PLOTTED:  
11/17/2023 9:31 AM  
JOB NO: 23261173  
FILE: SK-APP1-03.DWG

<b>Westlake</b>		North American Chlor-Alkali & Derivatives™ Lake Charles South Complex 1300 PPG Drive, Westlake, LA 70669	
SULPHUR BRINE FIELD		CIVIL	
CONTAINMENT LEVEE			
CONTAINMENT SYSTEM PLAN			
DRAWN BY	B. WHITTINGTON	DATE	11/2023
CHECKED BY		DATE	
APPROVED BY		DATE	
DWG.		SK-APP1-03	

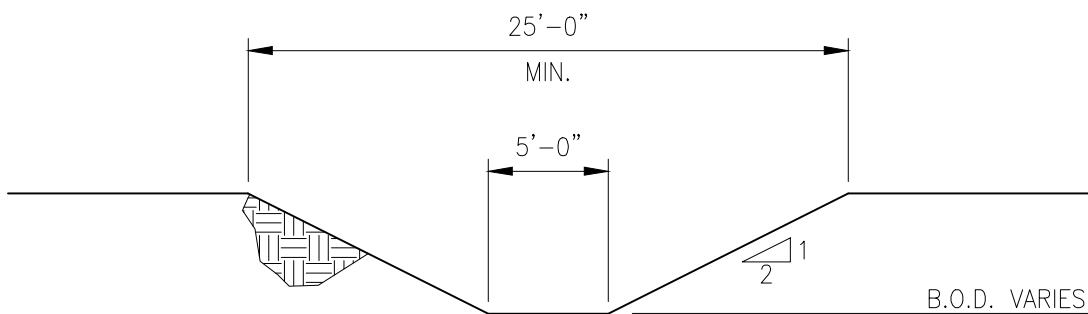
DATE: 11/2023

ISSUE FOR RECORD





PUMP STATION  
SCALE: 1" = 100'



SECTION  
DRAINAGE DITCH  
SCALE: 1/8" = 1'-0"

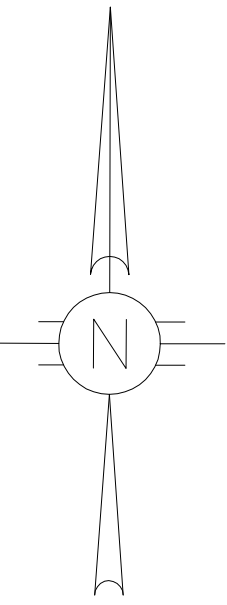


WEIR STRUCTURE 1  
SCALE: 1" = 150'



WEIR STRUCTURE 2  
SCALE: 1" = 150'

DATE: 11/2023  
ISSUE FOR RECORD



REVISIONS	
ISSUED: CONST.	
FOR: CONST.	
BULLETIN NO.: CONST.	

ALL PRINTS DATED BEFORE LAST REVISION ARE CANCELLED AND RECALLED.

**ReCON**  
Management • Engineering  
Inspection

PLOTTED:  
11/17/2023 9:32 AM

SULPHUR, LA

JOB NO: 23261173  
FILE: SK-APP1-04.DWG

APPROVED:

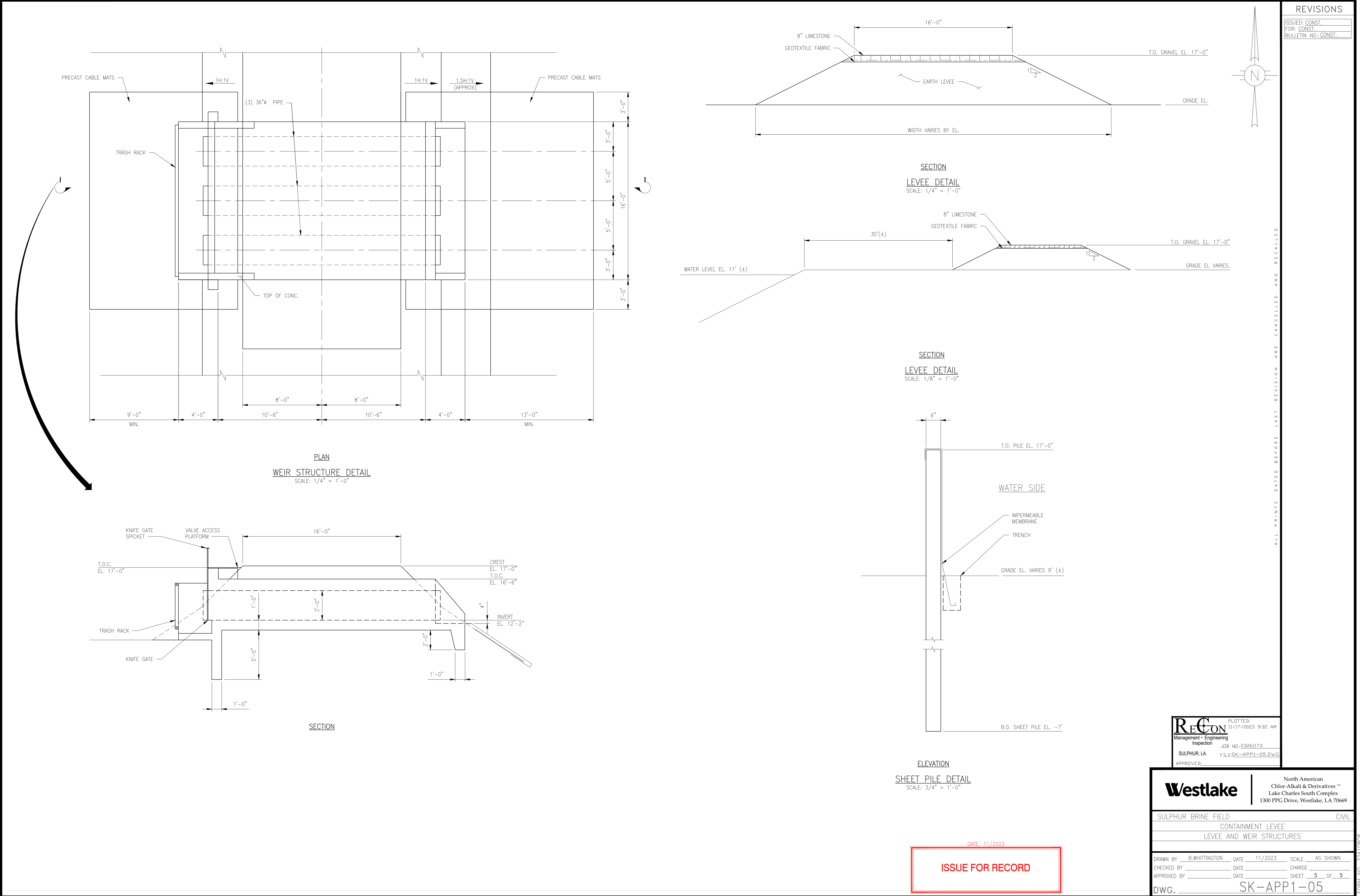
**Westlake** North American  
Chlor-Alkali & Derivatives™  
Lake Charles South Complex  
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD	CIVIL
CONTAINMENT LEVEE	
WEIR STRUCTURE AND PUMPS PLAN	

DRAWN BY	B. WHITTINGTON	DATE	11/2023	SCALE	AS SHOWN
CHECKED BY		DATE		CHARGE	-
APPROVED BY		DATE		SHEET	4 OF 5
DWG.		SK-APP1-04			

