



**Investigation Goals:** Use field instruments to measure for presence of landfill gas at 14 landfill gas probes monthly, for a period of three months. Install one permanent landfill gas probe GP-16 and Collect landfill gas samples from 6 landfill gas probes for laboratory analysis. Conduct a soil cover investigation across the site on a 100-foot grid across unpaved surfaces and a 200-foot grid across all paved surfaces.

## Field Services

The following activities and tasks will be completed for the soil cover borings, landfill gas probe install and landfill gas probe screening/sampling.

- ❖ S&ME will use an all-terrain vehicle (ATV). An ATV is necessary to access cleared paths through wooded areas that can only be accessed by foot and ATV (no truck access), to transport heavy equipment between sampling locations (with minimal damage to the landscaped areas), to expedite the work cost effectively and work safer than having field personnel haul around the equipment where trucks cannot gain access.
- ❖ The One-Call Center coordinates utility mark-outs for its member companies. Not all utility owners/operators are members of the One-Call Center.
- ❖ The One-Call Center utility mark-outs are for known utility locations that are marked out in easements and right-of-ways. The mark-outs do not typically go very far onto private property from the easement or right-of-way areas.
- ❖ Private utility locators will enhance the One-Call center mark-outs by continuing to extend and show the lines marked by the One-Call Center mark out into the project area (if present). Private utility locators may also use additional equipment (other than just magnetic scans) like ground penetrating radar to locate underground utilities. Private utility locators will actually go to each proposed drilling location and mark utilities or “clear” the drilling locations.
- ❖ S&ME will take photographs of the locations of the site where clearing, soil boring installations, monitor well installations, and landfill gas probe installations will occur prior to the commencement of site services. S&ME will also take photographs during soil boring, landfill gas probe, and monitor well installation and sampling. These photos will provide a “before-and-after sampling condition” photo log. A photo log will only be submitted as part of the report where property was/is damaged and/or not restored to its original condition.
- ❖ Site Clearing: The southern area of the site near the stream (Salem Creek) is heavily overgrown and wooded. Many of the proposed soil cover borings will be located in these heavily wooded areas. S&ME will hire a subcontractor (Harris Precision Construction) to clear paths from the back of the developed properties down to the proposed drilling locations. Harris Precision Construction is familiar with the site as they previously navigated side slopes of the southern portion of the landfill under the previous task order. S&ME will conduct minor hand clearing in areas that are not cleared by the subcontractor on-site as needed to allow access for the drilling activities.
- ❖ A track mounted Geoprobe will utilize direct push technology to collect the shallow soil samples that make up the soil cover. Decontamination procedures will be followed according to S&ME’s SOP/QA Manual. Decontamination will be conducted between general boring locations.
- ❖ Soil samples will be logged and classified to identify soil types according to the Unified Soil Classification System (USCS).

- ❖ The soil borings will be closed by filling the bore holes with auger cuttings. If there are voids after placing auger cuttings in a boring, the remainder of the bore hole will be filled with bentonite. Impacted materials not used as fill will be drummed. Bentonite will also be used in borings that encounter groundwater.
- ❖ The locations of the soil cover samples will be recorded with a GPS unit capable of sub-meter accuracy using differential correction just after completion. The locations will be recorded in State Plane Coordinate System using the North American Datum of 1983 (NAD83) in meters to fifth order and will be provided in an appendix with brief location descriptions/designations (e.g. SB-1, GP-1, etc.). In addition, S&ME will report the data points in latitude and longitude in decimal degrees to the seventh order using the World Geodetic System 1984 (WGS84).
- ❖ One duplicate sample will be collected for soil and landfill gas per day of sampling.
- ❖ One volatile organic compound (VOC) trip blank will be analyzed per sample shipment. (Equipment rinsate blanks are not collected when new acetate sleeves are used for soil sampling).
- ❖ Collected media samples (soil) will be analyzed by a North Carolina certified laboratory using the most current USEPA Contract Laboratory Program Target Compound list for:
  - Volatile organic compounds (VOCs) by Method 8260;
  - 1,4-Dioxane by Method 8260 SIM;
  - Semi-volatile organic compounds (SVOCs) by Method 8270D;
  - 14 Metals by totals analysis (antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver, thallium, and zinc) by Method 6010C/6020A;
  - Mercury by Method 7471 (solids)
  - Ammonia by Method 350.1 or 9050;
  - Sulfate by Method 300 or 9056; and
  - Nitrate by Method 300, 9056, or 353.2.

