

December 30, 2013

Mr. Michael Taylor
Grand Bayou Response Manager
Texas Brine Company, LLC
1301 Highway 70
Belle Rose, LA 70341

Dear Mr. Taylor:

RE: Work Plan for Shallow Gas Zone Depressurization, Bayou Corne Community

RESPEC is pleased to provide Texas Brine Company, LLC (TBC) this draft Work Plan for shallow gas zone depressurization within the Bayou Corne Community. The proposed program includes installing three new shallow vent wells and modifying wellheads for eight existing wells to facilitate additional venting, pressure monitoring, and/or sampling.

Specifically, the Scope of Work for the proposed depressurization program includes the following tasks:

- Job Safety Analysis (JSA)
- Site access agreements
- Utility clearances
- Installing a new 2-inch-diameter passive vent well (PVW) adjacent to well NSDMW006 with instrumentation installed at NSDMW006 for pressure monitoring and sampling
- Installing new 2-inch-diameter PVWs adjacent to existing wells GP-5 and GP-6 with instrumentation installed at wells GP-5 and GP-6 for pressure monitoring and sampling
- Installing a passive vent riser pipe on existing well DPVE-37 with instrumentation installed at GP 37-2 and NDSMW015 for pressure monitoring and sampling
- Installing a passive vent riser pipe on existing well DPVE-22 with instrumentation installed at GP-22-2, GP 22-3, and NSDMW017 for pressure monitoring and sampling.

This work focuses primarily on further developing passive gas venting and monitoring of gas pressures in the Shallow Stratified Sands (SSS). The area of concern for this plan is the Bayou Corne Community (BCC). Recent passive venting success has been experienced at NSDBS-056, and the Scope of Work outlined in this plan is intended to build upon that success. A plan for tie-in to the aboveground gas management infrastructure will be finalized when the above-referenced wells are installed/modified, and it is determined which wells, if any, produce sufficient gas on a sustainable basis to warrant venting/flaring.

BACKGROUND AND RATIONALE

This work plan has been developed based on the results of investigations undertaken to determine the extent of subsurface gas in the vicinity of the Oxy 3 cavern failure. Note that gas compositional and isotopic analyses indicate the presence of multiple types of gas, and the linkage of some types of gas to the cavern failure remains uncertain. Free gas may be common in the subsurface in the vicinity of salt domes and near areas of oil and gas exploration and production. Gas pockets that are distant from the Oxy 3 cavern or that are isolated by low permeability barriers, such as clay layers, may be natural, background occurrences. The investigations to locate subsurface gas pockets and relief wells installed to-date to vent discovered gas have been performed as mandated in DNR directives. These programs are not completed based on an implicit assumption that gas at any specific depth or at any specific location is necessarily attributable to the formation of the sinkhole.

Monitoring of shallow wells (i.e., those screened in the SSS in the upper 40 feet of the subsurface) in Bayou Corne indicated the presence of pressurized gas in an east-west trending zone south of Highway 70 and in an isolated zone on the northeastern edge of the community. The locations of the pressurized gas zones (PGZs) are illustrated in Figure 1. In November 2013, shut-in wellhead pressures up to 10 pounds per square inch (psi) were recorded south of Highway 70, and up to 5.5 psi were recorded in the DPVE-22 area north of Highway 70.

Vent wells targeting the SSS may facilitate depressurizing the PGZs as demonstrated by the recent elimination of bubble site NSDBS-056 following the installation of vent well GP-BS-56. NSDBS-056 was the only remaining Level 2 or Level 3 location within the immediate vicinity of the BCC. As demonstrated by GP-BS-56, pressurized gas in the SSS is driving at least some bubble sites, and efficient relief of gas pressure and rapid elimination of bubble sites may be achieved with properly located and constructed shallow PVWs.

JOB SAFETY ANALYSIS

A JSA was prepared for drilling wells in Bayou Corne. The JSA is presented as Appendix A of this draft Work Plan.

SITE ACCESS AGREEMENTS

Property access and notification of property owners will be coordinated with the Grand Bayou Response Manager. To facilitate property access, proposed vent wells in Bayou Corne will be drilled with a compact Geoprobe rig similar to that used to advance membrane interface probe/hydraulic profiling tool (MiHPT) borings. The proposed new well sites requiring drilling are all located south of Highway 70 in Bayou Corne. The location of the PGZs and associated zones of artesian wellhead pressures in Bayou Corne are illustrated in Figure 1, and Figure 2 depicts the location of proposed passive vent wells.