FORM NO. 32A10808





**LONQUIST**

FIELD

SERVICE

## **ATTACHMENT Fb**

### **Updated Impact Zone Estimate**

**LONQUIST**

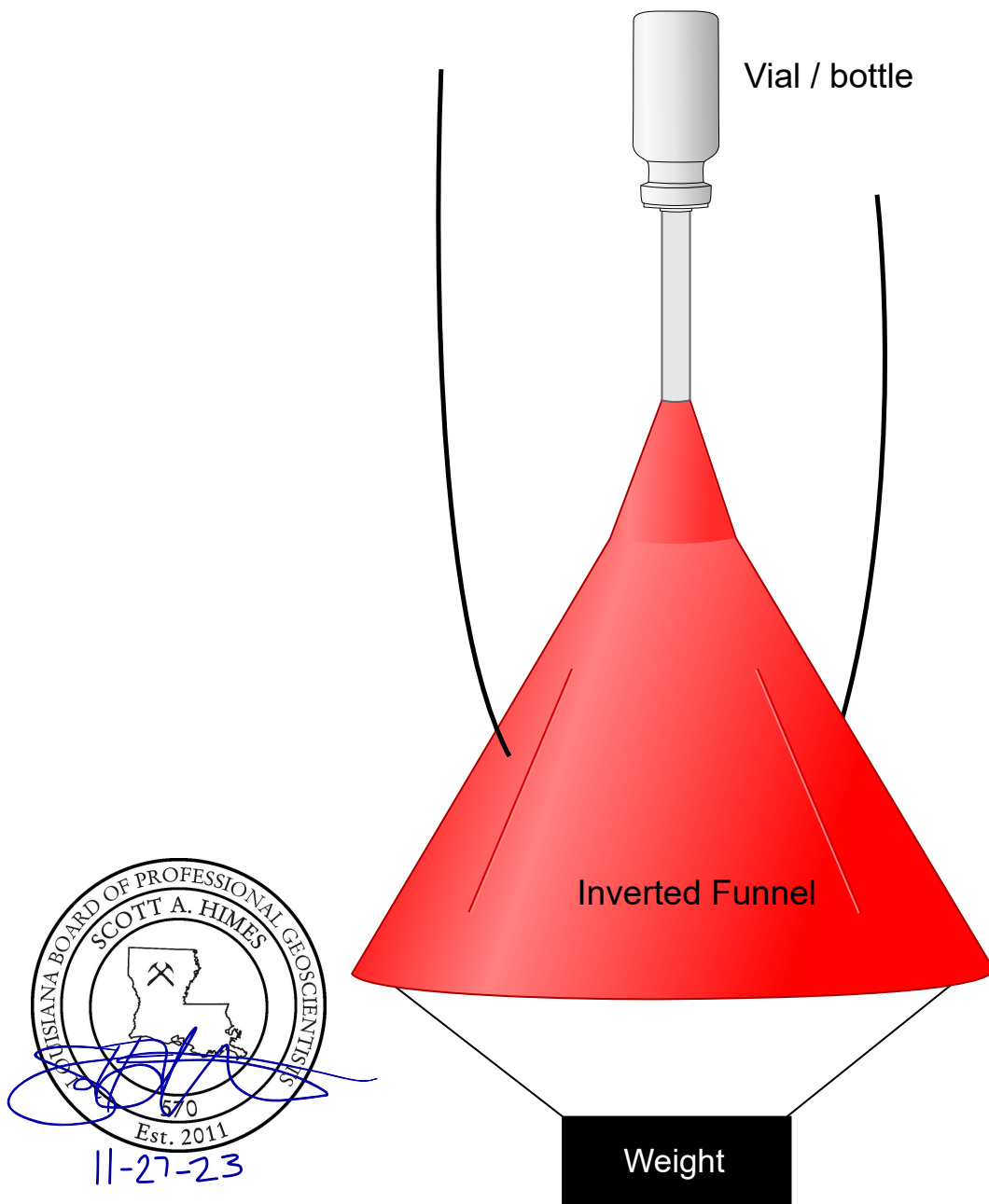
**FIELD**

**SERVICE**

## **ATTACHMENT G**

**Response to Order 3j – Figure 2 & Figure 3  
Regarding a Plan to Collect and Sample Gas Over Bubble Sites**



**Procedure:**

1. Prior to sampling, the funnel and vial/bottle are filled entirely with water, such that no air bubbles are present.
2. The device is then lowered to the sediment and the sediment is impacted with the weight ~15 times, triggering the release of bubble gas from the sediment, filling the vial/bottle with gas.
3. The device is recovered quickly to just below the water surface. The vial filled with gas is capped still under water, avoiding exchange with the water or atmosphere.

**Notes:**

Modified from Langenegger, T., et al., 2019,  
*What the bubble knows: lake methane dynamics  
 revealed by sediment gas bubble composition*,  
 Limnology and Oceanography, vol. 64, pp. 1526-1544

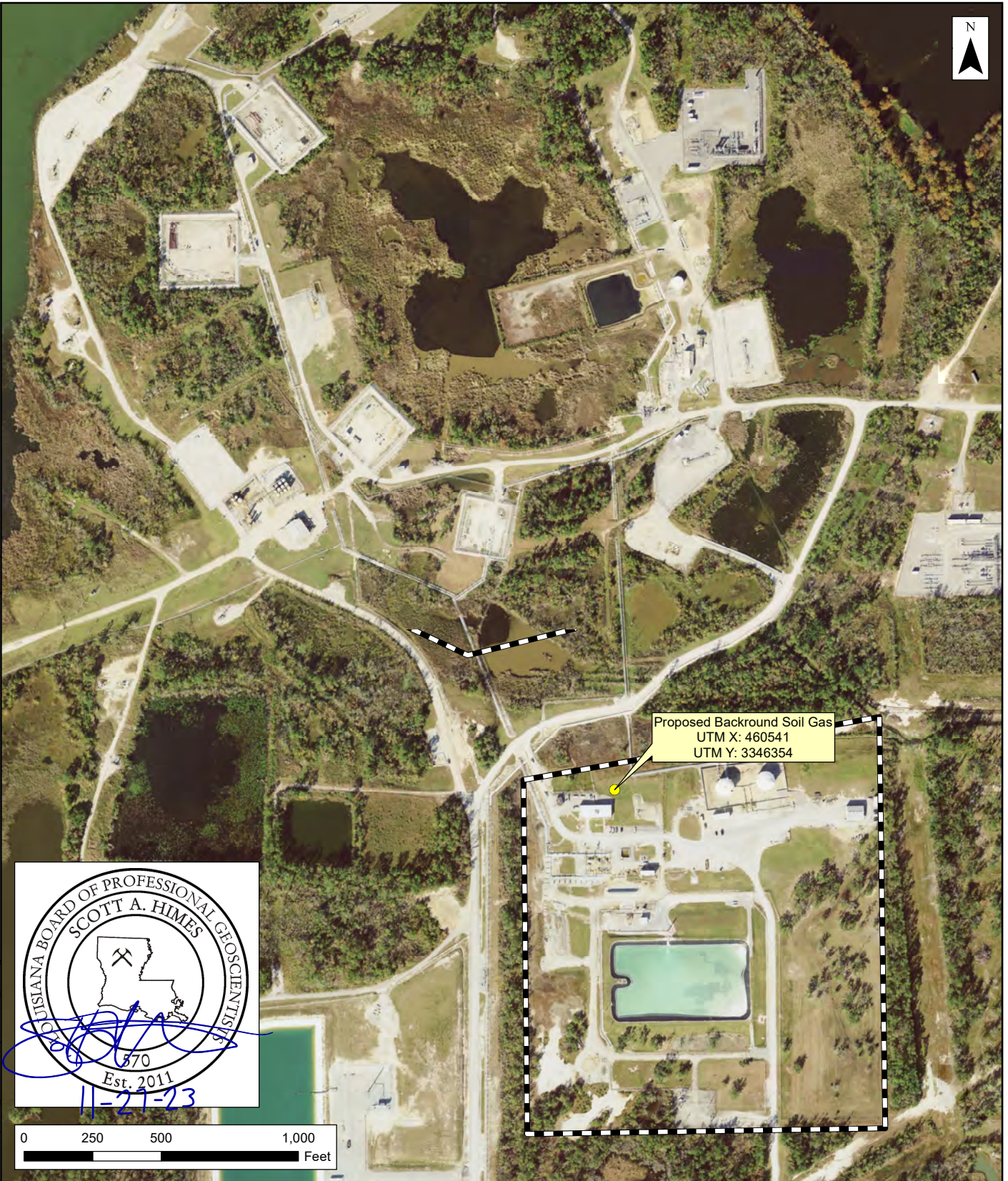
**Figure 2**  
**Gas Sampling Device**  
 Sulphur Dome  
 Westlake US 2, LLC  
 Calcasieu Parish, Louisiana





DRAWN BY: SAH

M:\US\Projects\IV-Z\Westlake\Sulphur Dome\Maps\05 LDNR Response\03 Background Soil Gas Location.mxd, REVISED: 11/27/2023, SCALE: 1:6,000 when printed at 8.5x11



**Legend**

Westlake Property

**Figure 3**  
**Proposed Background Soil Gas Location**  
Sulphur Dome  
Westlake US 2, LLC  
Calcasieu Parish, Louisiana

**Notes:**  
Water wells obtained from LDNR SONRIS database.  
Monitor & observation wells not shown.  
2021 Aerial imagery via USGS Earth Explorer (NAIP).

Source: ESRI - ArcGIS Online; NAD 1983 UTM Zone 15N

**LONQUIST**

FIELD

SERVICE

## **ATTACHMENT H**

### **Groundwater Extraction Well Metering**

# **Sulphur Brine Field Flow Meters at Groundwater Wells**

*Submitted by:*

Westlake



November 24, 2023



## **BACKGROUND**

Order 4 of the Third Supplement to Compliance Order No. IMD 2022-027 issued by the State of Louisiana Department of Natural Resources Office of Conservation requires Westlake US 2, LLC (Westlake) to install metering devices for each groundwater extraction well to measure rates and volumes of freshwater withdrawal on a per-well basis.

In response to the order, Westlake has installed Optiflux 4000 electromagnetic flow meters at each of the five freshwater wells in service at the Sulphur Dome. Meters were installed at the following locations in the sizes indicated:

- Water well 11 – 10"
- Water well 12 – 8"
- Water well 13 – 8"
- Water well 19 – 10"
- Water well 40 – 12"

Installation of the meters is documented on P+IDs 01A-10090.RA and 01A-10090.RXA. Piping tie-ins and the line list are also included in the attachments.

The meters were specified in accordance with Westlake instrumentation and piping standards, and Recognized and Generally Accepted Good Engineering Practices.

The meters were specified and placed on order 11/3/2023. Meters were received and delivered to the work site on 11/9/2023. Instrument installation started on 11/13/2023, and was completed on 11/16/2023. Electrical work was completed and the instruments commissioned on 11/20/2023.

The meters have been incorporated into Westlake's standard instrument maintenance program. The instruments will be inspected every 6 months by qualified Westlake instrument mechanics. Repairs will be installed as needed by Westlake.

Meters will be manually recorded daily and reported in Westlake's daily observation report.