### **Task Orders 744DP-9A, 9B and 9C Monthly Landfill Gas Screening (Three Months)**

S&ME will use portable hand-held meters to screen landfill gas in the 14 existing landfill gas probes (GP-1 through GP-9 and GP-11 through GP-15) and one newly installed landfill gas probe (GP-16), as shown on **Figure 1**.

Portable meters will be used to collect the following parameters at each landfill gas probe:

- ❖ Landfill Gas Meter – GEM5000 PLUS (or equivalent) for:
  - methane: 0-100%, +/- 0.5% to 3.0% accuracy
  - hydrogen sulfide: 0-500 ppmv, with +/- 50 ppmv resolution
  - carbon dioxide: 0-100%, +/- 0.5% to 3.0% accuracy
  - oxygen: 0-25%, +/- 1.0% accuracy
  - barometric pressure: +/- 5.9 inches mercury from calibration pressure, +/- 0.15 inches mercury accuracy
- ❖ Photo-Ionization Detector – Mini Rae 3000 (or equivalent) for total VOCs: 0.5 – 2,000 ppmv

Each of these meters has an internal pump. New Teflon tubing will be connected from the meters to each landfill gas probe cap for sampling.

A UEI Test Instruments DTH10 Digital Thermo-Hygrometer (or equivalent) will be used to measure ambient air for humidity, and temperature.

The following steps will be followed:

- ❖ **Step 1** – Calibrate the instruments according to the manufacturer’s specifications. In addition, prepare the instruments for monitoring by allowing them to properly warm up as directed by the manufacturer. Make sure the static pressure shows a reading of zero on the instruments with this feature, prior to taking the first sample.
- ❖ **Step 2** –Connect the instrument tubing to the landfill gas monitoring well cap fitted with a valve. Purge sample tubing for at least one minute prior to taking readings.
- ❖ **Step 3** – Record the initial readings prior to recording the stabilized readings. A stable reading is one that does not vary more than 0.5 percent by volume on the instrument’s scale.
- ❖ **Step 4** - Record the stabilized readings.
- ❖ **Step 5** – Disconnect the tubing and turn the cock valve to the off position.
- ❖ **Step 6** – Proceed to the next landfill soil gas probe and repeat Steps 2 – 5.
- ❖ **Step 7 (if needed)** – At locations where detections were recorded at levels greater than the IHSB Residential Vapor Intrusion Screening Levels for Soil Gas, another round of readings will be collected from those locations. The follow-up round of readings will be conducted at 15-minutes or more after the first round of readings.

Duplicate readings will be recorded from two or more of the landfill gas probes. The duplicate readings will not be recorded sooner than one-hour following completion of the first readings. A background reading will be recorded away from the landfill (up-wind of the site). Assuming that the work plan is approved in June 2016, the monthly events will be scheduled for June, July and August of 2016. A separate letter report will be submitted following each sampling event.

## **TASK ORDER 744DP-10**

### **744DP-10 (Subtask A) Work Plan / Proposal Preparation**

The following services were performed:

- ❖ Developed drawings to present the landfill gas probe, and soil cover sampling locations.
- ❖ Prepared request for proposals and secured competitive bids from drillers, laboratories, utility clearance subcontractors and surveying clearing subcontractors.
- ❖ Developed a plan to handle investigative derived waste (IDW).
- ❖ Developed a field work activity schedule.
- ❖ Planned access to drilling locations on the property of active businesses and discussed sampling methods with drillers.
- ❖ Planned air sampling schedule with reduced hold times for hydrogen sulfide analysis.
- ❖ Preparation of this proposal.
- ❖ Developed Cost Estimate Spreadsheets.

