



**Vantage Fort Worth Energy, LLC
Sampling and Response Action Plan**

LABC Well S8H

32°41'43.15"N, -97°11'0.60"W

Arlington, Tarrant County, Texas

Terracon Project No. 94147264

April 21, 2015

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A. PROJECT INFORMATION

Vantage Fort Worth Energy LLC ("Vantage") operates a well pad located in Arlington, Tarrant County, Texas (32°41'43.15"N, -97°11'0.60"W). On April 11, 2015, at approximately 1:30 PM Central Time, an equipment failure occurred on the LABC Well S8H. Frac fluid began leaking up from the well at the surface and Vantage implemented procedures for handling that situation. In response to the equipment failure, Vantage attempted to set a composite bridge plug in the well casing to stop the flow. However, that procedure was unsuccessful.

The failure resulted in a release of hydraulic fracturing fluids (flowback) to the surface. The following parties were notified of the release by Vantage or their representatives during the event.

- City of Arlington, Colin Gregory, contacted by Joe Massey from Terracon
- City Fire Dept., attempt to notify, left message for Morkita Washington, by J. DeRosa from Vantage
- Railroad Commission (RRC) notified by J. DeRosa
- City Fire Dept. Dispatch contacted by J. DeRosa
- Boots and Coots notified by J. DeRosa
- RRC David Culpepper contacts J. DeRosa for further information
- Colin Gregory, City of Arlington, contacts J. DeRosa
- TCEQ, "Chrissy", notified by J. DeRosa – Spill # 20151204
- National Response Center (NRC/EPA), Bill Roddenbury, notified by J. DeRosa – Spill # 1113339
- City requested a barrier be put in front of storm sewer. Sand pile placed.

Flowback water was diverted to a large capacity multi-well cellar on location and was removed utilizing multiple vacuum trucks. The vacuum trucks were unable to keep up with the discharge of flowback water from the well and some of the flowback water discharged to the north of the well pad site toward a storm drain. Vacuum trucks were stationed upstream of the storm drain as well to

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Vantage Fort Worth Energy, LLC - Response Action Plan

LABC Well S8H
Arlington, Tarrant County, Texas
April 21, 2015

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Terracon

remove flowback water prior to it entering the drain, however, some water did enter the storm drain.

Downstream, the storm drain discharges into an open concrete detention pond located along Little Road, approximately 480 feet northeast of the site. From the detention pond, the flowback water flowed through subsurface storm drains a distance of approximately 600 feet northeast along Little Road to its intersection with Huntwick Blvd. The flowback water then flowed a distance of approximately 700 feet southeast along Huntwick Blvd. and entered an unnamed tributary of Rush Creek. Rush Creek is located approximately 3,600 feet downstream of the location where the release entered the unnamed tributary.

Sorbent booms were placed in the tributary at the location where the release entered the tributary at Huntwick Blvd. and at the location where the tributary crosses beneath Woodside Drive further downstream.

On April 11, 2015 at 18:50 CST, the City of Arlington placed a load of sand on the property neighboring the LABC pad, at a point just upstream of the storm drain. Over time the flow from the well decreased. The sand, along with the reduced flow from the well and continued use of vacuum trucks, was sufficient to stop the flow of water into the storm drain. Therefore, flowback water did not enter the storm drain after this time.

Since the waste (flowback water) was generated in association with exploration and production activities, it would be under Railroad Commission of Texas (RRC) jurisdiction. Based on a conversation with Mr. Mike Vanderworth, Director with the RRC Kilgore District Office, no additional actions beyond those completed or in progress are being requested by the RRC to date regarding environmental-related issues.

Based upon evaluation of the waters and fluids used in the frac of the S8H well, no reportable quantities of hazardous substances were released.

B. SURFACE WATER SAMPLING

On April 12, 2015, Terracon collected surface water samples to evaluate potential impacts associated with the release of flowback water. Surface water samples were collected at the following locations:

- where the release entered the unnamed tributary along Huntwick Blvd.;
- where the tributary runs beneath Woodside Drive (approx. 1,100 feet downstream of release point into tributary);
- where Rush Creek runs beneath West Arkansas Lane (approx. 1.6 miles downstream of release point into tributary);

Vantage Fort Worth Energy, LLC - Response Action Plan

LABC Well S8H
Arlington, Tarrant County, Texas
April 21, 2015



- where Rush Creek runs beneath West Division Street (approx. 3.7 miles downstream of release point into tributary); and
- where Rush Creek runs beneath Interstate 30 (approx. 6.6 miles downstream of release point into tributary).