Water Well 11



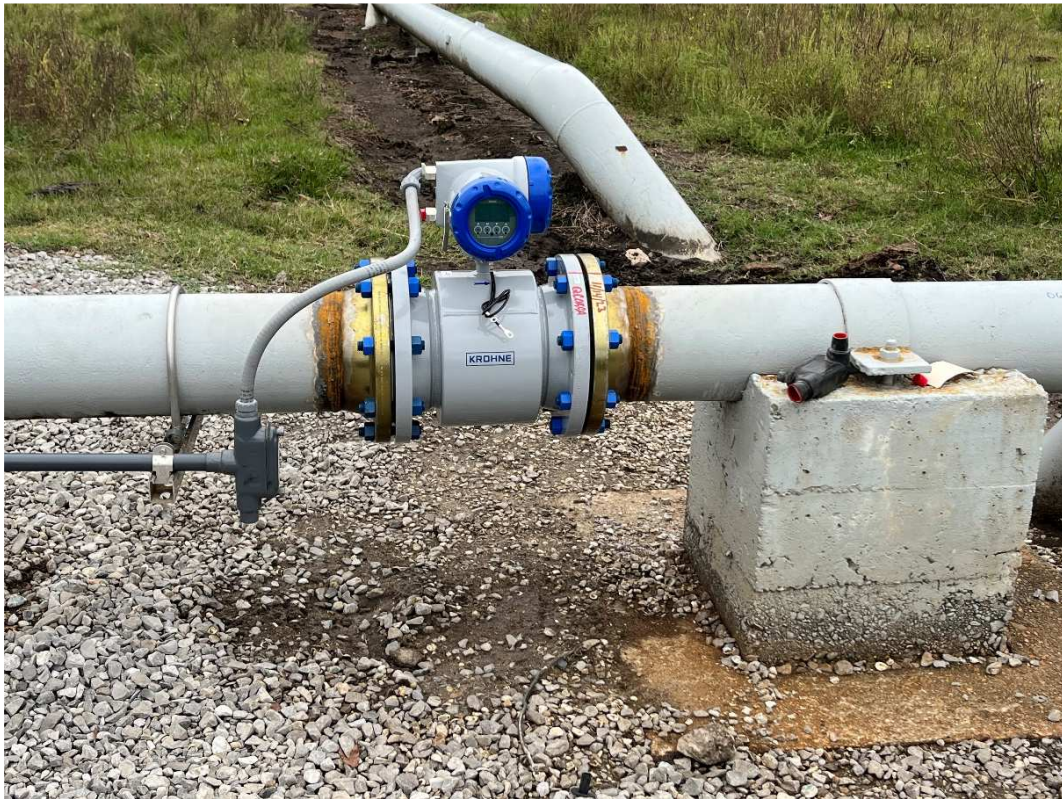


Water Well 12





Water Well 13





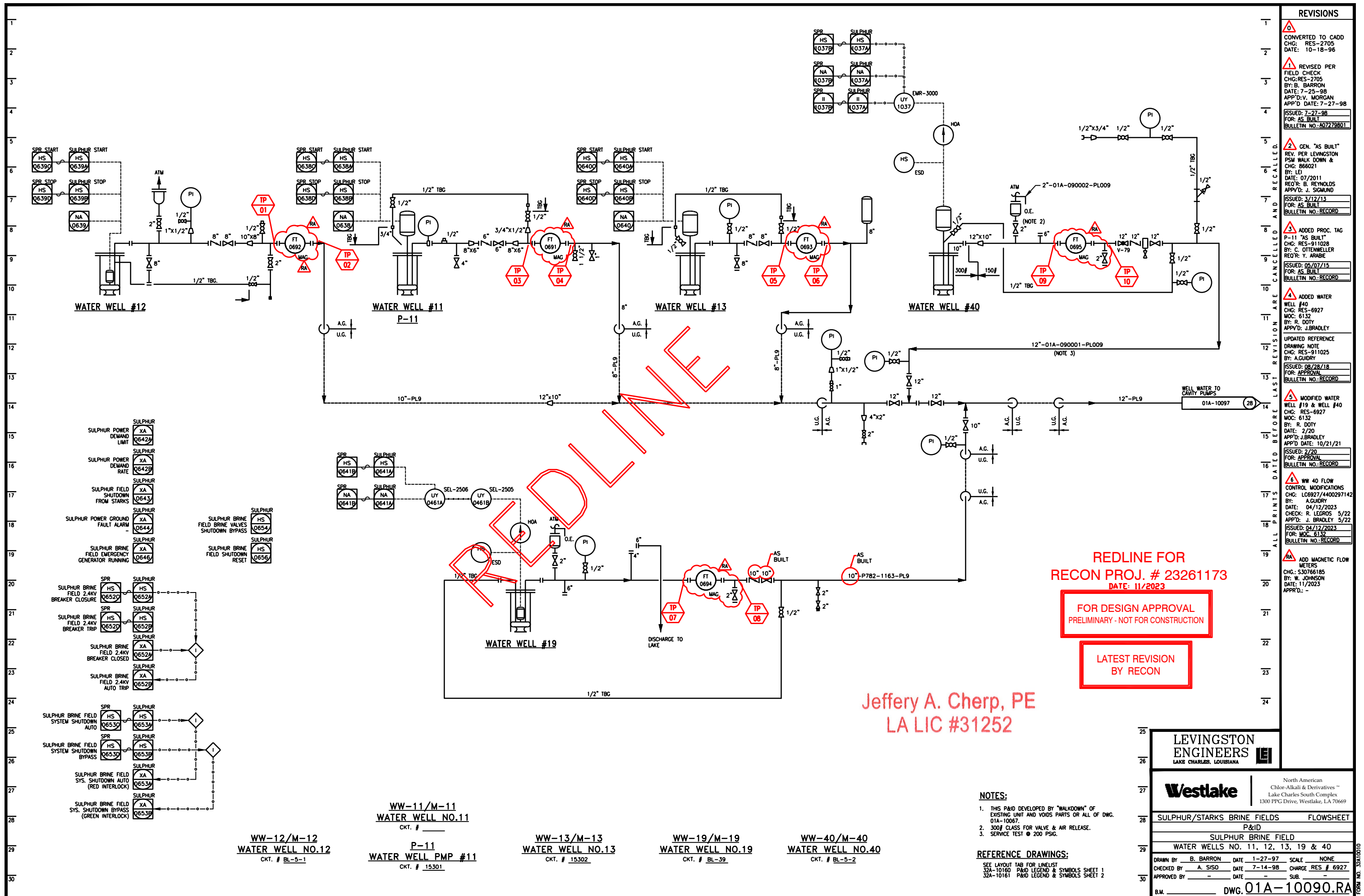
Water Well 19





Water Well 40





REVISIONS	
1	CONVERTED TO CADD CHG: RES-2705 DATE: 10-18-96
2	REVISED PER FIELD CHECK CHG: RES-2705 BY: B. BARRON DATE: 7-25-98 APP'D: V. MORGAN APP'D DATE: 7-27-98 ISSUED: 7-27-98 FOR: AS BUILT BULLETIN NO.: A07279801
3	GEN. "AS BUILT" REV. PER LEVINGSTON PSM WALK DOWN & CHG: 866021 BY: LEI DATE: 07/2011 REQ'D: B. REYNOLDS APP'D: J. SIGMUND ISSUED: 3/12/13 FOR: AS BUILT BULLETIN NO.: RECORD
4	ADDED PROC. TAG P-11 "AS BUILT" CHG: RES-911028 BY: C. OTTENWELLER REQ'D: Y. ARABIE ISSUED: 05/07/15 FOR: AS BUILT BULLETIN NO.: RECORD
5	ADDED WATER WELL #40 CHG: RES-6927 MOC: 6132 BY: R. DOTY APP'D: J. BRADLEY ISSUED: 08/28/18 FOR: APPROVAL BULLETIN NO.: RECORD
6	MODIFIED WATER WELL #19 & WELL #40 CHG: RES-6927 MOC: 6132 BY: R. DOTY DATE: 2/20 APP'D: J. BRADLEY APP'D DATE: 10/21/21 ISSUED: 2/20 FOR: APPROVAL BULLETIN NO.: RECORD
7	WW 40 FLOW CONTROL MODIFICATIONS CHG: LC6927/4400297142 BY: A. GUDRY DATE: 04/12/2023 CHECK: R. LEGROS 5/22 APP'D: J. BRADLEY 5/22 ISSUED: 04/12/2023 FOR: MOC: 6132 BULLETIN NO.: RECORD
8	ADD MAGNETIC FLOW METERS CHG: 530760185 BY: W. JOHNSON DATE: 11/2023 APP'D: -