### 744DP-10 (Subtask B) *Landfill Cover Soil Investigation*

To assess the soil cap thickness, an estimated 145 soil borings will be installed within the waste disposal area on an approximate 100-foot grid over the undeveloped areas and on an approximate 200-foot grid over the developed/paved areas. Soil borings will be advanced to an approximate total depth of three feet below ground surface (bgs) or until waste is encountered first. S&ME will utilize a Geoprobe (direct push technology) to install approximately 115 of the soil borings in locations that are accessible through open areas and limited site clearing. The remaining 30 soil borings will be installed using a stainless steel hand auger in areas that are not readily accessible due to heavy vegetation and other physical barriers.

Soil samples will be continuously logged from the geoprobe sleeves and from the hand auger soil cuttings that are turned up at the ground surface. Soil samples will be logged and classified to identify soil types according to the Unified Soil Classification System (USCS).

At locations where the soil cover is greater than or equal to 6 inches, S&ME will collect one soil sample at 6 inches bgs. At locations where the soil cover is greater than or equal to 2 feet, S&ME will collect one soil sample at 6 inches bgs and one soil sample at 18 inches bgs. For the purpose of preparing this proposal, S&ME will assume a total of two soil samples from each boring, plus QC samples. S&ME estimates a total of 296 samples (including 6 days of QC samples) will be submitted for laboratory analysis.

#### *Investigation Derived Waste*

Investigative waste materials extracted from a boring exhibiting olfactory or visual impact will be placed back in the boring as fill as long as the water table was not bisected; these impacted materials will not be spread on the surface. Impacted materials not used as fill will be drummed. If there are voids after using non-impacted soil in a boring, the remainder of the bore hole will be closed by filling the bore hole with bentonite. The soil drill cuttings from soil borings outside of the waste disposal area where contamination is indicated will be containerized in steel 55-gallon drums. The drums will be sealed and labeled and placed on a wooden pallet near the borings. The stored drums on the wooden pallet will be contained within a self-standing temporary chain-link fence. Three corners of the fenced area will be secured with hardware. The fourth corner will be secured with chain and a padlock to allow controlled access to the fenced area.

### 744DP-10 (Subtask C) *Landfill Gas Probe Installation and Sampling*

Refer to **Figure 1** for the proposed install location (VP-16).

One landfill gas probes will be installed as follows:

- ❖ A decontaminated 3 ¼" or 4 ¼" diameter auger will be extended with a Geoprobe unit up to 15 feet below ground surface. The bottom of the PVC well screen will be installed at least two feet or more above the estimated groundwater table elevation. If the estimated groundwater table is expected to be less than 13 feet below ground surface, adjustments to the length of well screen and, if needed, the distance between the bentonite seal and the ground surface will be made.

- ❖ A one to five foot long 1-inch diameter, 0.010 inch slot screen, with 1-inch diameter PVC well casing from the top of the screen up to four feet above ground surface will be placed into the open boring.
  - If the well screen is cut to accommodate a shallow groundwater depth, a push cap will be placed onto the bottom of the well screen.
  - A PVC cap will be installed over the top of the stick-up PVC well casing.
  - Coarse sand (#3 sand) will be poured into the boring hole around the PVC screen and casing from the bottom of the gas probe up to approximately six inches to one foot above the top of the screen.
  - A one-foot thickness of bentonite pellets will be poured into the boring around the PVC casing from the top of the sand to one foot above the sand. The landfill gas probe will be installed to ensure that there is at least four feet from the top of the bentonite to the ground surface. Approximately one gallon of clean water will be poured into the boring to hydrate the bentonite seal (the thickness of the bentonite seal may be increased if the distance from the ground surface to the bentonite seal is required to be less than five feet due to shallow groundwater).
  - Soil from the drill cuttings will be packed into the boring from the top of the bentonite layer to the ground surface. This soil layer will be at least four feet thick if there is adequate depth to groundwater.

The landfill gas probe will be installed as a permanent sampling points and will be completed with concrete pads and a flush mount protective steel casing with bolted manhole cover. The landfill gas probe will be completed with a four-inch thick concrete pad.

