URBAN BACKGROUND STUDY
SAMPLING AND ANALYSIS PLAN
AND QUALITY ASSURANCE PROJECT PLAN

Revision 5

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY Region 4

Atlanta, Georgia

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1.0 INTRODUCTION

At the request of the U.S. Environmental Protection Agency (EPA) Region 4, the Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) has prepared this Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) describing activities to be conducted for the Urban Background Study. This project is a joint effort between EPA Region 4, EPA's Office of Research and Development (ORD), and states within EPA Region 4; this project is funded by an ORD Regional Applied Research Effort (RARE) grant.

Urban areas that have been heavily impacted by human activity for decades may contribute in ways unrelated to any specific spills or releases to an overall higher localized level of some contaminants. Soil samples collected in any large, long-established city may contain elevated levels of contaminants such as metals and polycyclic aromatic hydrocarbons (PAH), and their presence is commonly referred to as "urban background" or "anthropogenic background." Because these increased contaminant concentrations are the result of long-term, generalized urban activity and not necessarily due to specific site releases, it can be challenging to account for the contribution from urban background at sites where investigation, remediation, and risk management of contaminated media are occurring.

The primary purpose of this study is to collect data that will provide the necessary context for understanding background concentrations and distributions of urban contaminants in selected cities located in participating EPA Region 4 states. Another goal of this project is to develop a consistent and robust data collection and analysis process that can be replicated in other states, EPA regions, and tribal lands. Tetra Tech has been tasked with the following activities for this project: develop this SAP/QAPP; conduct soil sampling and sample management activities; and present the analytical data in a final report.

Section 2.0 of this report presents the site background information. Section 3.0 lists the project personnel and their roles. Section 4.0 lists the project field schedule dates. Section 5.0 presents information on the determination of sampling locations (Site Reconnaissance). Section 6.0 outlines the proposed field investigation procedures. Section 7.0 presents the data quality objectives (DQO) for the project. Section 8.0 describes the analytical methodology. Section 9.0 outlines how investigation-derived waste will be disposed. Section 10.0 briefly discusses the frequency and type of report submittals. Section 11.0 contains the references used to develop this SAP/QAPP.

Support actions by the state participants are presented in Appendix A. An EPA access letter template is include in Appendix B. Signed access letter summary is contained in Appendix C. City grid placement and sample location selection guidance can be found in Appendix D. Analytical reporting limits are presented in Appendix E. The soil sampling and equipment decontamination procedures are discussed in Appendices F and G. The soil sampling field form is shown in Appendix H. The Scribe database data elements for sampling locations are listed in Appendix I. Because the SAP covers the requirements of the QAPP, an abbreviated category 3 QAPP with cross references is provided in Appendix J. Appendix K presents the project health and safety plan.

2.0 SITE BACKGROUND

This project is a joint effort between EPA Region 4, EPA ORD, and participating Region 4 states and cities, and is funded by an ORD RARE grant. The primary goal of this Urban Background Study is to collect data to define "urban background" concentrations of select contaminants in surface soils for eleven cities in seven states within Region 4. The following cities have been identified by EPA's state partners for inclusion in this investigation however, are subject to change as the planning process continues:

- Jacksonville, Florida (885 square miles)
- Gainesville, Florida (63 square miles)
- Athens, Georgia (118 square miles)
- Brunswick, Georgia (25 square miles)
- Louisville, Kentucky (399 square miles)
- Lexington, Kentucky (286 square miles)
- Jackson, Mississippi (107 square miles)
- Raleigh, North Carolina (145 square miles)
- Columbia, South Carolina (135 square miles)
- Nashville, Tennessee (526 square miles)
- Memphis, Tennessee (324 square miles)

Conceptual Site Model

Metals and polycyclic aromatic hydrocarbons (PAH) in surface soil are the contaminants of interest (COI) for this study. It is anticipated that low concentrations of the COIs have been deposited via aerial deposition and surface runoff to surface soils over decades of urban land use, rather than point source releases from localized industrial activities and urban release events. EPA defines anthropogenic background as "natural and human-made substances present in the environment as a result of human activities (not specifically related to the CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act] release in question)" (EPA, 2002).

Aerial deposition and surface runoff are the assumed pathways by which the COIs have entered the environment. While long-term urban background deposition mechanisms may have resulted in the presence of COIs at considerable depths in some areas, this study will focus its efforts to the top two inches of the soil column. In terms of risk of human exposure to urban background COIs, this soil horizon is considered the most relevant for evaluating urban background concentrations for this study.