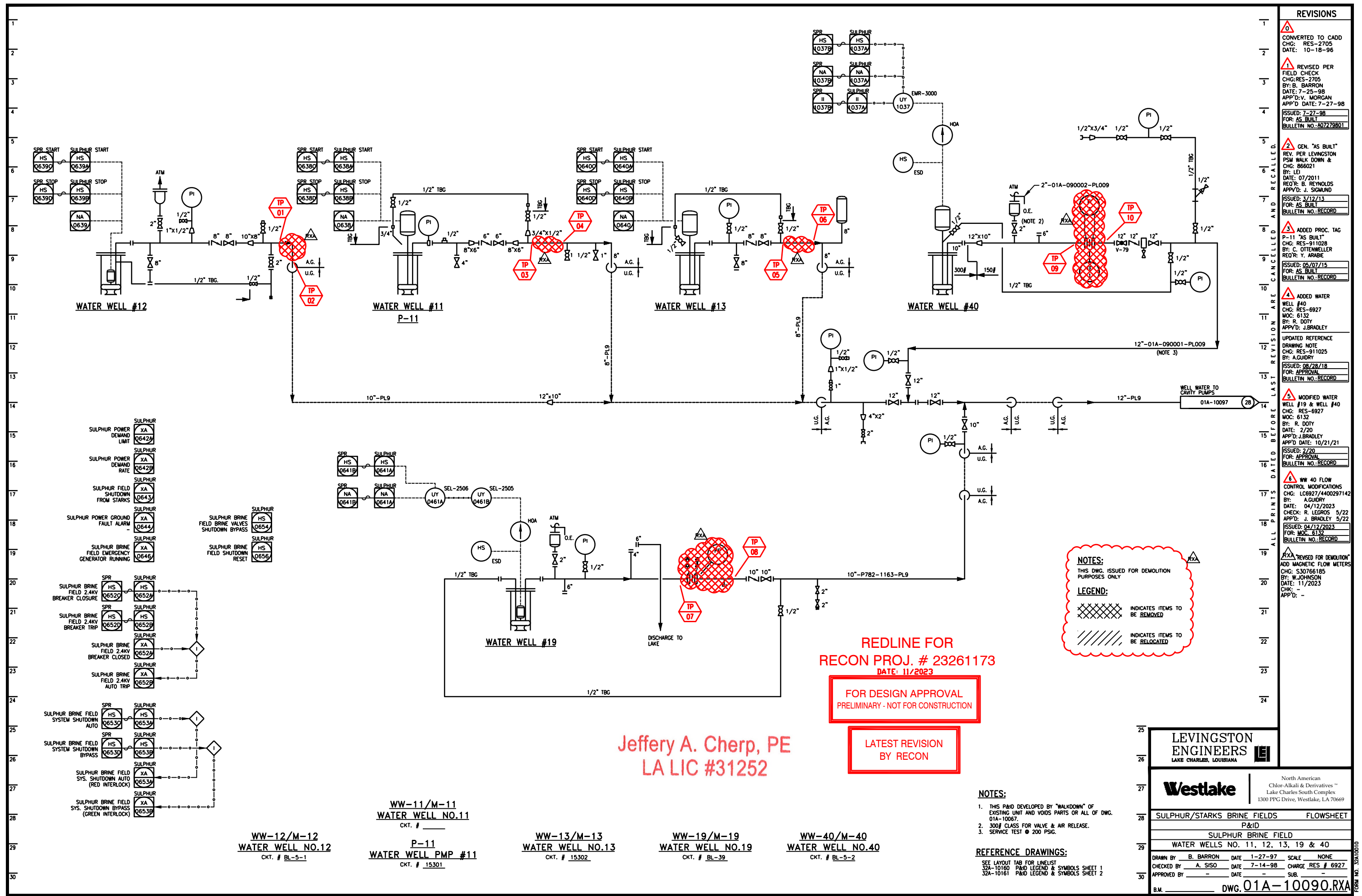
**NOTES:**

- THIS P&ID DEVELOPED BY "WALKDOWN" OF EXISTING UNIT AND VOIDS PARTS OR ALL OF DWG. 01A-10067.
- 300# CLASS FOR VALVE & AIR RELEASE.
- SERVICE TEST @ 200 PSIG.

**REFERENCE DRAWINGS:**

SEE LAYOUT TAB FOR LINELIST  
32A-10160 P&ID LEGEND & SYMBOLS SHEET 1  
32A-10161 P&ID LEGEND & SYMBOLS SHEET 2









[illegible]



Email: recon@recon-group.com

LOUISIANA OFFICE:  
P.O. BOX 29  
Sulphur, LA 70664  
1907 Ruth St.  
Sulphur, LA 70663  
Phone: (337) 583-4662  
Fax: (337) 583-7565

TEXAS OFFICE:  
550 Fannin Street, Suite 850  
Beaumont, TX 77701  
Phone: (409) 842-8103  
Fax: (409) 832-0202

## Document Transmittal

### Instrument Specification Package - Magnetic Flow Meter

DATE: 11/17/2023

TO: Westlake South

1300 PPG Drive

Lake Charles, LA 70602

ATTENTION: Meg Quinn

PROJECT TITLE: No. 7 Investigation Work

TRANSMITTAL NUMBER: 003

RECON PROJECT NUMBER: 23261173

CLIENT REFERENCE NUMBER:

#### Issued For:

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> As-Built             | <input type="checkbox"/> For Construction Revised | <input checked="" type="checkbox"/> For Record |
| <input type="checkbox"/> For Approval         | <input type="checkbox"/> For Design Approval      | <input type="checkbox"/> For Reference Only    |
| <input type="checkbox"/> For Review & Comment | <input type="checkbox"/> Preliminary              | <input type="checkbox"/> Return of Documents   |
| <input type="checkbox"/> For Construction     | <input type="checkbox"/> For Estimate Only        | <input type="checkbox"/> Unchecked             |

#### Transmittal includes:

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Bid Tabulations      | <input type="checkbox"/> Opinion of Probable Cost | <input checked="" type="checkbox"/> Specifications           |
| <input type="checkbox"/> Calculations         | <input type="checkbox"/> Report                   | <input type="checkbox"/> Tie-In Schedule                     |
| <input type="checkbox"/> Drawings             | <input type="checkbox"/> Scope of Work            | <input checked="" type="checkbox"/> Vendor Data / Quotations |
| <input type="checkbox"/> Engineering Estimate | <input type="checkbox"/> Sketch                   | <input type="checkbox"/> FEL-3 Report                        |

Transmittal Details: Transmitted via email in .pdf format.

#### Special Notes:

Document	Revision	Description	Issue
01A-FT-0691	0	Magnetic Flow Meter Data Sheet - Water Well #11	For Record
01A-FT-0692	0	Magnetic Flow Meter Data Sheet - Water Well #12	For Record
01A-FT-0693	0	Magnetic Flow Meter Data Sheet - Water Well #13	For Record
01A-FT-0694	0	Magnetic Flow Meter Data Sheet - Water Well #19	For Record
01A-FT-0695	0	Magnetic Flow Meter Data Sheet - Water Well #40	For Record
23-32176R2	REF	Accutrol Sales Quote (4 Pgs)	For Reference Only

Prepared By: Stacy Skaggs, Document Control

Issued By:

, Project Manager

Distribution:

Tim Gerami


John Leibee

Jason Gooze

Claire Owens

Jeff Cherp




		Westlake Lake Charles, Louisiana				TAG No.		01A-FT-0691		
		INSTRUMENT SPECIFICATION MAGNETIC FLOW METER				Sht No.		1 of 1		
Drawing Number		01A-FT-0691				Project No.		23261173		
Plant		WESTLAKE SOUTH PLANT				RFQ No.		0		
Location		LAKE CHARLES				P.O. No.				
Unit		SULPHUR BRINE FIELD								
GENERAL	1	Tag Number		P&ID No.		01A-FT-0691		01A-10090		
	2	Service Description				Water Well #11 Flow Measurement				
	3	Line No.				8"-01A-PL009				
	4	Function				Flow Measurement				
	5	Mounting				Inline Process Connection				
	6	Area Classification				N/A				
	7	Electrical Installation								
	8									
PROCESS DATA	9	Fluid		Well Water						
	10	FLUID	Max. Flow		UOM		1200		GPM	
	11		Max. Velocity		UOM				ft/s	
	12		Norm. Flow		Min. Flow		UOM		600-800 0 GPM	
	13		Max. Temp.		Min. Temp.		UOM		120 Ambient Deg. F	
	14		Max. Press.		Min. Press.		UOM		200 0 PSIG	
	15		Min. Fluid Conductivity							
	16		Vacuum Possibility							
	17		Specific Gravity				1			
METERING ELEMENT	18	CONN.	Line Size		Schedule		8"		40 (Note 4)	
	19		Connection Type		8" 150# RF B16.5 Flange					
	20		Face to Face		13.78"					
	21	Flange Material		Carbon Steel (St 37-c22 / A 105)						
	22	METER	Tag Number		01A-FT-0691					
	23		Tube Material		Austenitic Stainless Steel					
	24		Liner Material		PFA					
	25		Electrode Type		Fixed					
	26		Electrode Material		Hastelloy C 22					
	27		Electrode Housing Configuration		Carbon Steel (St 37-c22 / A 105)					
	28		Power Supply		From Transmitter					
	29		Grounding, Type & Material		None (Virtual Reference)					
	30	Enclosure Class		IP66 / 67 DIN						
	31	Conduit Entries		N/A						
TRANSMITTER	32	Tag Number		01A-FT-0691						
	33	Function		Transmit						
	34	Mounting		Integral to flow tube						
	35	Enclosure Class		Aluminum Housing						
	36	Signal Cable		Length		DS 300 Signal				
	37	Electrical Connection		3 x 1/2" npt						
	38	Power Supply		120VAC, 60Hz						
	39	TRANS.	Transmitter Output		4-20 mA / HART, 2 Status, 1 Pulse					
	40		Calibration Range		0 - 1200 GPM					
	41	DISPLAY	Scale Size		Range		N/A 0-1200 GPM			
	42		Chart Drive		Speed		N/A N/A			
	43		Chart Range		Chart Number		N/A N/A			
	44	Integrator								
	45	CONTR.	Modes		Output					
46	Action		Auto-Man.							
47	ALARM	Contact No.		Form						
48		Rating		Elec. Code						
49		Action								
PURCHASE	50	Manufacturer		Krohne						
	51	Flow Tube Model Number		Optiflux 4000 - VN044EA01C0B1100000000000						
	52	Transmitter Model Number		IFC 300C-VN3044A0430010100100						
	53	Purchase Order Number								
	54	Serial Number								

**NOTES:**

1. Stainless Steel Name Tag stamped with Tag Number.
2. IFC Min Conductivity > 200 µMho/cm, 10 pipe diameter upstream +2 pipe diameter down stream.
3. Krohne Process Min Temp -40 °F + Max Temp 284 °F
4. Assumed per pipe spec plan to field verify.