A background surface water sample was collected along Huntwick Blvd., upstream of the location where the release entered the tributary. Additionally, a sample of the flowback water was collected to characterize this material. Surface water sample locations are shown on Figures 3 and 4.

The surface water samples were analyzed for volatile organic compounds (VOCs) utilizing EPA Method 8260B, total petroleum hydrocarbons (TPH) utilizing TCEQ Method TX 1005 and total chloride utilizing EPA Method 9056. The sample of flowback water was analyzed for VOCs utilizing EPA Method 8260B, TPH utilizing TCEQ Method TX 1005, RCRA 8 metals utilizing EPA Method 6010/7470, alkalinity utilizing Standard Method 2320B, anions (bromide, chloride, nitrate, sulfate) utilizing EPA Method 9056A, cations (calcium, magnesium, potassium, sodium) utilizing EPA Method 6010, specific conductance utilizing EPA Method 9050, total dissolved solids (TDS) utilizing Standard Method 2540C and pH utilizing EPA Method 9040.

Once the flowback water entered the storm drain, it discharged into an open concrete detention pond located along Little Road, approximately 480 feet northeast of the site. From the detention pond, the flowback water flowed through subsurface storm drains a distance of approximately 600 feet northeast along Little Road to its intersection with Huntwick Blvd. The flowback water then flowed a distance of approximately 700 feet southeast along Huntwick Blvd. and entered an unnamed tributary of Rush Creek. This unnamed tributary would likely be classified as an intermittent stream based on the classification of Rush Creek, as indicated below.

Rush Creek is located approximately 3,600 feet downstream of the location where the release entered the unnamed tributary. Rush Creek is listed as stream segment 0841R, but is considered unclassified. It is considered part of the watershed associated with the Lower West Fork of the Trinity River. According to the 2014 Texas Integrated Report of Surface Water Quality, Rush Creek is classified as intermittent with pools. Rush Creek is considered to have limited aquatic life use and is not listed as a public water supply. Rush Creek is listed as an impaired water body due to the presence of *E. coli* bacteria.

The Lower West Fork of the Trinity River is the first classified segment (0841) located downstream of the release. According to the 2014 Texas Integrated Report of Surface Water Quality, the Lower West Fork of the Trinity River is classified as a perennial stream. The Lower West Fork of the Trinity River is considered to have intermediate aquatic life use and primary contact recreation. It is not listed as a public water supply. Fish consumption is restricted due to the presence of PCBs and dioxins.

Vantage Fort Worth Energy, LLC - Response Action Plan

LABC Well S8H
Arlington, Tarrant County, Texas
April 21, 2015



Chemicals of concern (COCs) identified in the surface water samples were compared to the applicable Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program (TRRP) aquatic life and human health surface water risk-based exposure limits. The RRC does not specify cleanup criteria for surface water. However, according to the Memorandum of Understanding between the RRC and TCEQ (16 TAC Part 1, Chapter 3, Rule 3.30 (b)(2)(B)(i)) regarding discharges under the Texas Water Code, "Discharges regulated by the RRC into or adjacent to water in the state shall not cause a violation of the water quality standards. While water quality standards are established by the TCEQ, the RRC has the responsibility for enforcing any violation of such standards resulting from activities regulated by the RRC."

Based on a review of the TCEQ guidance document Determining PCLs for Surface Water and Sediment (RG-366/TRRP-24), only the acute aquatic life criteria apply to intermittent streams. Human health criteria do not apply. For an intermittent stream with perennial pools, both the acute and chronic aquatic life criteria apply. Additionally, human health freshwater fish tissue (x10) criteria apply.

Laboratory analyses of the surface water samples did not indicate VOC or TPH concentrations above the laboratory reporting limits (RLs) with the exception of an estimated (J-value) TPH concentration of 0.67 milligrams per liter (mg/L) in surface water sample LABC-SW-02, which is located in the tributary where it intersects with Woodside Drive. The RRC and TCEQ do not have specific standards for TPH in surface water. For general comparison purposes, facilities that are authorized under the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXG830000 for Petroleum Fuel or Petroleum Substance Discharges can discharge fluids containing up to 15 mg/L TPH.

Laboratory analysis of the surface water samples indicated chloride concentrations above the laboratory reporting limits ranging from 22.2 to 734 mg/L. Chloride concentrations were compared to applicable TCEQ TRRP aquatic life and human health surface water risk-based exposure limits (SWRBELs). Chloride concentrations in the surface water samples did not exceed applicable SWRBELs as indicated in Table 1.