### **Landfill Gas Sampling**

Upon completion of landfill gas probe install (GP-16), independently certified summa canisters will be connected to the vapor probes GP-1, GP-2, GP-5, GP-7, GP-15 and GP-16 for the collection of VOCs by method TO-15, Mercury by NIOSH 6009 and Hydrogen Sulfide by US EPA 918 Method 15. All of the landfill gas probes will be field screened with portable meters following the landfill gas sampling.

#### **Landfill Gas Samples Collected for Lab Analysis (GP-1, GP-2, GP-5, GP-7, GP-15 and GP-16):**

A sample train will be used at six locations (GP-1, GP-2, GP-5, GP-7, GP-15 and GP-16) that will include: Teflon tubing, rotometers, valves, gauges, tubing fittings, flow control valve and Summa canisters. After the sampling train is connected, two leak tightness checks will be conducted at each of the sampling locations:

- ❖ Helium - Leak Tightness Check:
  - Calibrate and check helium detection meter (Ion Science, GasCheck G3, or equivalent). Record background ambient air readings for at least one-minute.
  - Close the valves at the top of the PVC landfill gas probe and at the summa canister.
  - Attach Teflon tubing from helium detection meter to the sample train tee fitting where a valve is connected between the sample train and the helium detection meter.
  - Ensure that all connections are made and valves are in correct positions to only allow flow from the sample train into the helium detection meter. No flow should be from the landfill gas probe, into the Summa canister or from ambient air sources.
  - Open the valve to allow flow to the helium detection meter.

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- Continuously apply helium gas from a helium tank with tubing attached onto the sample train, fittings, valves, meters and gauges for at least three minutes.
  - Operate the helium detection meter for at least three minutes while helium is applied to the sample train.
  - Record meter readings. If helium is detected above background levels, stop the leak check and check all fittings and adjust as needed.
  - Recheck and readjust as needed to ensure that the sample train has no leaks and no readings of helium are recorded above background levels.
- ❖ Vacuum - Leak Tightness Check:
- Close the valve at the top of the PVC landfill gas probe.
  - Ensure that all connections are made and valves are in correct positions to only allow flow from the sample train into Summa canister. There should be no flow from the landfill gas probe or from ambient air sources.
  - Open the valve to the Summa canister to allow flow to the Summa canister only (there should be no flow, as the valve to the landfill soil gas probe remains closed).
  - Record the vacuum pressure on the gauge on the Summa canister for at least three minutes.
  - If a change of vacuum is recorded at more than +/- 5 mm of mercury, stop the leak check and check all fittings and adjust as needed.
  - Recheck and readjust as needed to ensure that the sample train has no leaks and vacuum pressure changes are within +/- 5 mm of mercury or less.
- ❖ Collect Soil Gas Samples with Summa Canisters (TO-15):
- Laboratory certified Summa canisters under approximately 28 – 30 inches of mercury (Hg) vacuum will be provided by a NC certified laboratory. The Summa canisters will be six-liters and will be independently certified. The laboratory will provide a pressure gauge and flow controller for the Summa canisters, Swagelok type fittings with Teflon tape will be used. The flow controller will be set by the laboratory to collect landfill gas into the Summa canisters at approximately 25 ml/minute. (A collection rate of 200 ml/minute or less is recommended to limit stripping of VOCs from the air samples).
  - The Summa canister valve and the valve at the top of the PVC soil gas probe will be opened to ensure that air flow is from the landfill soil gas probe into the summa canister only. It will take about four-hours to fill the Summa canister.
  - The sampling and Summa canisters parameters will be recorded (e.g. time, rate, begin pressure, end pressure, etc.).
  - When the Summa canister is full, the valve on the Summa canister will be closed and disconnected from the sampling train. The sampling train will also be removed from the PVC landfill soil gas probe and a PVC cap will be replaced on the landfill soil gas probe to close the probe.
  - The Summa canisters will be shipped under standard chain of custody to the laboratory for VOC analyses by EPA Method TO-15.
  - One QC sample will be collected: one duplicate drawn concurrently from one of the landfill soil gas probes.