NOV 15 2023

FOR  
RECORD


		Westlake Lake Charles, Louisiana				TAG No.		01A-FT-0692		
		INSTRUMENT SPECIFICATION MAGNETIC FLOW METER				Sht No.		1 of 1		
Drawing Number		01A-FT-0692				Project No.		23261173		
Plant		WESTLAKE SOUTH PLANT				Rev.		0		
Location		LAKE CHARLES				Date		11/10/23		
Unit		SULPHUR BRINE FIELD				By		JSG		
						Chk		JAC		
						Appr		TG		
GENERAL	1	Tag Number		P&ID No.		01A-FT-0692		01A-10090		
	2	Service Description				Water Well #12 Flow Measurement				
	3	Line No.				10"-01A-PL009				
	4	Function				Flow Measurement				
	5	Mounting				Inline Process Connection				
	6	Area Classification				N/A				
	7	Electrical Installation								
	8									
PROCESS DATA	9	Fluid		Well Water						
	10	FLUID	Max. Flow		UOM		2000		GPM	
	11		Max. Velocity		UOM				ft/s	
	12		Norm. Flow		Min. Flow		UOM		1600-1800 0 GPM	
	13		Max. Temp.		Min. Temp.		UOM		120° Ambient Deg. F	
	14		Max. Press.		Min. Press.		UOM		200 0 PSIG	
	15	Min. Fluid Conductivity								
	16	Vacuum Possibility								
	17	Specific Gravity				1				
METERING ELEMENT	18	CONN.	Line Size		Schedule		10"		40 (Note 4)	
	19		Connection Type		10" 150# RF B16.5 Flange					
	20		Face to Face		15.75"					
	21	Flange Material		Carbon Steel (St 37-c22 / A 105)						
	22	METER	Tag Number		01A-FT-0692					
	23		Tube Material		Austenitic Stainless Steel					
	24		Liner Material		PFA					
	25		Electrode Type		Fixed					
	26		Electrode Material		Hastelloy C 22					
	27		Electrode Housing Configuration		Carbon Steel (St 37-c22 / A 105)					
	28		Power Supply		From Transmitter					
	29		Grounding, Type & Material		None (Virtual Reference)					
	30		Enclosure Class		IP66 / 67 DIN					
	31	Conduit Entries		N/A						
	TRANSMITTER	32	Tag Number		01A-FT-0692					
33		Function		Transmit						
34		Mounting		Integral to flow tube						
35		Enclosure Class		Aluminum Housing						
36		Signal Cable		Length		DS 300 Signal				
37		Electrical Connection		3 x 1/2" npt						
38		Power Supply		120VAC, 60Hz						
39		TRANS.	Transmitter Output		4-20 mA / HART, 2 Status, 1 Pulse					
40			Calibration Range		0 - 2000 GPM					
41		DISPLAY	Scale Size		Range		N/A		0-2000 GPM	
42			Chart Drive		Speed		N/A		N/A	
43			Chart Range		Chart Number		N/A		N/A	
44		Integrator								
45		CONTR.	Modes		Output					
46			Action		Auto-Man.					
47	ALARM	Contact No.		Form						
48		Rating		Elec. Code						
49		Action								
PURCHASE	50	Manufacturer		Krohne						
	51	Flow Tube Model Number		Optiflux 4000 - VN044FA01C0B1100000000000						
	52	Transmitter Model Number		IFC 300C-VN3044A0430010100100						
	53	Purchase Order Number								
	54	Serial Number								

**NOTES:**

1. Stainless Steel Name Tag stamped with Tag Number.
2. IFC Min Conductivity > 200 µMho/cm, 10 pipe diameter upstream +2 pipe diameter down stream.
3. Krohne Process Min Temp -40 °F + Max Temp 284 °F
4. Assumed per pipe spec plan to field verify.

NOV 15 2023

**FOR  
RECORD**

		Westlake Lake Charles, Louisiana				TAG No.		01A-FT-0693			
		INSTRUMENT SPECIFICATION MAGNETIC FLOW METER				Sht No.		1 of 1			
Drawing Number		01A-FT-0693			Project No.	23261173	Rev.	Date	By	Chk	Appr
Plant		WESTLAKE SOUTH PLANT			RFQ No.		0	11/10/23	JSG	JAC	TG
Location		LAKE CHARLES			P.O. No.						
Unit		SULPHUR BRINE FIELD									
GENERAL	1	Tag Number		P&ID No.		01A-FT-0693		01A-10090			
	2	Service Description				Water Well #13 Flow Measurement					
	3	Line No.				8"-01A-PL009					
	4	Function				Flow Measurement					
	5	Mounting				Inline Process Connection					
	6	Area Classification				N/A					
	7	Electrical Installation									
	8										
PROCESS DATA	9	Fluid				Well Water					
	10	Max. Flow		UOM		1200		GPM			
	11	Max. Velocity		UOM				ft/s			
	12	Norm. Flow		Min. Flow		UOM		400-800		0 GPM	
	13	Max. Temp.		Min. Temp.		UOM		120°		Ambient Deg. F	
	14	Max. Press.		Min. Press.		UOM		200		0 PSIG	
	15	Min. Fluid Conductivity									
	16	Vacuum Possibility									
METERING ELEMENT	17	Specific Gravity				1					
	18	Line Size		Schedule		8"		40 (Note 4)			
	19	CONN.		Connection Type		8" 150# RF B16.5 Flange					
	20			Face to Face		13.78"					
	21			Flange Material		Carbon Steel (St 37-c22 / A 105)					
	22	METER		Tag Number		01A-FT-0693					
	23			Tube Material		Austenitic Stainless Steel					
	24			Liner Material		PFA					
	25			Electrode Type		Fixed					
	26			Electrode Material		Hastelloy C 22					
	27			Electrode Housing Configuration		Carbon Steel (St 37-c22 / A 105)					
	28			Power Supply		From Transmitter					
	29			Grounding, Type & Material		None (Virtual Reference)					
	30			Enclosure Class		IP66 / 67 DIN					
	31			Conduit Entries		N/A					
TRANSMITTER	32	Tag Number				01A-FT-0693					
	33			Function		N/A					
	34			Mounting		Integral to flow tube					
	35			Enclosure Class		Aluminum Housing					
	36	Signal Cable		Length		DS 300 Signal					
	37			Electrical Connection		3 x 1/2" npt					
	38			Power Supply		120VAC, 60Hz					
	39	TRANS.		Transmitter Output		4-20 mA / HART, 2 Status, 1 Pulse					
	40			Calibration Range		0 - 1200 GPM					
	41	DISPLAY		Scale Size		Range		N/A		1200 GPM	
	42			Chart Drive		Speed		N/A		N/A	
	43			Chart Range		Chart Number		N/A		N/A	
	44			Integrator							
	45	CONTR.		Modes		Output					
	46			Action		Auto-Man.					
47			Contact No.		Form						
48	ALARM		Rating		Elec. Code						
49			Action								
PURCHASE	50	Manufacturer		Krohne							
	51	Flow Tube Model Number		Optiflux 4000 - VN044EA01C0B1100000000000							
	52	Transmitter Model Number		IFC 300C-VN3044A0430010100100							
	53	Purchase Order Number									
	54	Serial Number									


**NOTES:**

1. Stainless Steel Name Tag stamped with Tag Number.
2. IFC Min Conductivity > 200 µMho/cm, 10 pipe diameter upstream +2 pipe diameter down stream.
3. Krohne Process Min Temp -40 °F + Max Temp 284 °F
4. Assumed per pipe spec plan to field verify.

NOV 15 2023

**FOR  
RECORD**




		Westlake Lake Charles, Louisiana				TAG No.		01A-FT-0694	
		INSTRUMENT SPECIFICATION MAGNETIC FLOW METER				Sht No.		1 of 1	
Drawing Number		01A-FT-0694				Project No.		23261173	
Plant		WESTLAKE SOUTH PLANT				Rev.		0	
Location		LAKE CHARLES				Date		11/10/23	
Unit		SULPHUR BRINE FIELD				By		JSG	
						Chk		JAC	
						Appr		TG	
GENERAL	1	Tag Number		P&ID No.		01A-FT-0694		01A-10090	
	2	Service Description				Water Well #19 Flow Measurement			
	3	Line No.				10"-01A-P782-1163-PL009			
	4	Function				Flow Measurement			
	5	Mounting				Inline Process Connection			
	6	Area Classification				N/A			
	7	Electrical Installation							
	8								
PROCESS DATA	9	Fluid				Well Water			
	10	FLUID	Max. Flow		UOM		2000		GPM
	11		Max. Velocity		UOM				ft/s
	12		Norm. Flow		Min. Flow		UOM		1400-1600
	13		Max. Temp.		Min. Temp.		UOM		120°
	14		Max. Press.		Min. Press.		UOM		200
	15		Min. Fluid Conductivity						0
	16	Vacuum Possibility							
17	Specific Gravity				1				
METERING ELEMENT	18	CONN.	Line Size		Schedule		10"		40 (Note 4)
	19		Connection Type		10" 150# RF RF B16.5 Flange				
	20		Face to Face		15.75"				
	21	Flange Material		Carbon Steel (St 37-c22 / A 105)					
	22	METER	Tag Number		01A-FT-0694				
	23		Tube Material		Austenitic Stainless Steel				
	24		Liner Material		PFA				
	25		Electrode Type		Fixed				
	26		Electrode Material		Hastelloy C 22				
	27		Electrode Housing Configuration		Carbon Steel (St 37-c22 / A 105)				
	28		Power Supply		From Transmitter				
	29		Grounding, Type & Material		None (Virtual Reference)				
	30	Enclosure Class		IP66 / 67 DIN					
31	Conduit Entries		N/A						
TRANSMITTER	32	Tag Number		01A-FT-0694					
	33	Function		Transmit					
	34	Mounting		Integral to flow tube					
	35	Enclosure Class		Aluminum Housing					
	36	Signal Cable		Length		DS 300 Signal			
	37	Electrical Connection		3 x 1/2" npt					
	38	Power Supply		120VAC, 60Hz					
	39	TRANS.	Transmitter Output		4-20 mA / HART, 2 Status, 1 Pulse				
	40		Calibration Range		0 - 2000 GPM				
	41	DISPLAY	Scale Size		Range		N/A		
	42		Chart Drive		Speed		N/A		
	43		Chart Range		Chart Number		N/A		
	44	Integrator							
45	CONTR.	Modes		Output					
46		Action		Auto-Man.					
47	ALARM	Contact No.		Form					
48		Rating		Elec. Code					
49		Action							
PURCHASE	50	Manufacturer		Krohne					
	51	Flow Tube Model Number		Optiflux 4000 - VN044FA01C0B1100000000000					
	52	Transmitter Model Number		IFC 300C-VN3044A0430010100100					
	53	Purchase Order Number							
	54	Serial Number							

**NOTES:**

1. Stainless Steel Name Tag stamped with Tag Number.
2. IFC Min Conductivity > 200 µMho/cm, 10 pipe diameter upstream +2 pipe diameter down stream.
3. Krohne Process Min Temp -40 °F + Max Temp 284 °F
4. Assumed per pipe spec plan to field verify.
5. Replacing existing transmitter/meter.