C. SURFACE SOIL/SEDIMENT SAMPLING

On April 13, 2015, Terracon collected surface soil and creek sediment samples to evaluate potential impacts associated with the release of flowback water. Surface soil samples were collected in impacted areas of the well pad. These include five samples from areas along the northern portion of the well pad site, as well as off-site at the location where the water was flowing off-pad into the nearby stormwater culvert. Two background surface soil samples were additionally collected north of the site for comparison purposes.

Vantage Fort Worth Energy, LLC - Response Action Plan

LABC Well S8H
Arlington, Tarrant County, Texas
April 21, 2015

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Creek sediment samples were collected in the streambed where the released water entered the unnamed tributary along Huntwick Blvd. and at the location where the tributary runs beneath Woodside Drive. An upgradient background sediment sample was collected along Huntwick Blvd., upstream of the location where the release entered the tributary. Surface soil/sediment sample locations are shown on Figures 2 and 3.

The surface soil/sediment samples were analyzed for VOCs utilizing EPA Method 8260B, TPH utilizing TCEQ Method TX 1005, RCRA 8 metals utilizing EPA Method 6010/7471, total chloride utilizing EPA Method 9056A and synthetic precipitation leaching procedure (SPLP) chloride utilizing EPA Method 9056A/1312. Data is pending for these samples.

Contaminants of Concern (COCs) identified in the surface soil samples will be compared to the applicable RRC Class 1 and Class 2 Residential Soil-to-Groundwater Protection Limits for Delineation and Remediation as described in the Field Guide for the Assessment and Cleanup of Soil and Groundwater Contaminated with Condensate From a Spill Incident. In the event RRC standards are not available for a particular COC, the data will be compared to applicable TCEQ TRRP protective concentration levels (PCLs) for soil and sediment and Texas-Specific Soil Background Concentrations (TSSBC) for metals.

Chloride concentrations identified in the soil samples will be evaluated in accordance with the RRC document entitled Field Guide for the Assessment and Cleanup of Produced Water Releases, Draft, dated December 11, 2009. In accordance with this draft guidance document, soils with maximum concentrations of 3,000 mg/kg chloride are generally expected to be protective of groundwater. SPLP analytical results will represent the leachable component in soils for chlorides and will be compared to the USEPA Groundwater Maximum Contaminant Level (MCL) of 250 mg/L.

D. SOIL REMEDIATION PROGRAM

As indicated previously, Terracon has collected surface soil samples from the well pad site to evaluate potential impacts associated with the release of flowback water. However, as a conservative measure, Vantage has elected to remove surface soils from the northern portion of the well pad site (were flowback water was discharging across the surface) to minimize the potential for impacted materials to migrate off-site.

A 100-foot by 230-foot grid was established covering a majority of the northeast portion of the site. The grid was placed on ten-foot centers and soil field conductivity sampling was conducted throughout the grid pattern on approximate 20 foot centers.

Vantage Fort Worth Energy, LLC - Response Action Plan

LABC Well S8H
Arlington, Tarrant County, Texas
April 21, 2015

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Surface soils were scraped away until field conductivity readings demonstrated the impacted soils had been substantially removed. Following completion of the soil excavation activities, soil confirmation samples were collected along the same aforementioned grid pattern from the excavated area and analyzed for VOCs utilizing EPA Method 8260B, TPH utilizing TCEQ Method TX 1005, RCRA 8 metals utilizing EPA Method 6010/7471, total chloride utilizing EPA Method 9056A and SPLP chloride utilizing EPA Method 9056A/1312. Excavated soils will be transported by a Texas licensed waste hauler under manifest to the Tervita Vortex Landfill (a Republic Services facility) located in Alvarado, Texas.

E. HEALTH & SAFETY FOR SOIL REMEDIATION FIELD ACTIVITIES

Terracon proposes to manage the excavation, characterization and disposal activities associated with the potentially-impacted soils at the site and will complete the following:

- Prepare a site-specific Health and Safety Plan for Terracon personnel for the soil remediation activities. At this time, it is anticipated that an OSHA Level D work uniform consisting of hard hats, safety glasses, fire-resistant (FR) clothing, protective gloves, and steel-toed boots will be required by all personnel in the work area;
- Mark-out underground utilities where digging greater than 6-inches beneath the pad site surfacing materials;
- Supervise excavation activities performed by the Subcontractor;
- Collect soil samples for confirmation purposes and composite soil stockpile samples for waste characterization purposes;
- Supervise stockpiling of excavated soil into roll-off boxes or on polyethylene sheeting and verify that stockpiles are covered and bermed; and
- Characterize the material for disposal at an appropriate disposal facility.