2.1 ENVIRONMENTAL SETTING AND SITE DESCRIPTION

Eleven cities in seven states within EPA Region 4 (listed in Section 2.0) are participating in this study. Due to the varying environments within each of the cities, Tetra Tech START will coordinate not only with EPA, but with city and state officials to determine the specific target sampling locations. Generally, a grid measuring 7 miles by 7 miles will be applied around the approximate center of each city. Each cell of the grid will measure 0.5-mile by 0.5-mile, resulting in a total of 196 cells. Samples for laboratory analysis will be collected from 50 randomly-selected cells within the grid. Final determination of target sample locations will be made by EPA, state, and/or city officials based on the grid pattern and the feasibility of sampling locations.

2.2 PREVIOUS INVESTIGATIONS

Previous investigations that are similar in nature or related to this Urban Background Study are discussed in the following paragraphs.

History and Evaluation of National-Scale Geochemical Data Sets for the United States (U.S. Geological Survey [USGS] [Boerngen and Shacklette, 1981; Shacklette and Boerngen, 1984])

From 1961 through 1975, the U.S. Geological Survey (USGS) made the first effort to produce a national-scale geochemical database for the contiguous U.S. During that time, soil samples were collected from a total of 1,323 sites, representing a density of approximately 1 site per 2,300 square miles. The USGS study evaluated soils by collecting samples from the top 5 centimeters (cm) (2 inches) and from soil horizons A, B, and C; the soil samples were subsequently analyzed for 20 metals (Boerngen and Shacklette, 1981; Shacklette and Boerngen, 1984). Soil horizons are layers in soil defined by physical, chemical, biological, or mineralogical properties which vary with depth. Sampling of Superfund sites does not typically involve defining soil horizons, and soil horizons can vary in depth. Sampling the top 5 cm of the soil column allows direct comparison of the soil data from this Urban Background Study with the USGS data set, and is consistent with the conceptual site model for the COIs.

Soil Contamination with PAHs in Poland – a Review (Wcislo, 1998)

This document published in 1998 provided a summary of data on PAH content in soils in Poland that were included in literature over the previous 20 years. This study included a review of existing data but did not include the collection of additional samples. Generally, the study found that soils in urban areas contained PAH concentrations that were approximately 10 times higher than those in rural areas of the country. The study also recommended continued research on PAH contamination in environmental media in order to better define exposure estimates for the general population and to examine the relationship between levels of PAHs in the environment and the subsequent development of health effects.

PAHs in Urban Soil: A Florida Risk Assessment Perspective (Teaf, 2008)

This document published in 2008 utilized three case studies from Florida to confirm the ubiquity of PAHs at low levels, and to demonstrate the need for more sophisticated and transparent treatment by regulatory agencies. The study included an evaluation of risk assessment activities and used benzo(a)pyrene-equivalents as a marker constituent (contaminant) for statistical analyses. The case studies indicated the presence of benzo(a)pyrene-equivalent concentrations up to 5 parts per million, which exceeds the default cleanup level established by the Florida Department of Environmental Protection. The study also states that "there is an ongoing need to consider the development of a default urban background level for PAHs in areas characterized by busy roadways or multiple industrial facilities, in much the same way that geological or anthropogenic background levels are established for some inorganics."

Operational Street Pollution Model (OSPM) (Berkowicz, 2000)

The OSPM was developed by the Department of Environmental Science at Aarhus University in Denmark. The OSPM is used to calculate the concentrations of exhaust gases in urban "street canyons," and uses a combination of a plume model for the direct contribution and a box model for the recirculating portion of pollutants in the street. The OSPM assumes that most urban background is derived from auto emissions in these "street canyons."

2.3 POTENTIAL SOURCES OF CONTAMINATION

Metals and PAHs have been identified in various anthropogenic sources involved with industrial and manufacturing uses and personal, domestic lifestyle uses throughout many years (over 150 years) of modern human activity.

Heavy metals have been used in many forms of industrial/manufacturing processes and for everyday consumer applications. For example, lead was present in "leaded" gasoline until it was phased out in the 1970s. Exhaust from cars contained particulates including lead that deposited near roadways. Additionally, lead-based paint may have released lead into soils near houses, bridges, and other structures. Arsenic compounds have been widely used in pesticides and wood treating applications. Arsenic and various metals can also be released from coal burning and other metal refinery operations.