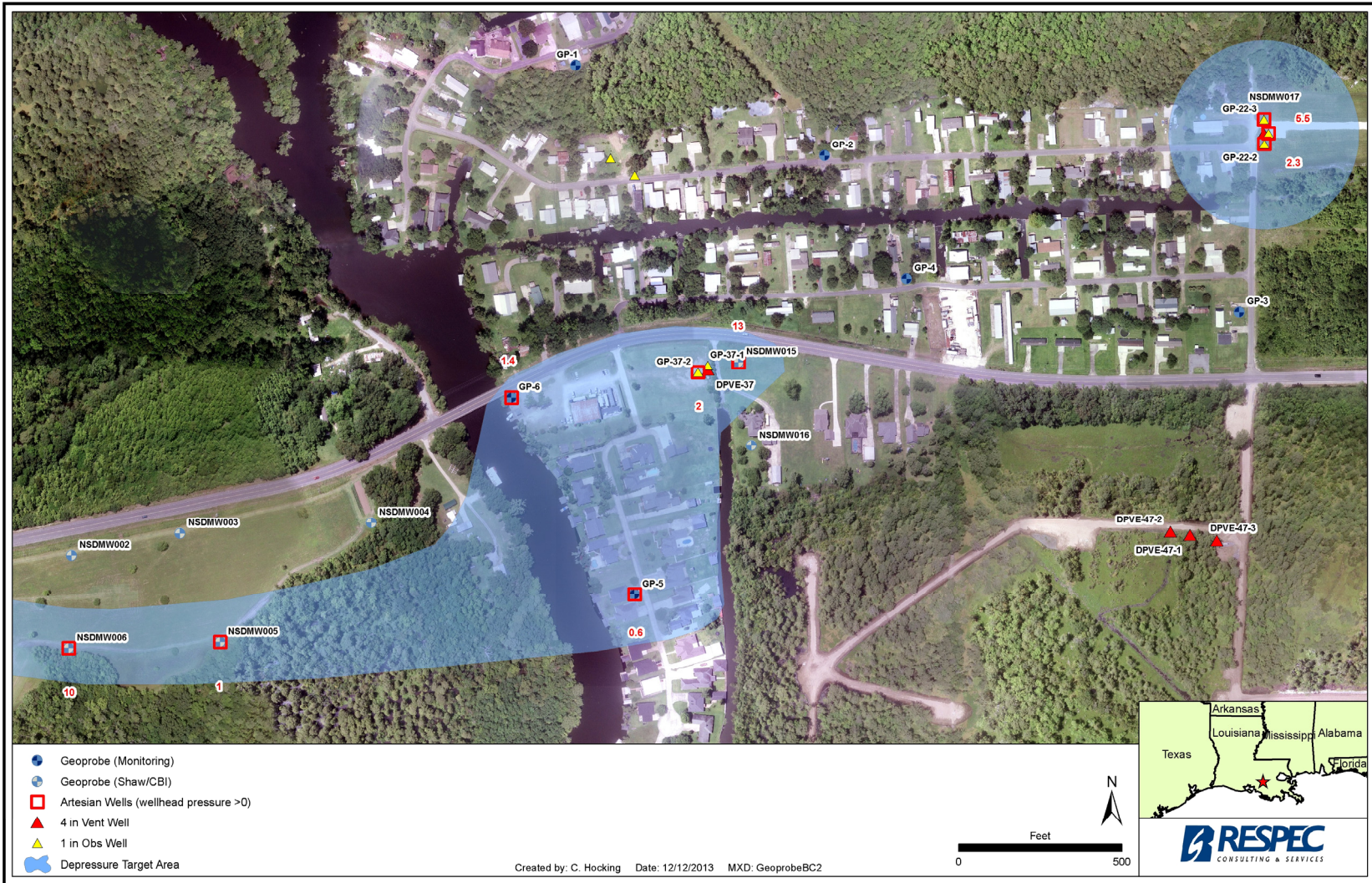


Figure 1. Location of Pressurized Gas Zones and Artesian Wells. Values in red are based on the November gas pressure survey by Pisani & Associates.

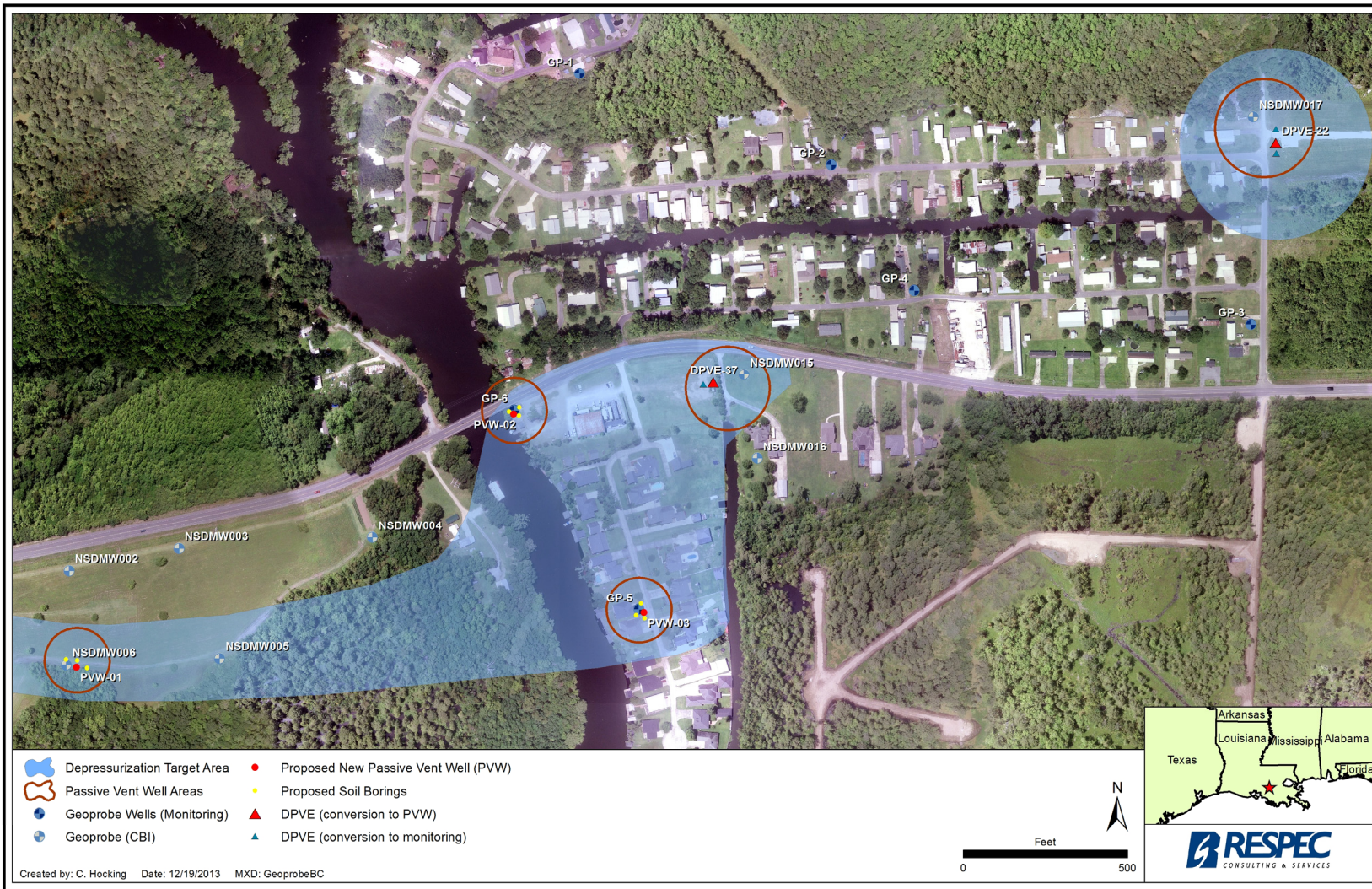


Figure 2. Location of Proposed Passive Vent Wells.