The Subcontractor(s) selected for this project will be responsible for completion of the following tasks under Terracon's supervision:

- The Subcontractor will be responsible for preparing a job hazard analysis/site safety and health plan to protect worker safety for the duration of the project. The Subcontractor will be responsible for the safety of its workers, and any individuals subcontracted by the Subcontractor working on the site. The Subcontractor's workers should be 40-hour OSHA HAZWOPER trained with annual 8-hour refreshers current;
- The Subcontractor will be responsible for performing the transportation activities within Local, State and Federal Guidelines. The Subcontractor shall utilize Texas Department of Transportation (TxDOT) approved and State of Texas Licensed vehicles and equipment. The Subcontractor shall be responsible for utilizing State of Texas licensed drivers and equipment operators during all on-site excavation and off-site transport related activities. The

Vantage Fort Worth Energy, LLC - Response Action Plan

LABC Well S8H
Arlington, Tarrant County, Texas
April 21, 2015



- Subcontractor shall be responsible for meeting State of Texas or Local requirements pertaining to the proper control of on-site traffic and in the ingress/egress of off-site traffic;
- Excavation of the source area soil. Impacted soils will be temporarily stockpiled on-site pending waste characterization and landfill approval for acceptance of this material;
 - Excavation surrounding shallow subsurface utilities, if present, will consist of hand digging to uncover the location of the utility line;
 - Following completion of excavation activities, the Subcontractor will be responsible for backfilling the excavated area to surface grade;
 - The site will be secured at the end of each day to prevent public access;
 - The Subcontractor will assist consultant in the collection of soil samples from the excavation floor and sidewalls using heavy equipment as necessary;
 - The Subcontractor will implement erosion control measures (such as berms, silt fencing, etc.) to prevent surface runoff from entering the excavation and minimize surface water runoff from excavated and disturbed areas; and
 - The Subcontractor will be responsible for restoring the site to near its original condition including, but not limited to, removing all mobilized equipment from the site, removing all debris generated by the Subcontractor and restoring or repairing items damaged by the Subcontractor during construction.

F. CLOSURE REPORT

Upon completion of site activities and receipt of all final laboratory analytical results, a site closure report will be prepared that will include the following:

- Documentation of field activities;
- Site plan showing pertinent site features;
- Analytical laboratory results;
- Data evaluation and presentation of findings.

Vantage proposes to complete response actions described herein on or before a date 60 days after the incident.

Copies of the final site closure report will be provided to the RRC, TCEQ, EPA and City of Arlington as required by regulation and/or as otherwise requested.

Vantage Fort Worth Energy, LLC - Response Action Plan

LABC Well S8H
Arlington, Tarrant County, Texas
April 21, 2015



Please contact either of the undersigned at 214-630-1010 with any comments or questions regarding this plan.

Sincerely,

Terracon

A blue ink signature of Max Majesko, consisting of a stylized, cursive "M" followed by a horizontal line.

Max Majesko
Senior Project Manager

A blue ink signature of Scott M. Kolodziej, featuring a stylized "S" and "K" in a cursive script.