PAHs are composed of cyclic (fused-ring) hydrocarbon compounds that primarily arise from the incomplete combustion of organic materials such as wood, coal, oil, gasoline, and garbage, as well as leaching from coal tar products, such as asphalt and roofing shingles. PAHs can also be produced from natural sources such as forest fires and volcanic eruptions. However, a large percentage of PAHs released into the environment are from anthropogenic sources, such as the operation of motor vehicles; burning coal, wood, and trash in residential furnaces; thermoelectric power generation; and coking operations. Burning of fossil fuels results in atmospheric

emissions of PAHs, typically in the vapor phase or attached to particulate matter. Because of the nature of the release and mode of transport, PAHs are capable of being transported long distances from their source before deposition occurs (Kay et al. 2008).

There are more than 100 PAH compounds; however, the PAH compounds of interest for most environmental investigations, including this Urban Background Study, are 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. These 17 PAHs are of interest because they tend to be the most toxic and most widespread of the PAH compounds in environmental media (air, soil, sediment, and water) (Kay et al. 2008).

3.0 PROJECT PERSONNEL

Anticipated project personnel and their responsibilities are presented in Table 1 below. The distribution list for this plan will also consist of the project personnel presented below. The project personnel can be tied to the organization chart by the assigned title in parentheses next to the name. The organizational chart is presented after Table 1 and depicts the lines of authority and the independence of the quality assurance personnel, for the project.