UTILITY CLEARANCE

The utility companies will be notified by the drilling contractor, and an underground utility locate request will be submitted before mobilizing.

NEW PASSIVE VENT WELL INSTALLATIONS

RESPEC proposes to install three new 2-inch-diameter PVWs located near existing monitoring wells NSDMW006, GP-6, and GP-5. The proposed soil boring and PVW locations are illustrated in Figure 2. The actual vent well locations may vary based on utilities clearance and findings from the borings drilled into the SSS as part of this program. Given the anisotropy of the SSS, the objective at each location is to drill one or more borings (with a maximum of four borings) to effectively locate and penetrate the local shallow gas pocket. The first boring to penetrate the gas zone will be completed with as a PVW. Borings that are not completed as wells will be grouted to surface.

The borings will be advanced by using direct-push techniques, and the vent wells will be installed by using hollow-stem auger drilling techniques and a small rig similar to that used to advance MiHPT borings and GP-BS-56 in the community. Drilling will be performed by Walker Hill Environmental (WHE), Foxworth, Mississippi, and will be observed by a RESPEC geologist. Well logs will be filed with the state and locations surveyed by TBC's surveyor Miller Engineers & Associates. During and following installation of the borings and vent wells, ambient air monitoring will be conducted by TBC's consultant Code Red in the vicinity of the well sites.

Anticipated construction details for proposed vent wells are provided in Table 1. Vent wells will be screened in the shallowest observed gas-bearing sand. Upon the detection of pressurized gas in the soil borings, augers will be advanced to the target depth and a polyvinyl chloride (PVC) well assembly (consisting of a 2-inch inside diameter [ID]) riser and a 0.01-inch slotted, 15-foot-long screen with a prepacked sand filter) will be inserted into the borehole. Above the sand pack, the well will be completed with a 1- to 2- foot seal of 0.25-inch bentonite pellets, and the remaining annular space will be grouted to the surface. Gas encountered during drilling will be controlled by filling the augers with water. Water produced by the hole during drilling and well installation will be controlled and contained to the extent practicable for discharge into a National Pollutant Discharge Elimination System (NPDES) discharge tank for ultimate discharge into the sinkhole.

Table 1. Anticipated New Passive Vent Well Installation Details

Site I.D.	Nearby Well	Diameter (in)	Total Depth (ft bgs)	Screen Interval (ft bgs)	Anticipated Pressure Based on Nearby Well Data (psi)
PVW-01	NSDMW006	2	30	15-30	8 to 12
PVW-02	GP-6	2	30	15-30	0.5 to 3
PVW-03	GP-5	2	30	15-30	0.5 to 2

ft bgs = feet below ground surface

The vent well risers will extend above ground surface and will be completed with a wellhead that will include a vent stack and valve system. This vent stack and valve system will allow for short-term venting of gas and pressure monitoring. The design of the wellheads for the PVWs is shown in Figure 3.

The PVWs are intended to lower the gas pressure in the Shallow Stratified Sands. Because this shallow gas has been documented to be at low pressures (below 15 psi) and appears to be limited in volume, the gas will be vented to the atmosphere on a short-term basis. Any short-term venting of gas for evaluation of sustainable gas production will be through a vent stack at a minimum of eight feet above ground level. Artesian waters produced by the well during passive venting will be contained and placed in an on-site NPDES discharge tank for ultimate discharge to the sinkhole. Upon completion, a fence will be constructed around the well and storage tank.

RETROFIT EXISTING WELLS AS PASSIVE VENTILATION WELLS

Existing 4-inch dual-phase vapor extraction (DPVE) wells DPVE-37 and DPVE-22 will be retrofitted to serve as PVWs. Each well is 40 feet deep and screened from 30 to 40 feet below ground surface, and well logs are provided in Appendix B. Both wells will be fitted with a riser vent stack at a minimum of eight feet above ground level. Wellheads will also be fitted with valves to enable water discharge, gas venting, and gas sampling. A schematic of the modified wellheads design is provided in Figure 4. Wellhead modifications will be performed by WHE with observation provided by RESPEC.

MODIFICATION OF EXISTING MONITROING WELLS

Existing, nearby, monitoring wells will be retrofitted to enable gas sampling and pressure monitoring. Wells included in the PVW monitoring network are shown in Figure 2 and include the following:

- NSDMW006
- GP-5
- GP-6
- GP 37-2
- NDSMW015
- GP-22-2
- GP 22-3
- NSDMW017.

Each wellhead will be modified to enable gas sampling and pressure monitoring. Schematics of the modified wellhead designs are provided in Figures 5 through 7. Wellhead modifications will be performed by WHE with observation provided by RESPEC.