Scott M. Kolodziej, P.G.
Environmental Department Manager

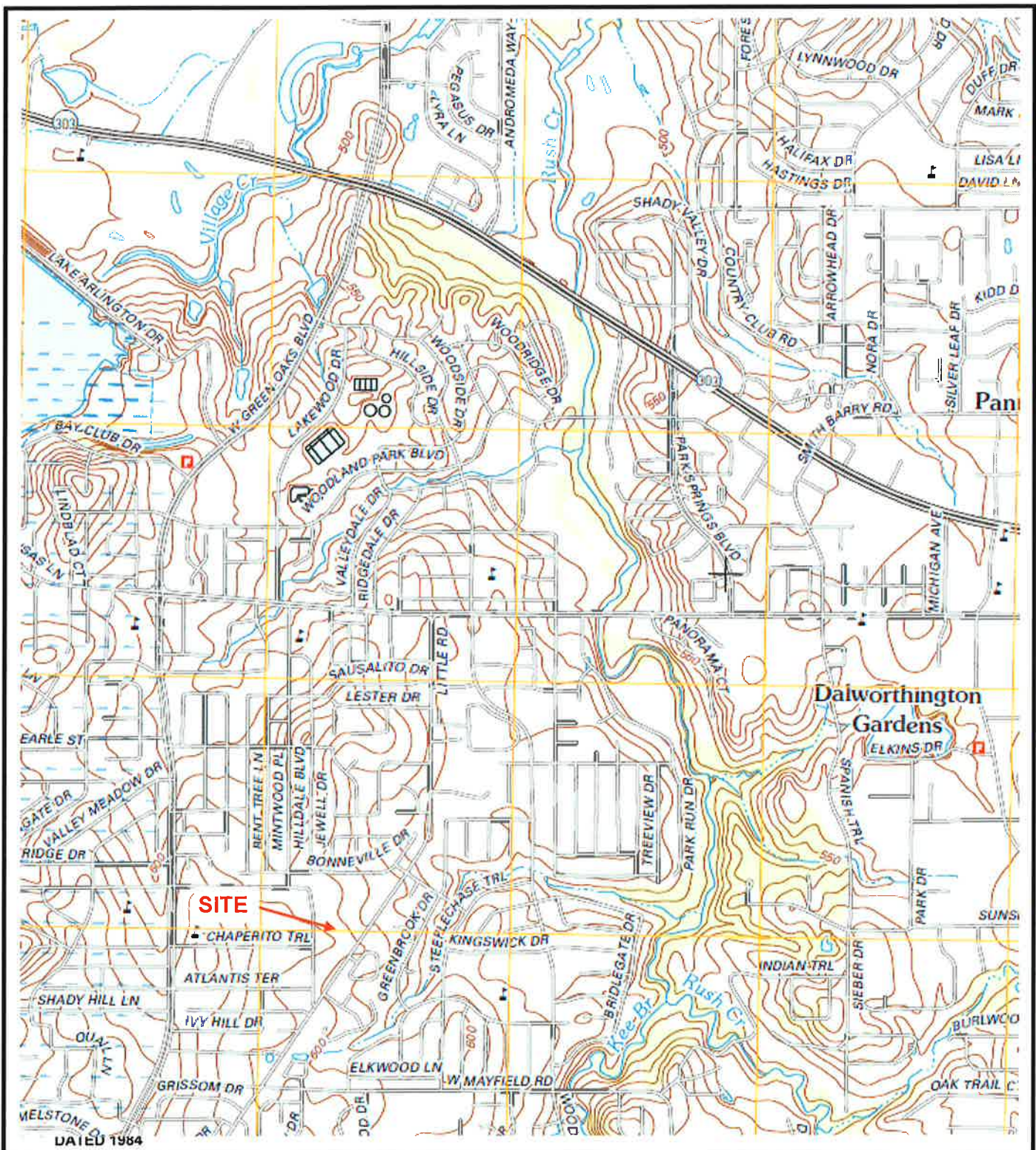
Attachments

- Figures
- Tables

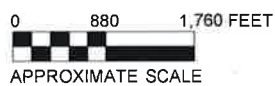
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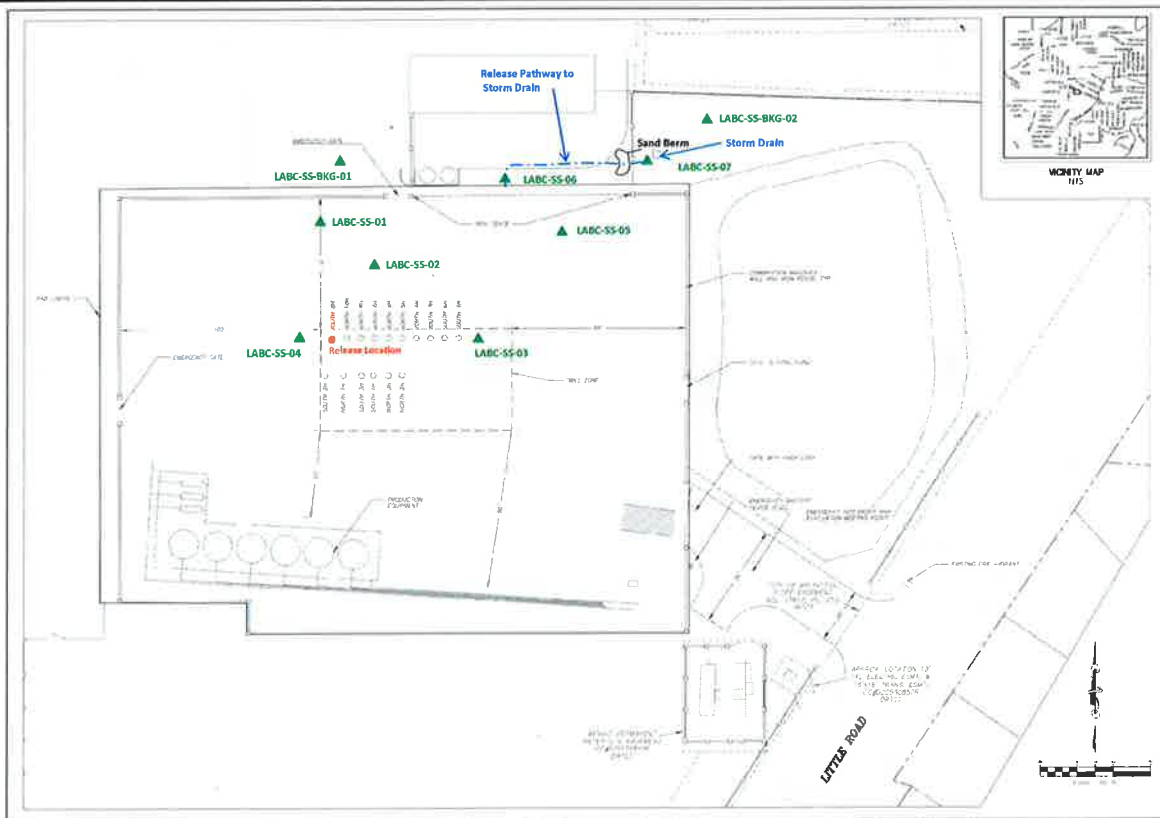


LABC WELL S8H
ARLINGTON, TARRANT COUNTY, TEXAS

Terracon Project No. 94147264

FIGURE 1: TOPOGRAPHIC MAP

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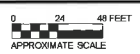


VANTAGE - LABC DRILL SITE
GAS WELL PERMIT
 2912 & 3012 LITTLE ROAD
 ARLINGTON, TEXAS

mma
 PROJECT: VANTAGE - LABC DRILL SITE
 SHEET: GAS WELL PERMIT EXHIBIT A-2 SITE PLAN
 DATE: 02/04/2015
 1 OF 1

Source: Mycoskie, McInnis and Associates, Vantage LABC Drill Site Gas Well Permit, dated February 4, 2015

THIS DRAWING SHOULD NOT BE USED SEPARATELY FROM ORIGINAL REPORT.