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**FOR  
RECORD**

		Westlake Lake Charles, Louisiana				TAG No.		01A-FT-0695		
		INSTRUMENT SPECIFICATION MAGNETIC FLOW METER				Sht No.		1 of 1		
Drawing Number		01A-FT-0695				Project No.		23261173		
Plant		WESTLAKE SOUTH PLANT				Rev.		0		
Location		LAKE CHARLES				Date		11/10/23		
Unit		SULPHUR BRINE FIELD				By		JSG		
						Chk		JAC		
						Appr		TG		
GENERAL	1	Tag Number		P&ID No.		01A-FT-0695		01A-10090		
	2	Service Description		Water Well #40 Flow Measurement						
	3	Line No.				12"-01A-090002-PL009				
	4	Function		Flow Measurement						
	5	Mounting		Inline Process Connection						
	6	Area Classification		N/A						
	7	Electrical Installation								
	8									
PROCESS DATA	9	Fluid		Well Water						
	10	FLUID	Max. Flow		UOM		2500		GPM	
	11		Max. Velocity		UOM				ft/s	
	12		Norm. Flow		Min. Flow		UOM		2000-2200 0 GPM	
	13		Max. Temp.		Min. Temp.		UOM		120° Ambient Deg. F	
	14		Max. Press.		Min. Press.		UOM		200 0 PSIG	
	15	Min. Fluid Conductivity								
	16	Vacuum Possibility								
	17	Specific Gravity		1						
METERING ELEMENT	18	CONN.	Line Size		Schedule		12"		STD (Note 4)	
	19		Connection Type		12" 150# RF B16.5 Flange					
	20		Face to Face		19.69"					
	21	Flange Material		Carbon Steel (St 37-c22 / A 105)						
	22	METER	Tag Number		01A-FT-0695					
	23		Tube Material		Austenitic Stainless Steel					
	24		Liner Material		PFA					
	25		Electrode Type		Fixed					
	26		Electrode Material		Hastelloy C 22					
	27		Electrode Housing Configuration		Carbon Steel (St 37-c22 / A 105)					
	28		Power Supply		From Transmitter					
	29		Grounding, Type & Material		None (Virtual Reference)					
	30	Enclosure Class		IP66 / 67 DIN						
	31	Conduit Entries		N/A						
TRANSMITTER	32	Tag Number		01A-FT-0695						
	33	Function		Transmit						
	34	Mounting		Integral to flow tube						
	35	Enclosure Class		Aluminum Housing						
	36	Signal Cable		Length		DS 300 Signal				
	37	Electrical Connection		3 x 1/2" npt						
	38	Power Supply		120VAC, 60Hz						
	39	TRANS.	Transmitter Output		4-20 mA / HART, 2 Status, 1 Pulse					
	40		Calibration Range		0 - 2500 GPM					
	41	DISPLAY	Scale Size		Range		N/A		0-2500 GPM	
	42		Chart Drive		Speed		N/A		N/A	
	43		Chart Range		Chart Number		N/A		N/A	
	44	Integrator								
	45	CONTR.	Modes		Output					
46	Action		Auto-Man.							
47	ALARM	Contact No.		Form						
48		Rating		Elec. Code						
49		Action								
PURCHASE	50	Manufacturer		Krohne						
	51	Flow Tube Model Number		Optiflux 4000 - VN044GA01C0B1100000000000						
	52	Transmitter Model Number		IFC 300C-VN3044A0430010100100						
	53	Purchase Order Number								
	54	Serial Number								

**NOTES:**

1. Stainless Steel Name Tag stamped with Tag Number.
2. IFC Min Conductivity > 200 µMho/cm, 10 pipe diameter upstream +2 pipe diameter down stream.
3. Krohne Process Min Temp -40 °F + Max Temp 284 °F
4. Assumed per pipe spec plan to field verify
5. Replacing existing transmitter/meter.

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**FOR  
RECORD**

# Engineering Standard-Piping

 <b>Westlake Chemical Corporation</b>	DOCUMENT: <b>PL-009</b> REVISION DATE: 12/01/22 PAGE: 1 of 9
DOCUMENT TITLE: <b>WATER-GENERAL SERVICE</b>	

## APPLICABILITY

This document provides materials specifications, engineering considerations, and fabrication requirements for carbon steel piping systems, with ASME Class 150 flanges, that transport most types of water. Types of water included are well water, cooling tower water, & chilled water. Potable water, typically used for safety showers, eye wash stations, bathrooms, and laboratories, is now covered under PL-441. Although historically this standard covered potable water, PL-441 shall be used for all potable water applications to avoid cross contamination and address higher quality potable water standards.

The performance of carbon steel piping in water depends largely on the oxygen content or the water treatment programs.

Care must be exercised when using well water in enclosed spaces that the entrained natural gas does not buildup and cause a flammable or explosive mixture that would result in fire or explosion were an ignition source available.

## PRESSURE TEMPERATURE LIMITS

Design Press. PSIG	285	260
Vacuum Rating	----- Full Vacuum -----	
Design Temp. °F	-20 to 100	200
Hydrostatic Test Pressure	450	

Remarks --1. The above ratings follow ASME ratings for ASME B16.5 flanges and flanged equipment with the same class rating specified herein. All other components specified meet the design pressures & temperatures stated with the possible exception of certain valves (see Valve Notes for further details and restrictions). These pressure/temperature ratings became effective 12/01/22, therefore all piping systems constructed to this standard after this date are rated to these pressures and temperatures.

2. Original pressure/temperature rating of this system was FV to 150 psig and -20F to 200F. Legacy piping systems built before 12/01/22 will continue to maintain those original ratings unless they are re-certified to ratings outside of the original limits. Legacy piping systems constructed prior to 12/01/22 that were originally rated to 150 psig and 200F can only be accepted as having the new class ratings if:
  - 1) All components are verified as ASME B31.3 compliant and their pressure/temperature ratings have been verified.
  - 2) A full API 579/ASME FFS-1 Fitness-For-Service evaluation has been performed to confirm legacy piping system is satisfactory for the new class pressure rating.
3. Piping built per this specification will structurally withstand full vacuum conditions, but would not be reliable for continuous high vacuum leak tightness.

## REGULATIONS

This commodity is not considered a hazardous material and is not covered by OSHA or other regulatory agencies dealing with releases.



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## PIPE

- 2" & below ----- Steel, Schedule 80 (ASTM A106 Grade B or ASTM A53 Grade B Type S).  
 3" thru 10"----- Steel, Schedule 40/Standard wall, (ASTM A53 Grade B Type E or S).  
 12 thru 24" ----- Steel, Standard wall (.375), (ASTM A53 Grade B Type E or S)  
 Over 24" ----- Consult Engineering

Remark(s): 1. Listed Pipe Schedules allow for 1/16" corrosion allowance at 285 psig pressure rating.

## FLANGES

Steel, 150# Class, Raised Face Weld Neck (RFWN). The flange bore is to be the same as the adjoining pipe. Dimensions and pressure ratings are per ASME B16.5. Steel is per ASTM A105.

- Remarks: -1. Minimize flange joints to reduce potential leak points and costs.  
 2. Raised Face Slip-On (RFSO) and Raised Face Socket Weld (RFSW) flanges are also acceptable in this service when RFWN flanges are not possible or practical. RFSO flanges shall be welded inside and outside to develop flange strength and seal the crevice.  
 3. Slip-on flanges have larger gasket surfaces IDs. This results in higher gasket stresses. This has occasionally caused problems in smaller flanges and plastic lined equipment (lined butterfly valves), where the gasket can be crushed or the liner can be cut and/or cold-flowed. Check the attaching equipment's ability to accommodate RFSOs before installing.  
 4. Threaded flanges should be used only when other types are unacceptable.  
 5. Use flat face flanges where required by equipment being bolted to.

Orifice Flanges are to be 300# weld neck orifice flanges bored to the same ID as the attached pipe. The steel is to be per ASTM A105. Dimensions to be per ASME B16.36 and ASME B16.5. Flanged orifice taps are preferred when available and spacing allows. If threaded orifice taps are deemed necessary, fittings must be schedule 160 and threads must be back-welded at connection to orifice flange. Back-welding of orifice valves should not be done unless valve is confirmed to be weldable by the valve manufacturer.

## WELD FITTINGS

Steel butt-weld fittings per ASTM A234 Grade WPB or ASTM A105 (Steel specification), and ASME B16.9 (physical dimensions). Fittings are to be the same schedule as the pipe being joined.

- Remark(s) 1. Butt weld fittings are preferred due to smoother flow characteristics, reduced corrosion crevices, easier painting, and ability to be non-destructively tested (NDT). Socket-weld fittings (steel 3000#, ASTM A105 and ASME B16.11) may be used on 2" and smaller pipe sizes. Socket fitting welds are required to be double-pass fillet welds.  
 2. Socket-weld fittings are acceptable, but less preferred, (see Remark 1 above) for 2" pipe and below where welding conditions hampers the ability to make small diameter butt welds. Use 3000# type per ASME B16.11 and ASTM A105.

## THREADED FITTINGS

2" & below: ---- Steel, ASTM A105, 3000# class per ASME B16.11.

- Remark(s): -- 1. Threaded piping systems should be minimized. With the exception of vents and drains threaded piping systems should only be used over contained areas. When used, back-welding is recommended to obtain a more leak tight system. Do not back weld valves or other equipment that would be damaged by welding heat. Use thread sealant only where back-welding is not to be done.  
 2. Where a threaded/screwed piping assembly branches off of a 3" or larger header, a flanged valve shall be located at the header with no threaded connections between the valve and the header. This provides a more rugged tie-in assembly for isolation of the branch. Vents and drains are not considered branches. Threaded components are allowed on vents and drains. Threaded vent and drain connections must be schedule 160 and back-welded, except for valves that would be damaged by welding.  
 3. Paint exposed external pipe threads and fittings after assembly. Paint with approved Westlake painting system.

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4. Due to threaded piping systems being of small bore, proper physical support of attachments such as valves and instruments shall be part of the design.

## UNIONS

2" & below ----- Steel, 3000#, steel-to-steel, ground joint type, ASTM A105.