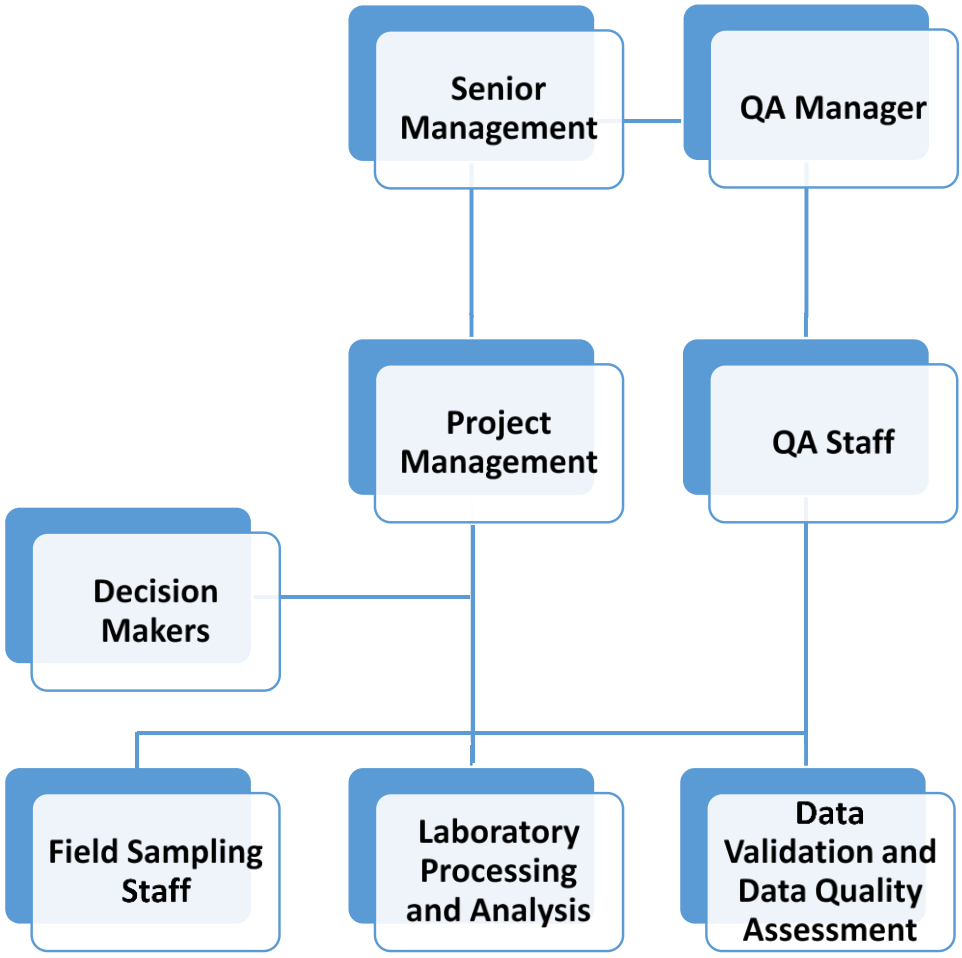
TABLE 1
PROJECT PERSONNEL AND RESPONSIBILITIES

Name (Org Chart Assignment)	Organization	Responsibilities	Telephone Number	Email Address
Brian Schumacher (Sr. Mgt.)	EPA ORD-NERL-ESD-ECB	Project Manager responsible for scope, budget, and technical approach	(702) 798-2242	Schumacher.brian@Epa.gov
Felicia Barnett (Sr. Mgt.)	EPA Region 4 (R4) ORD	Liaison between ORD and EPA R4 Technical Team	(404) 562-8659	Barnett.felicia@Epa.gov
Robert Ford (QA Staff)	EPA ORD-NRMRL-LRPCD-SSMB	Technical review	(513) 569-7501	Ford.robert@Epa.gov
Glenn Adams (Prj. Mgr.)	EPA R4 Scientific Support Section (SSS) Chief	EPA R4 Technical Team supporting technical approach	(404) 562-8771	Adams.glenn@Epa.gov
Barbara Alfano (Prj. Mgr.)	EPA R4 Brownfields Coordinator	EPA R4 Technical Team supporting technical approach and project coordination	(404) 562-8923	Alfano.barbara@Epa.gov
Tim Frederick (Prj. Mgr.)	EPA R4 SSS	EPA R4 Technical Team supporting technical approach	(404) 562-8598	Frederick.tim@Epa.gov
Nardina Turner (QA Mgr. / Data Validation)	EPA R4 Superfund Grants and Contracts Section	Sample Control Coordinator	(404) 562-8650	Turner.nardina@Epa.gov
Laura Ackerman (Lab Processing & Analysis)	EPA R4 SESD Superfund and Air Section Chief	SESD Technical Team supporting technical approach	(706) 355-8776	Ackerman.Laura@epa.gov
Didi Fung (Field Sampling Staff)	Tetra Tech START in EPA R4	START Technical Team supporting technical approach	(678) 773-5660	dd.fung@tetratech.com
Brian Dougherty (Decision Maker)	State of Florida Department of Environmental Protection	Florida Lead supporting technical approach	(850) 245-7503	Brian.Dougherty@dep.state.fl.us
Andy Taft (Decision Maker)	State of Georgia Department of Natural Resources	Georgia Lead supporting technical approach	(404) 657-8675	andy.taft@dnr.state.ga.us
Sheri Adkins, P.G. (Decision Maker)	State of Kentucky Superfund Branch	Kentucky Lead supporting technical approach	(502) 564-6716, ext. 4734	Sheri.Adkins@ky.gov

TABLE 1
PROJECT PERSONNEL AND RESPONSIBILITIES

Name (Org Chart Assignment)	Organization	Responsibilities	Telephone Number	Email Address
Robert Huckaby, P.E. (Decision Maker)	State of Mississippi Department of Environmental Quality (DEQ) Groundwater Assessment and Remediation Division	Mississippi Lead supporting technical approach	(601) 961-5360	robert.huckaby@deq.state.ms.us
James Bateson (Decision Maker)	State of North Carolina Superfund Section Chief	North Carolina Lead supporting technical approach	(919) 707-8329	james.bateson@ncdenr.gov
Ken Taylor (Decision Maker)	State of South Carolina Department of Health and Environmental Control	South Carolina Lead supporting technical approach	(803) 898-0835	taylorgk@dhec.sc.gov
Charles Jobe (Decision Maker)	State of Tennessee	Tennessee Lead supporting technical approach	(615) 532-0463	Charles.Jobe@Tn.gov

FIGURE 1
ORGANIZATIONAL CHART



When field teams encounter situations that may need them to deviate from the proposed soil sample locations, the field event leader should contact the assigned State technical lead to seek approval for a modification, as outlined in Table 2 below. All modifications will be documented.

TABLE 2
APPROVAL STEPS FOR CHANGING SAMPLE LOCATIONS

Approval Step	Responsible Party	Assigned Personnel	Responsibility and Authority
1	Field Event Leader	Tetra Tech Personnel	Executes sample collection at the proposed locations and contacts the State technical lead when variations from pre-selected target sampling areas may be needed.
2	State Technical Lead	See Table 1 for assigned leads	Consults with the assigned EPA technical team members and approves modifications to sampling locations.
3	EPA Technical Team	Barbara Alfano and Tim Frederick	Consults with the State technical lead about modifications to sampling locations.