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PVW WELLHEAD DESIGN

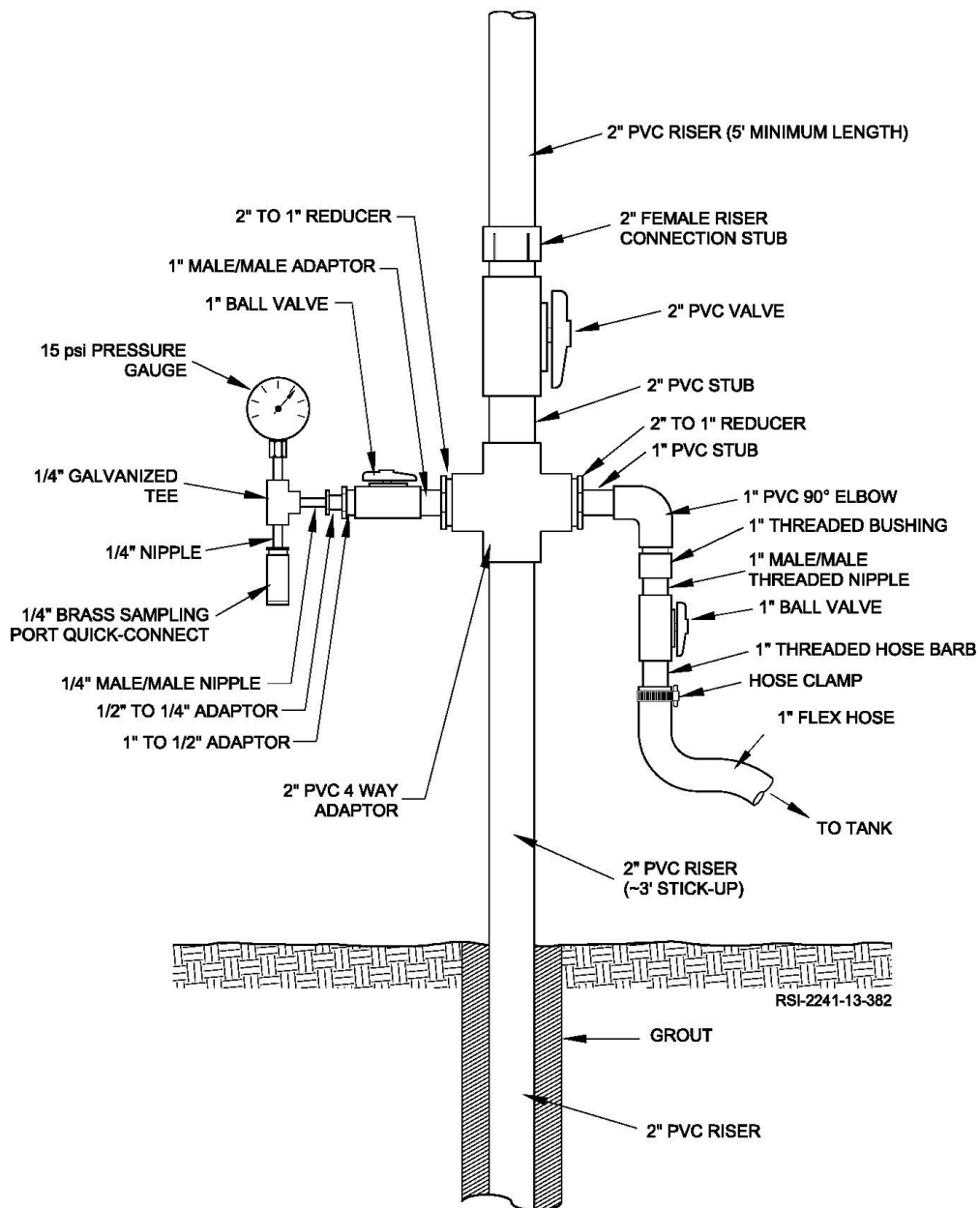


Figure 3. Schematic of Pressurized Vent Well Wellhead Valve System (Subject to Change Based on Field Conditions).

RSI-2241-13-383

DPVE 22 & 37 RETRO-FIT DESIGN

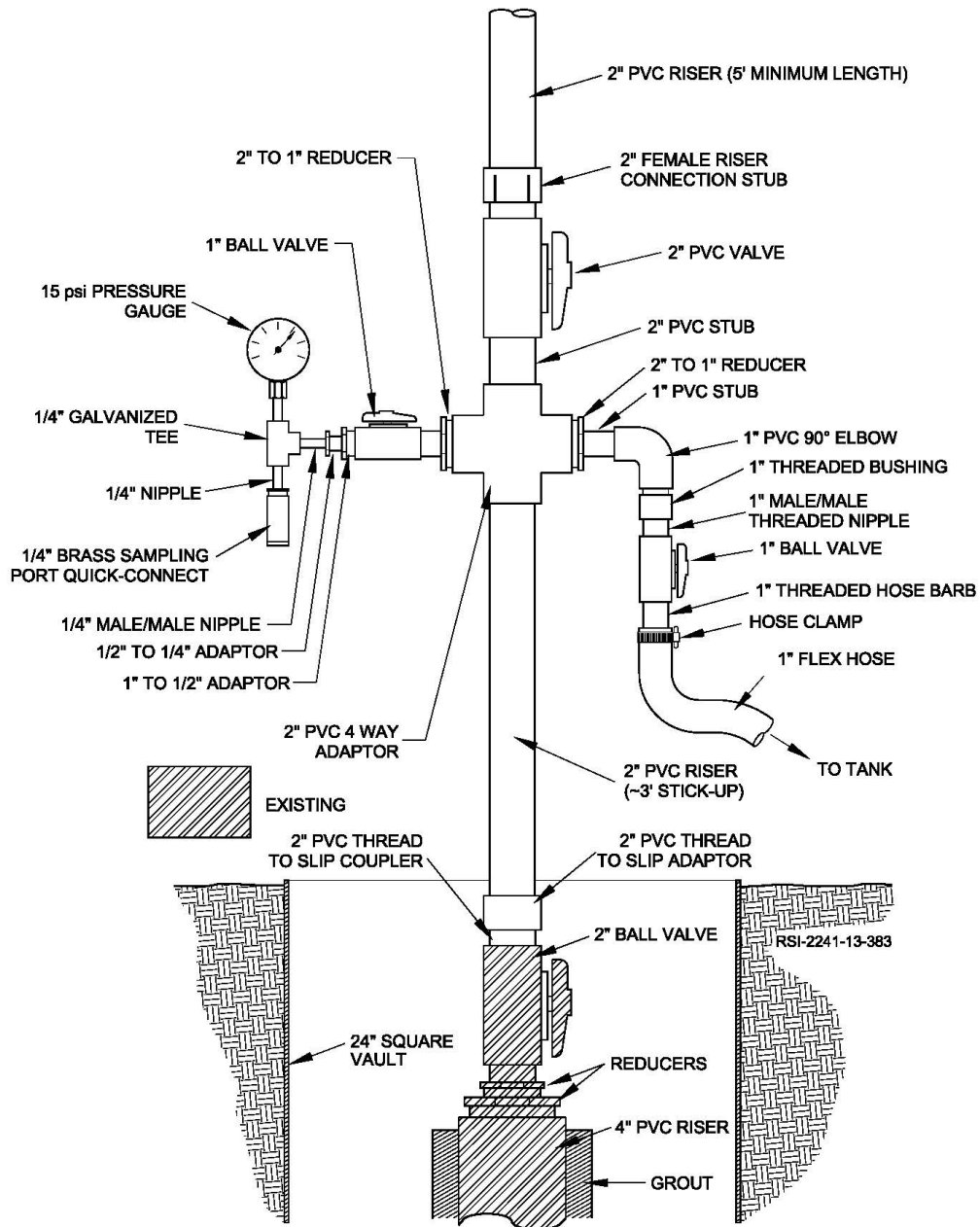


Figure 4. Schematic of Wellhead Valve System at DPVE 37 and DPVE 22 (Subject to Change Based on Field Conditions).