Above 2" ----- Use Flanges.

Remarks ----- 1. Minimize the use of unions to avoid potential leak points.

## PIPE THREAD SEALANT

RectorSeal #5 or #7; Loctite PST565, PST567 or 554.

## GASKETS

Material ----- 1. Non-Asbestos Composition sheet per PL-B-24, Group 3.0.

2. Filled PTFE per PL-B-24 Group 2.0.

3. SBR Red Rubber per PL-B-24, Group 7.3. See Remarks.

4. Neoprene Rubber per PL-B-24, Group 7.2. This gasket is recommended for use when bolting to non-metallic flanges. See Remarks.

5. Graphite with 316 Stainless Steel Foil stiffener/carrier per PL-B-24 Group 1.0.

Thickness ----- 1/16"; other thickness acceptable where required.

Shape ----- 150# class ring gaskets per ASME B16.21. Other gasket configurations may be ordered as required by equipment.

Remarks ----- Rubber gaskets, while offering easy seal ability, can be easily crushed by over torquing or pipe forces applied to the flanges. Care should be taken during engineering and installation that crushing forces are not applied. Limiting rubber gaskets to flat face flanges or other large-area sealing surfaces is recommended.

## BOLTING

Studbolts ----- Alloy Steel with Class 2A threads, per ASTM A193 Gr. B7.

Nuts ----- Carbon Steel, Heavy Hex with Class 2B threads per ASTM A194 Gr. 2H.

Remark(s) -----

1. Zinc and Cadmium plated bolts are prohibited.
2. Fluoropolymer coated studbolts (ASTM A193 Gr. B7) and nuts (ASTM A194 Gr. 2H) may be used for improved corrosion resistance.
3. Where thermal cycling or vibration is present use uncoated studs or use a thread locker such as Loctite 242 or 262. Loctite 7649 (Primer N) fast sets thread lockers on coated bolts.
4. Stud bolts shall be installed such that on one end, at least one thread, and no more than two threads extend past nut. This provides full nut engagement but eases disassembly. See Westlake Engineering Standard PL-B-25 for more details.
5. Do not weld on stud or nuts. B7 and 2H nuts are made of heat treatable steels. Welding creates a brittle region around the weld that can generate a fracture.

## BRANCH CONNECTIONS

The chart specifies branch connections that are cost effective and meet the pressure design requirements of B31.3. Other types are acceptable when circumstances dictate and the designer verifies suitability.

		BRANCH SIZE															
		1/2"	3/4"	1"	1½"	2"	3"	4"	6"	8"	10"	12	14	16	18	20	24
HEAD ENDER	1/2"	T															
	3/4"	T <sub>R</sub>	T														
	1"	T <sub>R</sub>	T <sub>R</sub>														
	1½"	T <sub>R</sub>	T <sub>R</sub>	T <sub>R</sub>	T												
	2"	T <sub>R</sub>	T <sub>R</sub>	T <sub>R</sub>	T <sub>R</sub>	T											
	3"	OL	OL	T <sub>R</sub> , OL	T <sub>R</sub> , OL	T <sub>R</sub>	T										
	4"	OL	OL	OL	OL	T <sub>R</sub> , SB	T <sub>R</sub>	T									
	6"	OL	OL	OL	OL	SB	T <sub>R</sub> , SB	T <sub>R</sub>	T								
	8"	OL	OL	OL	OL	BP	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T <sub>R</sub>	T							
	10"	OL	OL	OL	OL	BP	BP	BP	T <sub>R</sub> , BP	T <sub>R</sub>	T						
	12"	OL	OL	OL	OL	BP	BP	BP	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T <sub>R</sub>	T					
	14"	OL	OL	OL	OL	SB	SB	SB	SB	T <sub>R</sub> , SB	T <sub>R</sub> , SB	T <sub>R</sub> , SB	T				
16"	OL	OL	OL	OL	SB	SB	SB	SB	T <sub>R</sub> /SB	T <sub>R</sub> , SB	T <sub>R</sub> , SB	T <sub>R</sub> , SB	T				
18"	OL	OL	OL	OL	SB	SB	SB	SB	SB	T <sub>R</sub> , SB	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T			
20"	OL	OL	OL	OL	OL	OL	OL	OL	OL	T <sub>R</sub> , OL	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T		
24"	OL	OL	OL	OL	OL	OL	OL	OL	OL	OL	T <sub>R</sub> /OL	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T <sub>R</sub> , BP	T	

### Legend T - Tee

**TR** - Reducing Tee or Tee with Concentric Reducer

**OL** - Weld/Sock/Thread-O-Let

**SB** - Simple Branch

**BP** - Branch with reinforcement pad; pad thickness = run pipe, pad width = half the branch OD

**BFE** - Branch with full encirclement reinforcement; reinforcement length = twice branch OD

### Remarks

- The table lists branch connections that are mechanically sound and labor efficient for the size/schedule combination. Where the required components are unavailable, other types listed in the legend may be used as long as the requirements of ASME B31.3 are met.
- OL refers to integrally reinforced branch connections commonly called Weld-o-Lets, Sock-o-Lets, or Thread-o-Lets. The type of OL used depends on the fittings specified for that size in other requirements of this standard. The Weld/Sock/Thread-o-Let name is the Bonney-Forge Co.'s name for their integrally reinforced branch connection fittings. Other companies have different names for theirs such as the WFI Co.'s Pipets.
- OL type fittings are acceptable for most branch connections, but they are not listed where they are not labor efficient. O-lets require full weld out of the weld bevel to achieve reinforcement requirements unless otherwise confirmed by engineering calculation. This requires large welds for large sizes, and size on size branches. This is labor intensive and distortion is a possibility.
- Where vibration or substantial loading is applied to a branch connection the designer should evaluate and specify a suitable type, not necessarily the type listed in the table. Tees, full encirclement reinforcement, and reinforcement pads tend to distribute loads more uniformly than other types, particularly with thin wall pipe.
- See note under Threaded Fittings concerning threaded piping branches.



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## TUBE & TUBE FITTINGS

Where pipe sizes less than or equal to ½" NPS are desirable tubing and compression tubing fitting are preferred. Typical uses are connections to instrumentation, small purging ports, and chemical addition ports.

### Tube

¼" to ½" ----- 316 Stainless Steel, 035" wall thickness soft annealed per ASTM A269 Grade TP316. Do not use plastic coated tubing.

### Tube Fittings

¼" to ½" ----- 316 Stainless Steel, Compression/ferrule type, Swagelok® or approved equal.

Remarks ----- 316 stainless steel tubing is susceptible to external chloride stress cracking where the tubing is (a) covered by insulation such as in a steam tracing application, or (b), external conditions tend to be continually moist and corrosive. In those situations higher alloys (Monel, Hastelloy C or Alloy 20) are recommended. Contact Materials Engineering for assistance.

## INSTRUMENTATION MATERIALS

INSTRUMENT TYPE			PREFERRED	OPTIONS LIMITED TO SOME CONDITIONS		
ORIFICE PLATES, THERMOWELLS, PITOT TUBES, ANNUBARS, CONTACT RADAR, & VORTEX METER			316SS <sup>1</sup>	N/A	N/A	N/A
PRESSURE SENSORS-DIFFERENTIAL (DP) OR GAUGE	Process Wetted Body Parts	Body & Manifolds	316SS <sup>1</sup>	N/A	N/A	N/A
		Diaphragms	Hastelloy C	Tantalum	N/A	N/A
		O-rings	Glass Filled PTFE	N/A	N/A	N/A
		Vents/Drains	Hastelloy C	N/A	N/A	N/A
	Diaphragm Fill Fluid		Inert	N/A	N/A	N/A
MAGNETIC FLOW TUBE	Body (Lined)		CS <sup>1</sup> or 316SS <sup>1</sup>	N/A	N/A	N/A
	Body Liner		PTFE/PFA	N/A	N/A	N/A
	Grounding Ring		316SS	N/A	N/A	N/A
	Electrode Choices		316SS	N/A	N/A	N/A
CORIOLIS FLOW TUBE	Flow Tubes/Body		316SS <sup>1</sup>	N/A	N/A	N/A
RADAR, NON-CONTACT	Cone Antenna		316SS	N/A	N/A	N/A
	Rod Antenna		PFA	N/A	N/A	N/A
	Seal		PTFE	N/A	N/A	N/A
TRANSMITTER HOUSINGS & TERMINAL CONNECTION HEADS			Use powder-coat,-fusion-bonded epoxy coated low-copper aluminum	Plastic Housings (PBT) may be used where there is no chance of prolonged exposure to detrimental solvents, other chemicals or excessive heat. Consider mechanical damage and sandblasting also. -316SS is preferred in caustic areas and can be used elsewhere when desired.		