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- ❖ Collect Soil Gas Samples with sorbent tubes (Mercury – NIOSH 6009) and Tedlar Bags (Hydrogen Sulfide – US EPA 918 Method 15):
    - Once the summa canister is disconnected, the mercury samples will be collected using a portable air sampling pump set to a low-flow level of approximately 0.25 liters per minute. Tubing will be connected from the pump to the sample collection sorbent tube (solid hopcalite sorbent tube) and placed along the sample train. The pump will be set to run for approximately seven to eight hours to collect at least 100 liters of air. The sorbent tube will then be disconnected, labeled and shipped under chain of custody procedures to TestAmerica.
    - Upon completion of the mercury sampling the sorbent tube will be disconnected and a tedlar bag will be connected to the portable air sampling pump set to a low-flow level of approximately 0.25 liters per minute. Tubing will be connected from the pump to the sample collection tedlar bag until the bag is full. Once the bag is full, the tedlar bag will then be disconnected, labeled and shipped under chain of custody procedures to TestAmerica. This analysis must be shipped priority overnight to the lab in Sacramento California to meet the 72 hour holding time. Expedited shipping fees will be required for this shipment.

#### **744DP-10 (Subtask D) Project Management, Coordination & Support**

Project Management, Coordination & Support services include:

- The tasks and deliverables required prior to commencing field services include:
  - ❖ Development of site specific field sampling forms and logs for: landfill gas screening, sampling and soil sampling.
  - ❖ Data download and quality check after sampling event.
  - ❖ Pre-loading the GPS unit with the proposed screening location names and coordinates.
- Provide project management and technical support to the field sampling teams.
- Laboratory data quality review.
- Provide project management and communication with NCDEQ.

#### **744DP-11 Compile Rep – Soil Cover and Vapor Intrusion Assessment**

S&ME will compile a report that includes the findings detailed in the items listed above for the scope of services. The following sections and information will be included in the report:

- ❖ Explanation of services performed and the findings.
- ❖ Tables summarizing field screening data compared to the IHSB Non-Residential Vapor Intrusion Sub-Slab and Exterior Soil Gas Screening levels (VISL's).
- ❖ Tables summarizing field data, laboratory results compared to NCDEQ standards.
- ❖ Figures presenting the sample locations and selected data results.
- ❖ Copies of original field notes.
- ❖ Photographs of significant land disturbances or other significant or noteworthy items encountered during field activities will be taken and provided to the Unit for review and inclusion in the report if requested.

We will submit a digital copy of the report as required.



## ❖ SCHEDULE

The proposed Scope of Services will be completed within ten-weeks following receipt of a Task Authorization from the Unit. A proposed field services schedule is presented below.

Task Order 744DP-9A, 9B, 9C, and 10 – Proposed Field Services Schedule & Level of Effort					
Schedule	Task Order/Subtask	S&ME On-Site Staff			Others On-Site
		Project/PM	Staff	Tech	
Monthly (3 separate 1-day screening events)	<b>744DP-9A, 9B and 9C</b> – Landfill Gas Screening (14 Locations)		1	1	
Week 1, Day 1	<b>744DP-10 Subtask B</b> – Install (Geoprobe) up to 30 (or fewer) soil cover borings (clearing, logging, sampling, IDW and abandonments).	1 (Site Visit)	1	1	Drillers, Utility Clearance and Clearing Subcontractors
Week 1, Days 2-4	<b>744DP-10 Subtask B</b> – Install (Geoprobe) up to 30 soil borings per day.		1	1	Drilling Subcontractors
Week 1, Day 5	<b>744DP-10 Subtask B</b> – Install Install (Hand Auger) up to 15 soil borings per day.		1	1	
Week 2, Day 1					
Week 2, Day 2	<b>744DP-10 Subtask C</b> – Install landfill gas probe GP-16		1	1	Drillers
Week 2, Day 3	<b>744DP-10 Subtask C</b> – Sample and screen landfill Gas at six locations (GP-1, GP-2, GP-5, GP-7, GP-15 and GP-16).		1	1	

## ❖ PROJECT BUDGET

S&ME proposes to provide the Scope of Services presented above on a time and materials basis for an estimated fee of **\$163,402.30**. See the attached spreadsheet for details of the proposed budget.