During a sampling event in a selected city, field support staff and sampling teams will consist of the following personnel:

- Field Event Leader/Sample Processor - Tetra Tech
- Health and Safety Officer - Tetra Tech
- Sampling Team Leader - Tetra Tech (3 per city recommended)
- Sampling Team Member - State (6 per city recommended)

An ideal sampling team is made up of one team leader and two team members. Sampling team members must have participated in several surface soil sampling projects in addition to completing a full review of the site-specific SAP/QAPP before supporting the Urban Background Study. Special attention should be given to techniques used to minimize or eliminate cross-contamination between sampling locations. Other specific training requirements for personnel will be addressed in the health and safety plan (HASP).

4.0 PROJECT SCHEDULE

Prior to each sampling event, analytical request forms will be submitted to EPA for scheduling the laboratory analyses. The first sampling effort was conducted in September 2015. Subsequent events are scheduled based on the laboratory schedule, as well as the availability of sampling personnel and access agreements for the sampling locations. Table 3 below provides a brief summary of the most recent status of the schedule for field sampling events.

TABLE 3
SCHEDULE OF FIELD SAMPLING DATES

Location	Start Date	End Date	State Support
Louisville, KY	9/28/2015	9/29/2015	Yes (6-personnel)
Lexington, KY	11/4/2015	11/6/2015	Yes (6-personnel)
Raleigh, NC	11/17/2015	11/19/2015	Yes (6-personnel)
Memphis, TN	TBD	TBD	Yes
Columbia, SC	TBD	TBD	Yes
Brunswick, GA	TBD	TBD	Yes
Jackson, MS	TBD	TBD	Yes
Tallahassee, FL	TBD	TBD	Yes
Gainesville, FL	TBD	TBD	Yes
Jacksonville, FL	On 12/2/2015, the state requested that Tallahassee, FL act as a replacement city.		
Nashville, TN	On 11/12/2015, the State decided not to pursue sampling in this city.		
Athens, GA	On 9/10/2015, property access was not signed, therefore the city could not participate in this background study.		

5.0 SITE RECONNAISSANCE

EPA will provide each state with its grid in a format that is compatible with Google Earth Pro, such as ArcGIS shape files or Google Earth *.kmz files. A grid measuring 7 miles by 7 miles will be applied by the state official around the approximate center of each city. Each cell of the grid will measure 0.5-mile by 0.5-mile, resulting in a total of 196 cells. Samples for laboratory analyses will be collected from 50 randomly-selected cells within the grid. Appendix D contains exhibits depicting a typical city grid, an individual cell that makes up the grid, and the method used to generate the randomly-selected cells for each state. The target sample location will be the center of each of the randomly-selected cells. The state and the sampling team, in consultation with EPA Region 4, will review each of the target sampling areas prior to field activities to determine their appropriateness based on the criteria described in greater detail in Section 6.0. If the target sample area is not appropriate for sampling based on project goals, then the sampling location will be moved to the closest appropriate location within the sample cell. If no locations within the sample cell meet the specific sampling criteria, the next unused, randomly-selected cell in the series will be used as a replacement.

It is understood and anticipated that unexpected issues may arise in the field. In the event that a target sampling location is identified as inappropriate for sampling based on field inspection, field staff will contact the State Lead listed in Section 3.0 to confirm relocation of the sample location. The State Lead may need to consult with designated personnel on the EPA technical team (see Section 3.0) or city officials to determine an alternate location. All variations from pre-selected target sampling areas will be documented.

State participation is critical to ensuring the Urban Background Study is successful from a collaborative technical viewpoint. The kinds of technical and logistical support states may provide are listed in Appendix A to help states and other participating organizations plan for their level of participation.

6.0 PROPOSED FIELD INVESTIGATION

The sampling plan for this project will include the collection of 50 surface soil samples (plus quality control [QC] samples) within each of the eleven cities participating in the Urban Background Study. State officials will review each of the target sampling location areas to determine their appropriateness. The following criteria will be used to assist in identifying appropriate target sampling locations:

- Representative of the larger urban setting;
- Appears to be undisturbed;
- Public areas, such as along right-of-ways (i.e. on the outer edges of roadways and not the median), within city property (i.e. a historic park area), etc.;
- Locations that include a broad demographic spectrum of wealth, race, ethnicity relative to Environmental Justice (EJ) communities (sampling locations will include both EJ areas and more affluent urban areas and may be chosen based on EJ Screen, census, and real estate surveys).