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DPVE 37-2, 22-2, AND 22-3
WELLHEAD DESIGN

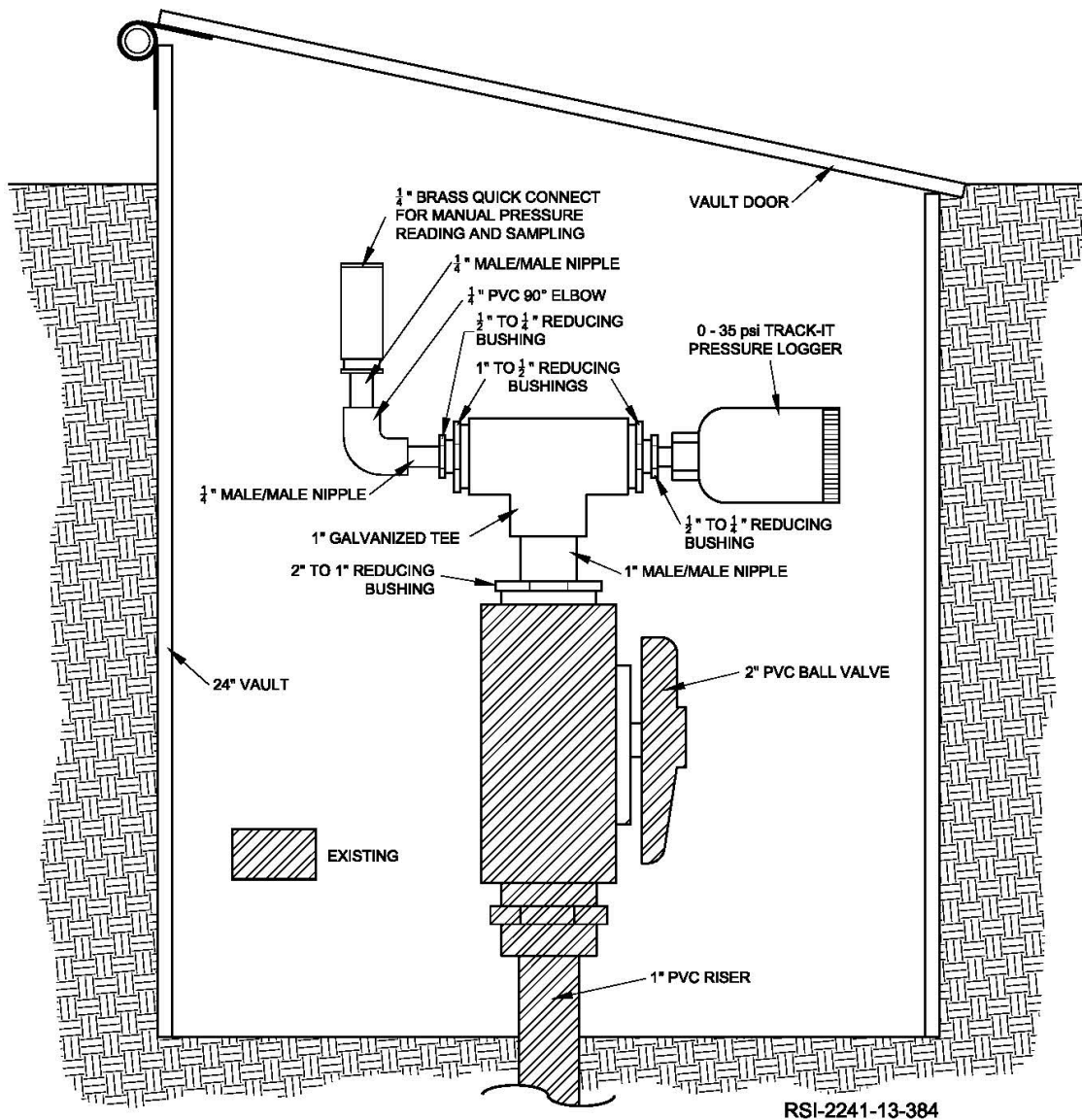


Figure 5. Schematic of Wellhead Monitoring and Sampling System at DPVE 37-2, DPVE 22-2, and DPVE 22-3 (Subject to Change Based on Field Conditions).