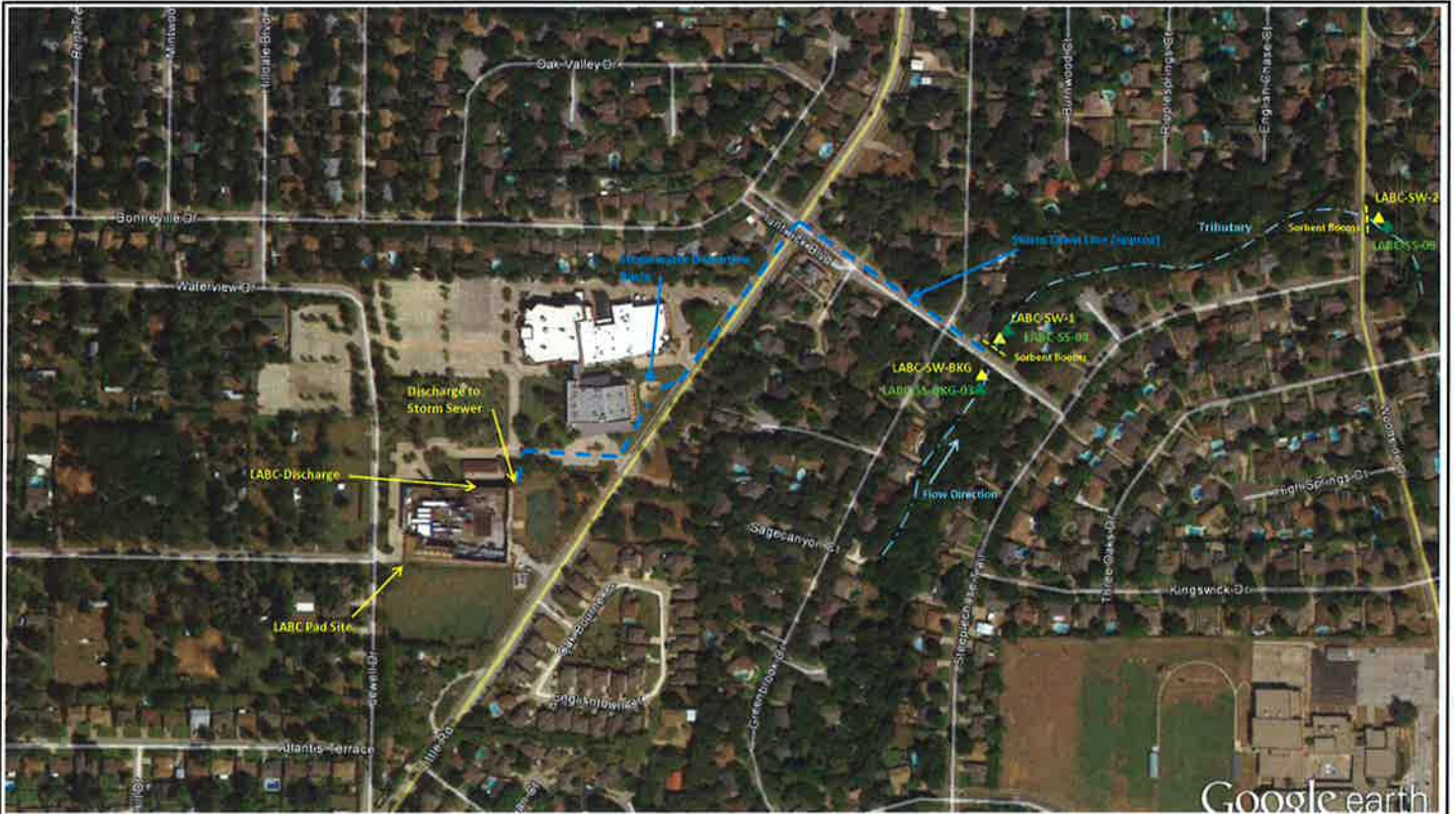


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LABC WELL S8H
 ARLINGTON, TARRANT COUNTY, TEXAS

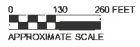
FIGURE 2: SURFACE SOIL SAMPLE LOCATIONS

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Source: Google Earth, 10/02/2014

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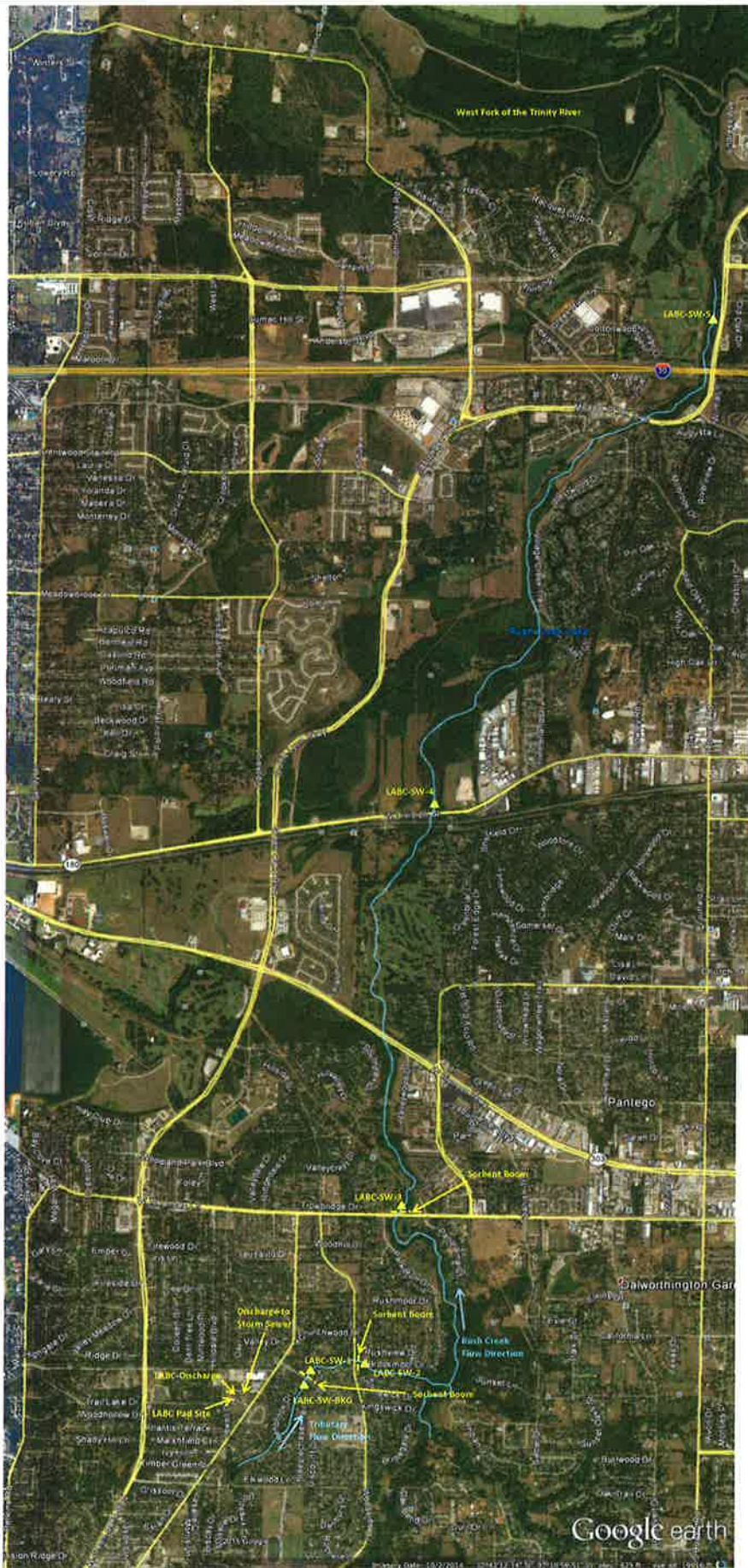
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LABC WELL S8H
ARLINGTON, TARRANT COUNTY, TEXAS