❖ <b>Field Services - Task Order 744DP-9A:</b>	<b>\$3,607.20</b>
❖ <b>Field Services - Task Order 744DP-9B:</b>	<b>\$3,607.20</b>
❖ <b>Field Services - Task Order 744DP-9C:</b>	<b>\$3,607.20</b>
❖ <b>Work Plan &amp; Proposal - Task Order 744DP-10 Subtask A:</b>	<b>\$1,999.00</b>
❖ <b>Field Services - Task Order 744DP-10 Subtask B:</b>	<b>\$134,825.80</b>
❖ <b>Field Services - Task Order 744DP-10 Subtask C:</b>	<b>\$7,534.70</b>
❖ <b>Project Management - Task Order 744DP-10 Subtask D:</b>	<b>\$4,155.20</b>
❖ <b>Compile Report - Task Order 744DP-11:</b>	<b>\$4,066.00</b>



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❖ AUTHORIZATION

These services will be performed according to the terms of Contract Number N15002i dated April 20, 2016 between NCDEQ and S&ME. S&ME will not begin site assessment services until receipt of a Task Authorization from the Unit which will authorize acceptance of this proposal.

S&ME appreciates the opportunity to submit this proposal and we look forward to working with you on this project. We will follow-up with you to review this proposal and to answer any questions that you may have.

Sincerely,

**S&ME, Inc.**

Gerald Paul  
Project Manager  
[jpaul@smeinc.com](mailto:jpaul@smeinc.com)

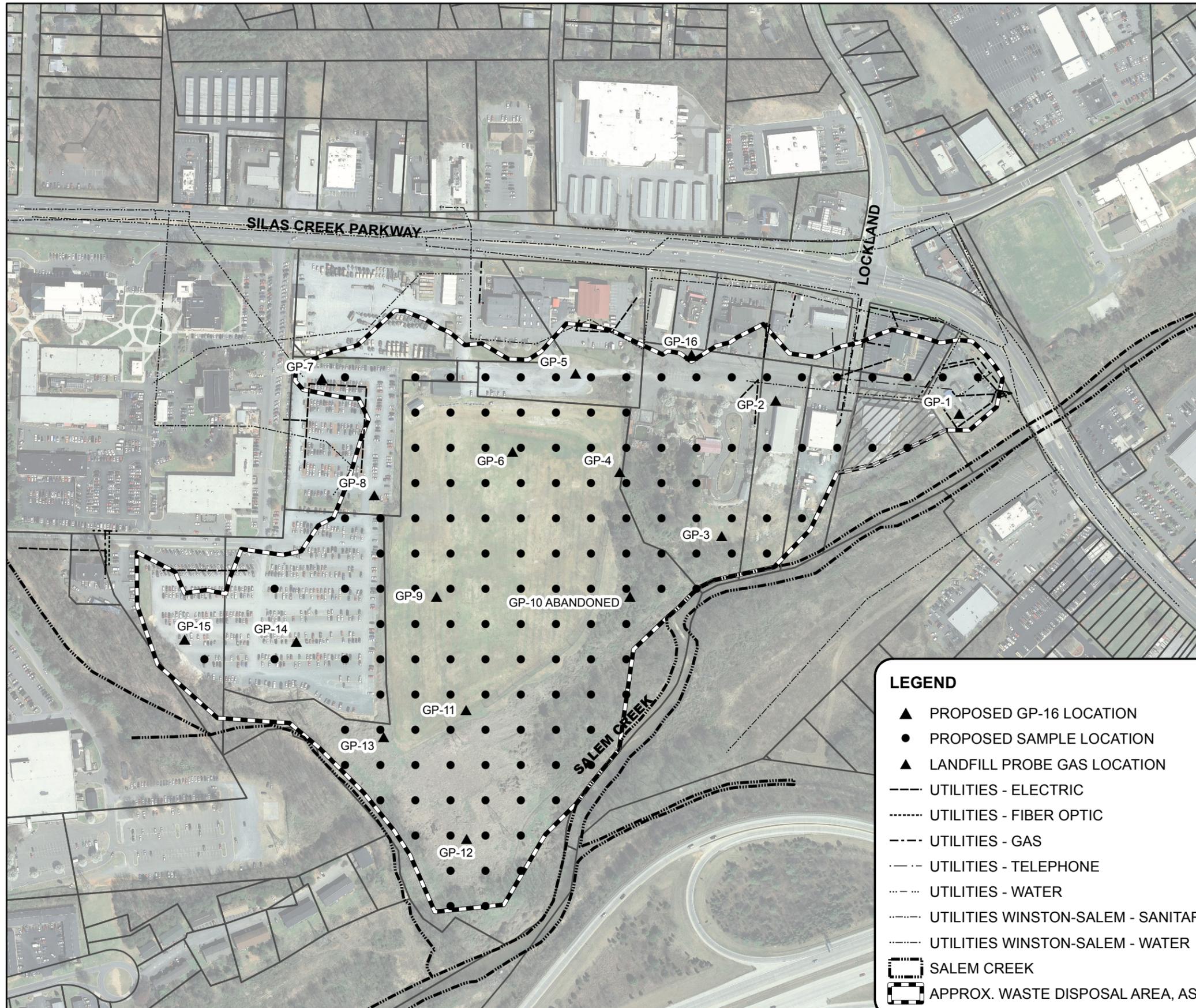
Thomas Raymond, PE, PMP  
Program Manager  
[traymond@smeinc.com](mailto:traymond@smeinc.com)