GP-5 & GP-6 RETRO-FIT WELLHEAD DESIGN

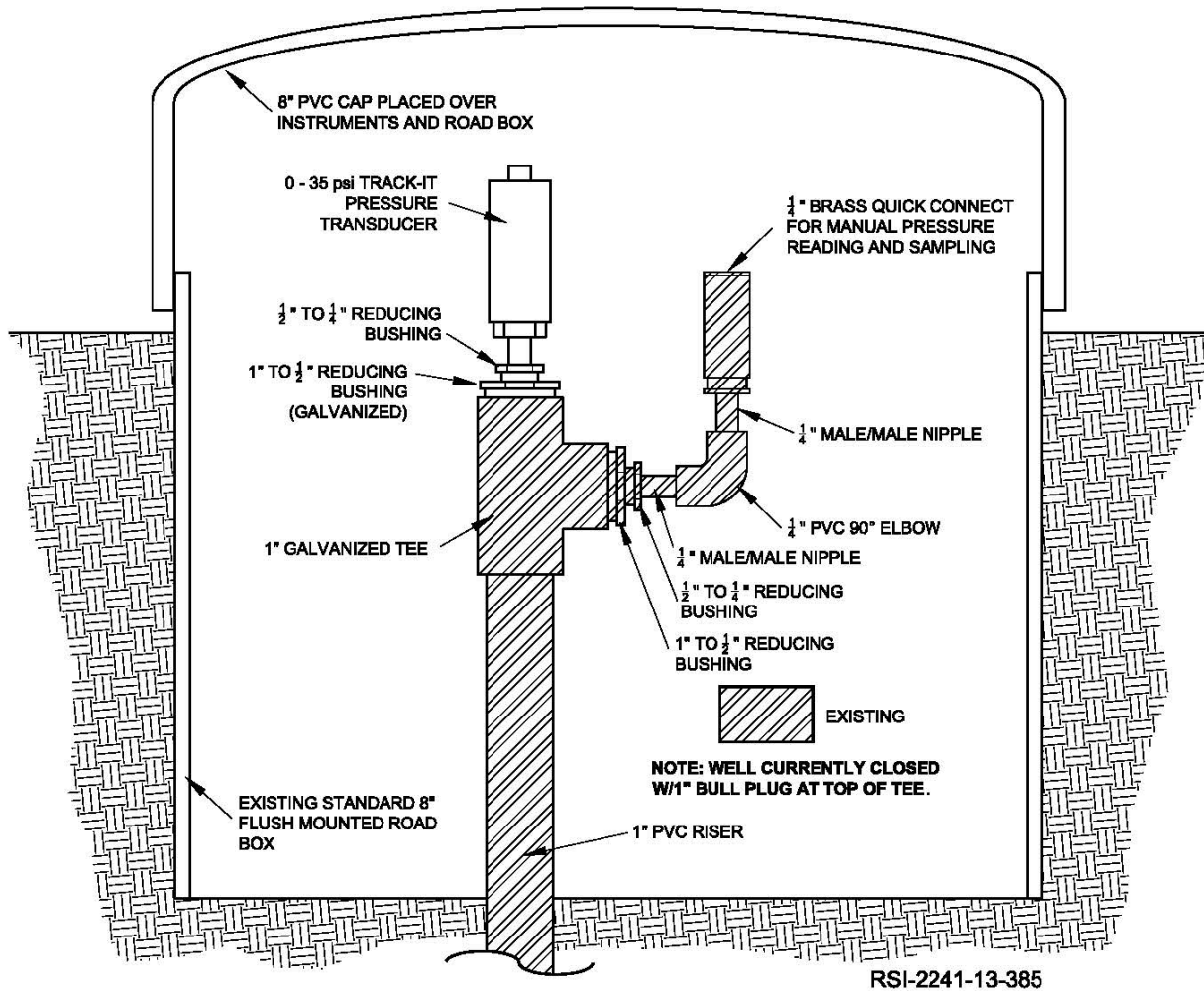


Figure 6. Schematic of Wellhead Monitoring and Sampling System at GP-5 and GP-6 (Subject to Change Based on Field Conditions).

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NSDMW/CB&I WELLS WELLHEAD DESIGN