*Continued on next page*

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## NOTES

- At temperatures over 140°F, 316SS is subject to external chloride stress corrosion cracking. If 316SS is used above this temperature and exposed to the external environment, it should be externally coated with high temperature silicone paint designed to prevent chloride stress cracking in stainless steel (Example: PPG Pitt-Therm or equal). All carbon steel components must be coated regardless of temperature. The coating will be a fusion bonded epoxy and polyurethane topcoat. Other coatings or no coating must be approved by Westlake personnel.
- At temperatures over 150°F, consult instrument manufacturer for temperature limitations.
- Material Specifications:  
**304/304L s.s.** - UNS S30400/S30403 (wrought); ASTM A351 Grade CF8/CF3 (cast)  
**316/316L s.s.** - UNS S31600/S31603 (wrought); ASTM A351 Grade CF8M/CF3M (cast)  
**2205 duplex s.s.** - UNS S31803 (wrought); ASTM A890 Grade 4A CD3MN (cast)  
**2507 duplex s.s.** - UNS S32750 (wrought); ASTM A890 Grade 5A CE3MN (cast)  
**Alloy 20** - UNS N08020 (wrought); ASTM A351 CN7M (cast)  
**Incoloy 800** - UNS N08800; **800H** - UNS N08810; **800HT** - UNS N08811  
**Inconel 600** - UNS N06600 (wrought); ASTM A494 CY40 (cast)  
**Monel 400** - UNS N04400 (wrought); ASTM A494 Grade M-35-1 (cast)  
**Nickel 200** - UNS N02200 (wrought); ASTM A494 CZ100 (cast)  
**Nickel 201** - UNS N02201 (wrought); ASTM A494 CZ100M (cast)  
**Hastelloy C276** - UNS N602276 (wrought); ASTM A494 CW12MW (cast)  
**Hastelloy C22** - UNS N06022 (wrought); ASTM A494 CX2MW (cast)  
**Hastelloy C2000** - UNS N06200 (wrought)  
**Titanium Grade 2** - UNS R50400 (wrought); ASTM B367 Grade C-2 (cast)  
**Titanium Grade 7** - UNS R52400 (wrought); ASTM B367 Grade C-7 (cast)  
**Tantalum** - UNS R05200/R05400 & R05252 - 2%W (wrought)  
**Silver** - UNS P07020 (wrought)

## VALVES

	THREADED END	FLANGED END	SOCKET WELD	BUTT WELD
GATE	V-24 V-245	V-31 V-241 <sup>1,2</sup> V-15 <sup>2</sup>		
GLOBE	V-112 V-60 <sup>2</sup>	V-79 V-237 <sup>2</sup>		
PLUG	V-191	V-190 <sup>2</sup>		
BALL	V-156	V-159 <sup>2</sup> , V-157, V-333		
CHECK	V-127 V-236 <sup>2</sup>	V-80, V-40 <sup>2</sup> , V-652		
BUTTERFLY		V-239 <sup>2</sup> , V-284 <sup>2</sup> , V-205 <sup>2</sup> , V-572 <sup>2</sup> , V-675 <sup>2</sup>		
DIAPHRAGM				
SRV 3-WAY	V-366	V-367		
OTHER	V-502			

- For underground use.
- Pressure Ratings may/will be below the limits set by this standard due to body pressure ratings and/or soft seal temperature limitations. Consult Materials Engineering or manufacturer for pressure and temperature ratings.

## VALVE PACKING

- PL-B-28- Group 5, Formed Grafoil rings and braided carbon/graphite top and bottom ring. For partial repack, use braided graphite.
- PL-B-28 Group 3, Lattice braided PTFE fiber, lubricated with PTFE dispersion.

## ENGINEERING & FABRICATION DETAILS

- The system shall meet the requirements of ASME B31.3.
  - New systems shall be evaluated according to the requirements of ASME B31.3 to determine if a flexibility analysis is required.
  - Replacement piping or piping of identical, or very similar geometry to an existing successful system do not require a flexibility analysis.
- All lines shall be properly supported as per Westlake Engineering Standards PL-B-18 or D5-7002 and associated standards. Support piping on elevating shoes (do not use eel slips) to avoid crevice type of corrosion at the pipe supports.

3. Expansion Joints shall meet the requirements of PL-B-29.
4. Vent and drain valves shall be placed in accessible locations. To avoid accidental opening and fugitive emissions, all high point vent valves shall be removed and plugged or blinded. All low point drain valves shall be plugged or blinded.
5. When tapping or branching into a header, the preferred method is to use Weld-o-lets.
6. All connections to process lines shall be at least 1/2" NPS, and preferably larger.
7. Contractors and Westlake maintenance groups must adhere to the requirements in Westlake Engineering standard PL-B-32, "Piping Fabrication & Installation Quality Control Requirements". PL-B-32 clarifies the requirements stated in the Welding, Examination, Testing, and Inspection sections of this document for contractors and Westlake maintenance groups.
8. System shall be painted per Westlake specification.

## WELDING SPECIFICATIONS

Westlake personnel shall use one of the following Lake Charles Welding Procedures:

- W-3 and/or W-5, (SMAW) for pipe above 2" size.
- W-10 (GTAW) recommended on pipe sizes 2" and below.
- W-18 (GMAW) for pipe 1" and above.
- Welders shall be qualified in the Welding Procedure used.

Two pass fillet welds are required when welding socket weld fittings.

Contractors and Westlake welders working under the QC authority of a third party must satisfy the requirements of Westlake Engineering Standard PL-B-32 "Piping Fabrication & Installation Quality Control Requirements" for welding quality control procedures.

## API CLASSIFICATION

API classifications are used to determine inspection protocol for plant piping systems as part of the Mechanical Integrity program. The piping contained in this standard is API Class 4. See Westlake Standard 2305-J-3 "Mechanical Integrity of Piping Systems" for more information.

## EXAMINATION AND LEAK TESTING

Water as specified in this standard fits in Piping Service Group "1A" as defined in specification PL-B-19 "Pipe Leak Testing & Non-Destructive Examination.

Water fits in the "Normal Failure Consequence Class in document 2305-MP-24 "Piping Service Evaluation." This class does not require qualified inspector verification or documentation of examination and testing, although they are recommended "good practices." This is left to the discretion of the Fixed Equipment Reliability Engineer and/or lead inspector.

The supervisor responsible for the piping job shall ensure that the required examination and leak testing is performed. To document results, the supervisor initiates Piping System Fabrication and Maintenance Form #32A-193.

Contractors and Westlake maintenance groups should adhere to the requirements of PL-B-32 with regard to the methods and practices of documentation and record keeping for examination and leak testing. The methods and extents of examination and leak testing used should compare favorably with those presented here.

### Visual Examination Requirements

Materials	Fabrication Joints	Longitudinal Joints <sup>(6)</sup>	Mechanical Joints	During Erection	After Erection
Examiner Satisfaction					

### Material Verification

Piping materials must carry material identification markings that can be verified during receipt into plant or fabrication site. Material must retain markings during fabrication until verified by authorized inspector.

### Radiographic Examination Requirements

Not Required



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**Standard Leak Testing Requirements** (See PL-B-19 for acceptable alternatives)

1. New Construction Leak Test Method: Initial Service Test
2. Major Repairs & Alterations-None; check for leaks when pressure is applied.

Remarks 1. A major repair is the addition or replacement of a welded or threaded component (e.g. pipe, ells, tees, flanges etc.)

**REVISIONS**

- 07/12/04 ----- (1.) Added new Applicability Section; (2.) Added New Regulatory Section; (3.) Revised Pressure Temperature limits to use term Standard Design Pressure and Standard Design Temperature to clarify pressure temperature ratings and give details behind the standard Temperature rating; (4.) Revised Gasket Section to accommodate PL-B-24 changes; (5.) Removed Reference to Corporate Welding Specifications (6.) Added new examination and leak testing section; (7.) Added revision section; (8.) Numerous other format and wording revision including moving statements to different sections. Removed
- 08/21/07 ----- Revised Welding Specifications section to include W-18, also included requirement for two pass welding socket welds. (DLH)
- 06/16/08 ----- revised Pressure/Temperature Rating section, revised Bolting section, added Branch Connection, added Tube and Tube Fittings Section.(NDR)
- 09/09/08 ----- Added V-366 & V-367 3-way valves. (SF)
- 05/20/10 ----- Added V-333 (SF)
- 10/13/10 ----- 1) Added Over 24" pipe size statement; 2) Added V-572 (SF)
- 03/11/11 ----- 1) Added requirements for hot-dipped galvanized fittings & unions and added recommendation for hot-dipped galvanized piping 2" & below; 2) Changed header to "General Service"; 3) Removed potable water from standard and referenced PL-441; 4) Increased threaded sizes to 2"; 5) Added RectorSeal #5 to thread sealants; 6) Added gasket options section; 7) Reworded applicability section (SF)
- 02/23/15-----1) Added graphite gasket option per operations request; 2) Updated title block and changed company name from PPG to Axiall (KG)
- 08/14/15 ----- Changed gasket from Garlock 3300 to 3000 to comply with PL-B-24 (KYG)
- 12/13/17 ----- 1) Added V-652 to valve table; 2) Changed title block; 3) Edited flanged section; 4) Removed gasket and packing examples; 5) General updates for clarification (KYG)
- 03/26/19 ----- 1) Added Instrument Materials section. (GSC)
- 09/23/19 ----- Added V-675 (SF)
- 09/14/20 ----- 1) Design Pressure Reevaluated based on ASME B16.5/34 150# Pressure Ratings using ASME B31.3 methodology. Both the highest design pressure/lowest temperature and lowest design pressure/highest design temperature were evaluated to ensure that the wall thickness specified herein this spec is acceptable. 2) Hydrostatic test pressure was changed to 450 psig. This is arrived at by using 1.5 x the max design pressure and rounding up to the nearest 25 psig. However since this is a category D fluid and only an initial service test is required this test pressure was not added to the Examination and Leak Testing Requirements section. 3) Changed ANSI to ASME. 4) Note 2 was added to denote corrosion allowance in the Pipe section. 5) The wording and format of the notes in the Flange were changed. 6) Wording added to the material description in the Gasket section. 7) Minor wording changes in Bolting Section. 8) Content and format of the Weld Fittings section was updated. 9). Wording of Threaded Fitting notes changed. 10) Solder Seal TiteSeal 55 was removed and RectorSeal #7 was added to the the Pipe Thread Sealant Section. 10) All valve specs pressure and temperature ratings were investigated to determine if they are up to the new design pressure and temperature. Valves from specs V-241, V-15, V-60, V-237, V-190, V-159, V-236, V-40,

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V-239, V-284, V-205, V-572, and V-675 may/will be below the updated design pressure and temperatures; Consult Materials Engineering or manufacturer for pressure and temperature ratings. 11) Notes 1a and b were added to Engineering & Fabrication Details Section along with other minor wording changes and the addition of standard PL-B-18 to note 2. 12) API Classification Section was added. 13) Note under Material Specification was changed. 14) Various formatting and section rearrangement changes along with minor wording changes throughout. 15) The title of PL-B-32 was updated in Welding Specifications section. 16) Vent and drain wording changed for more clarification (KYG)