Attachments:

- Figure 1 – Proposed Sample Locations
- Proposed Budget Spreadsheets
- Drilling Subcontractor proposals
- Laboratory proposals
- Clearing Subcontractor Cost Estimate
- Utility Clearance Subcontractor Cost Estimate

## **Attachments**

## **Attachment I –Figure**

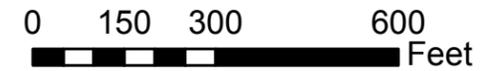


PARCEL SOURCE:  
CITY OF WINSTON SALEM GIS, DATED JAN. 2011

ROAD NAMES:  
CITY OF WINSTON SALEM GIS, DATED MARCH 2011

UTILITY DATA:  
WATER & SANITARY FEATURES, WINSTON-SALEM  
ELECTRIC, TELEPHONE, GAS & FIBER OPTIC,  
BATEMAN CIVIL SURVEY

ONE PARCEL (6824-66-4053) 1794 SILAS CREEK PKW  
WAS EXCLUDED FROM THE GEOPHYSICAL SURVEY  
AND WASTE DELINEATION BORINGS DUE TO LACK  
OF PERMISSION FROM THE PROPERTY OWNER.



**LEGEND**

- ▲ PROPOSED GP-16 LOCATION
- PROPOSED SAMPLE LOCATION
- ▲ LANDFILL PROBE GAS LOCATION
- UTILITIES - ELECTRIC
- ..... UTILITIES - FIBER OPTIC
- - - UTILITIES - GAS
- UTILITIES - TELEPHONE
- ..... UTILITIES - WATER
- ..... UTILITIES WINSTON-SALEM - SANITARY
- ..... UTILITIES WINSTON-SALEM - WATER
- ▭ SALEM CREEK
- ▭ APPROX. WASTE DISPOSAL AREA, AS DEFINED BY EM SURVEY AND SOIL BORINGS

DATE:	MAY 2016
SCALE:	1" = 300'
PROJECT NO.:	1054-11-1024
DRAWN BY:	BTR
CHECKED BY:	
DRAWING NUMBER:	B-2599

**S&ME**  
WWW.SMEINC.COM

NC ENG. LICENSE #0176  
3201 SPRING FOREST RD., RALEIGH, NC 27616

SITE MAP

CITY OF WINSTON SALEM - TASK ORDER 744DP-8  
WINSTON SALEM, NORTH CAROLINA

FIGURE NO.  
**1**