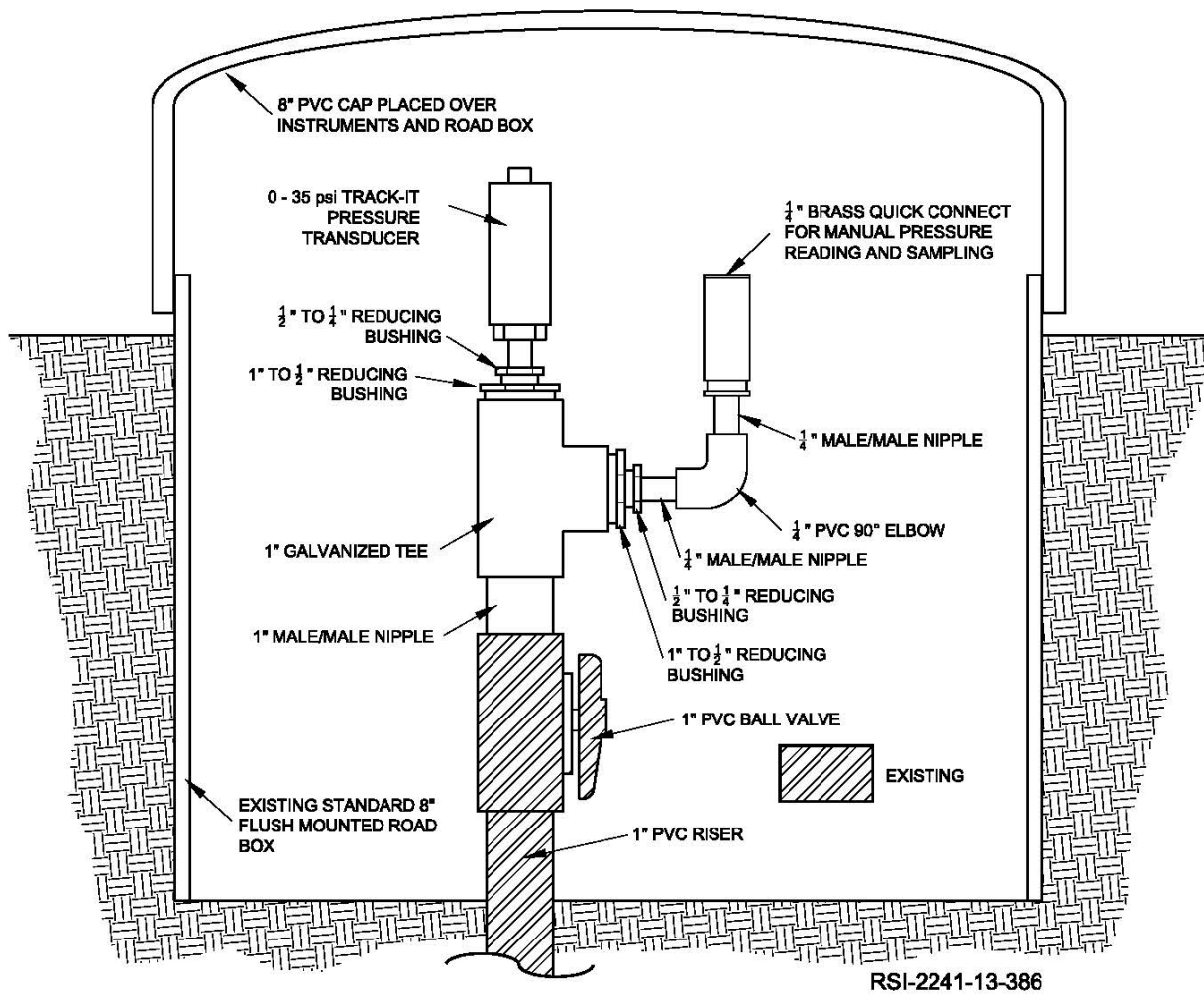


Figure 7. Schematic of Wellhead Monitoring and Sampling System at NSDMW-006, NSDMW-015, and NSDNW-017 (Subject to Change Based on Field Conditions).

PRESSURE MONITORING AND SAMPLING

Following the installation of the new PVWs, an effort to estimate volumetric flow will be conducted by RESPEC at each well within one week of its installation by using the following method:

1. Remove exhaust riser from wellhead
2. Install sampling wellhead
3. Close water valve to tank
4. Measure fill time for a 1-liter Tedlar sample bag
5. If unable to fill Tedlar sample bag, remove sample wellhead and reinstall exhaust riser
6. Close 2-inch ball valve, wait for well to come up to pressure
7. Open water valve to tank, open 2-inch ball valve to original valve position
8. Wait for gas/water eruption to cease, if any
9. Remove exhaust riser and reinstall sample wellhead
10. Collect volumetric sample estimate.

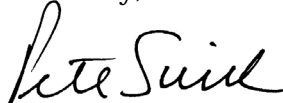
Additionally, a gas composition sample will be collected by TBC's consultant, Sage Environmental, Inc.

The new passive venting system will be visually monitored on a daily basis by TBC staff for a period of 30 days. During this period, the new vent wells and the retrofitted existing wells will be inspected by TBC personnel for integrity and evidence of gas production. A sample daily PVW inspection report is provided in Appendix C.

Pressure and methane concentration data will be collected on a monthly basis for a 1-year period or until shut-in well pressures drop to zero. Direct pressure readings at PVWs will be taken at the wellhead through a valve system connection. The ball valve on the wellheads will be temporarily closed for a 30-minute (or longer) time frame to allow for pressure to build, after which, the pressure and methane concentration measurements will be collected. After the measurements are taken, the valve will be left in an open position. Nearby monitoring wells will be equipped with Track-It National Institute of Standards and Technology (NIST) pressure transducers; data will be downloaded during the monthly site visit for monitoring of the PVW network. The PVW and adjacent well monitoring data will be in addition to the shut-in wellhead pressure data collected from other shallow Geoprobe wells on a monthly basis by Pisani & Associates.

Thank you for the opportunity to present this work plan. If you have any questions or need further information, please contact me directly by email (Pete.smith@respec.com) or telephone (585.943.3136).