FIGURE 3: SURFACE WATER/SEDIMENT SAMPLES AND FLOW DIRECTION - INTERMITTENT TRIBUTARY

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Source: Google Earth, 10/02/2014

0 1,150 2,300 FEET
APPROXIMATE SCALE

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LABC WELL S8H
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FIGURE 4: SURFACE WATER SAMPLE LOCATIONS

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TABLE 1
SURFACE WATER SAMPLE ANALYTICAL RESULTS - VOCs¹, TPH², and Chloride³
 LABC Well S8H
 Arlington, Tarrant County, Texas
 Terracon Project No. 94147264

Sample I.D.	Sample Date	VOCs ⁴ (mg/L)	TPH (TX1005 Rev. 3) (mg/L)				Chloride (mg/L)
			C6-C12	>C12-C28	>C28-C35	C6-C35	
Intermittent Tributary of Rush Creek							
LABC-SW-1	04/12/15	ND	<1.1	<0.86	<0.57	<2.6	403
LABC-SW-2	04/12/15	ND	<1.2	0.67-J	<0.58	<2.6	734
LABC-SW-BKG	04/12/15	ND	<1.1	<0.86	<0.57	<2.6	140
Acute Freshwater SWRBEL ^{5,6}		N/A	NP				860
Rush Creek							
LABC-SW-3	04/12/15	ND	<1.1	<0.86	<0.57	<2.6	65.9
LABC-SW-4	04/12/15	ND	<1.1	<0.84	<0.56	<2.5	42
LABC-SW-5	04/12/15	ND	<1.2	<0.88	<0.59	<2.6	22.2
Freshwater SWRBEL - Acute ⁶		N/A	NP				860
Freshwater SWRBEL - Chronic ⁶		N/A	NP				230
Human Health RBEL - Fish Only ⁵		N/A	NP				NP
TPH discharge criteria under TPDES General Permit TXG830000 for Petroleum Fuel or Petroleum Substance Discharges ⁷		N/A	15				N/A

1. VOCs = Volatile organic compounds analyzed by EPA Method 8260

2. TPH = Total petroleum hydrocarbons analyzed by TCEQ Method TX 1005

3. Chloride analyzed by EPA Method 9056A

4. Only those constituents detected above the laboratory sample detection limit (SDL) are reported

5. SWRBEL = Surface Water Risk-Based Exposure Limits

6. Applicable Water Quality Criteria based on TCEQ guidance document RG-366/TRRP-24 *Determining PCLs for Surface Water and Sediment* Table 3-1 *Determination of Appropriate Water Quality Toxic Criteria* and sample collection location

7. Provided for general reference purposes only

< = Constituent not detected above the indicated laboratory RL

ND = Constituents not detected above applicable laboratory RLs

N/A = Not Applicable

NP = Not Published

J = Estimated concentration above the adjusted MDL and below the adjusted RL

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