Sincerely,



Peter H. Smith
Project Geologist




Crystal M. Hocking
Staff Geologist

PHS:llf

cc: Project Central File 2241 — Category E

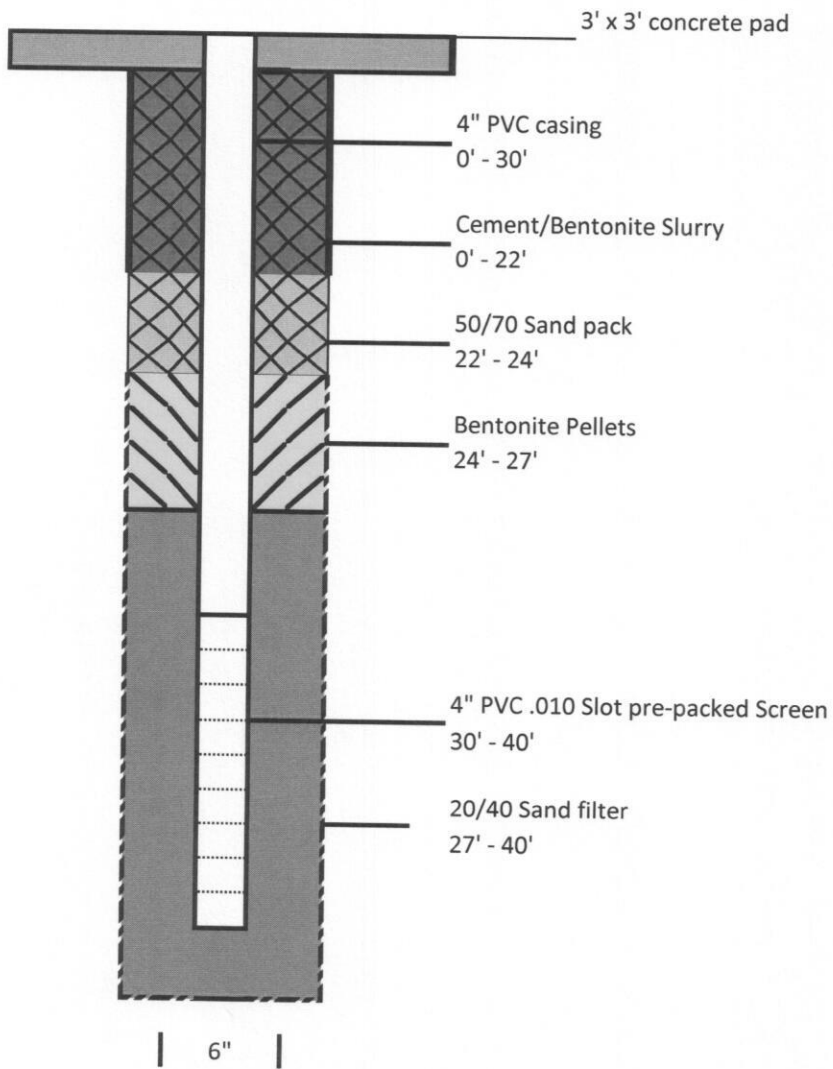
APPENDIX A

JOB SAFETY ANALYSIS FORM

	JOB SAFETY ANALYSIS	
	Job Title/Type of Work: Installation of borings and wells	Date: December 20, 2013
	Person(s) Conducting Work: RESPEC personnel, with help from others; Gary Hill, Walker Hill; with help from others	Project No. 2241
	Required\Recommended PPE: Safety glasses, gloves, hard hat, steel-toed boots, life preserver (if on water)	Page 1 of 1 <input type="checkbox"/> New <input checked="" type="checkbox"/> Revised
ANALYSIS BY: D. Gnage		
REVIEWED BY: P. Smith, CPG		
APPROVED BY: E. Krantz, PE		
Sequence of Basic Job Steps Potential Hazards Recommended Action or Procedure		
Installing Boreholes	Slips, trips, working in small areas and pinch points, noise from rig.	Be aware of surroundings and avoid the rear of the rig during operation. Wear hearing protection.
Working with MiHPT	String pot line, electronics in association with water, use of hydrogen gas as combustion source.	Be aware of surroundings and the location of the various lines running to the instruments. Do not touch the end of the probe. Keep away from cylinder heads.
Sample logging and collecting (if applicable)	Cuts from knives	Wear gloves.
Installing monitoring wells	Encountering methane gas	Use monitoring equipment if gas is present above Lower Explosive Limit (LEL). If gas is present above LEL in work zone, leave location and reevaluate.
Communication with others in the work party and an awareness of your surroundings are keys to safe work practices for this task.		

APPENDIX B

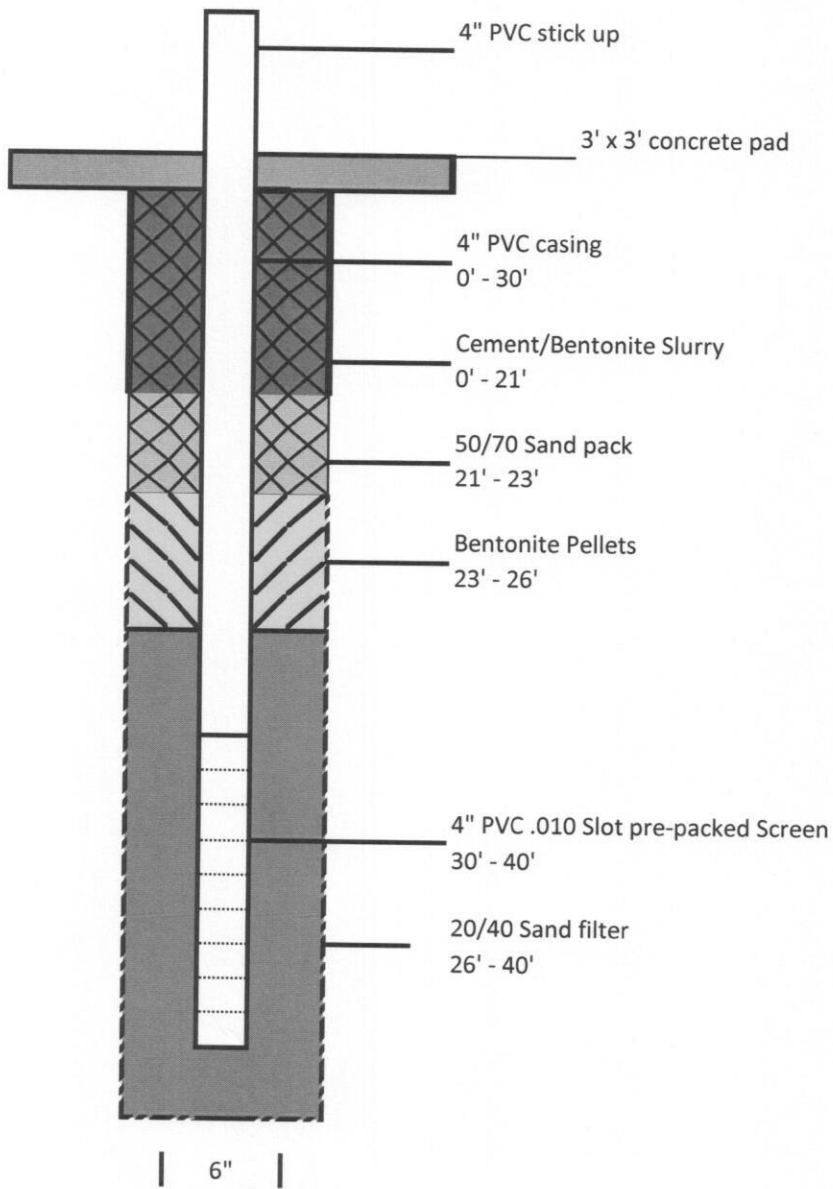
LOUISIANA DEPARTMENT OF NATURAL RESOURCES WELL REGISTRATION FORMS FOR DPVE-22 AND DPVE-37



Walker-Hill Environmental, Inc.
Foxworth, MS

Vent Well Construction Diagram

DPVE-22



Walker-Hill Environmental, Inc.
Foxworth, MS

Vent Well Construction Diagram

DPVE-37

APPENDIX C

DAILY PASSIVE VENT WELL INSPECTION REPORT

Date _____
Inspector _____

Time _____
Company _____
Location Bayou Corne _____

Well ID _____
Is gas visibly venting from the well? _____
Is water flowing from the well? (rate) _____
What is the water level in the tank? _____

Note any conditions/damage to the well.

Comments/Other _____

Well ID _____
Is gas visibly venting from the well? _____
Is water flowing from the well? (rate) _____
What is the water level in the tank? _____

Note any conditions/damage to the well.

Comments/Other _____

Well ID _____
Is gas visibly venting from the well? _____
Is water flowing from the well? (rate) _____
What is the water level in the tank? _____

Note any conditions/damage to the well.

Comments/Other _____