The following areas will not be sampled:

- Private/residential yards;
- Industrial properties or properties with likely significant pollutant influence from nearby industries;
- Areas of staining or other obvious impact (determined in the field);
- Areas that have been recently filled with dirt/soil (determined in the field);
- Areas of relatively recent (within the last twenty years; exceptions should be documented in the field and discussed in the project reports) development/redevelopment that involved any earth moving or heavy equipment (based on Google Earth images, real estate surveys, and possibly also determined in the field);
- Low-lying areas where solids from surface runoff could accumulate that may be routinely subjected to flooding or inundation, such as wetlands (based on real estate census and property/real estate surveys, or determined in the field);
- Paved or built upon areas (determined by aerial maps or in the field);
- Discharge points and overflow points for the city's storm water infrastructure (based on city/county storm water distribution maps, information from local sewer districts, or in the field);
- Areas immediately adjacent to asphalt-paved areas (samples should be collected at least one foot away from paved areas that could be affected by the material itself or by storm-water runoff from the material) (determined using aerial maps or in the field);

6.1 PROPERTY ACCESS

Private property will be avoided; therefore, private access agreements will not be necessary. Access agreements with each of the eleven cities will be needed in order to collect samples from the public areas. It is assumed that EPA Region 4 and the states will coordinate, as necessary, with officials from the selected cities to obtain the access agreements needed to perform the sampling activities proposed in this SAP/QAPP. States will make the initial contact with the city or county to discuss EPA's need for access. States will follow by sending an access agreement form to the city or county to obtain a fully executed agreement that will be held by the State, with a copy sent to EPA. Region 4 EPA's technical lead, Barbara Alfano will provide the field event leader with copies of the access letter prior to each sampling event. Copies of the signed access letters and a summary of granted access for each city can also be found in Appendix C. Field teams will be provided data collection devices showing parcel boundaries to ensure samples are collected in properties that have granted access.

6.2 SURFACE SOIL SAMPLING METHODS

At each target sampling location, grab surface soil samples will be collected from the upper 2 inches of the soil (0- to 2-inches interval starting below the root zone [if present] and after removal of organic layer [leaves, grass, etc.]) in the undisturbed soil horizon using a coring device. Soil sampling activities will be conducted in accordance with the EPA Region 4 Science and Ecosystem Support Division (SESD) Field Branches Quality System and Technical Procedures (FBQSTP) for *Soil Sampling* (SESDPROC-300-R3), August 21, 2014 or as adapted for this study (see Appendix F). For sampling areas supporting plant growth, the initial sample core will be collected to a depth of 4-inches to allow for removal of turf plug and root zone. If coring device refusal occurs before achieving a 4-inch depth, then the sampler should move the sampling location, within a 2-foot diameter zone around the initial sample core, until the required penetration depth can be achieved. The targeted 2-inch soil depth interval will be placed in a disposable aluminum pan. The coring process will be repeated at each location until adequate soil mass is accumulated to support both analysis procedures (Appendix F, Section 3.2). Field personnel will homogenize the soil sample by stirring the soil using a decontaminated stainless steel spoon. The homogenized soil will be placed in pre-labeled, certified clean sample containers for eight Resource Conservation and Recovery Act (RCRA) metals and PAH analyses. The samples designated for metals analysis will be shipped to Las Vegas where they will be dried, sieved, and prepared; once prepared, the samples will be delivered to the EPA Region 4 SESD laboratory in Athens, Georgia for eight RCRA metals analysis. The samples designated for PAH analysis will be sent to an EPA Contract Laboratory Program (CLP) laboratory. Additional details including a list of field sampling supplies are discussed in Appendix F, Soil Sampling Procedures. Decontamination procedures are discusses Appendix G. Table 4 summarizes the sample container requirements, volumes, preservation techniques, and holding times.

TABLE 4
SAMPLE VOLUMES, CONTAINERS, PRESERVATION, AND HOLD TIMES

Analyte	Sample Type	Matrix	Sample Volume and Container Type	Preservation Technique	Holding times	
					Extraction	Analysis
PAHs	Field Sample[a]	Soil	One 4-oz amber glass jar (Teflon™-lined cap)	Store at 4°C	14 days	40 days
PAHs	Equipment Blank	Aqueous	One 1-liter amber glass jar	Store at 4°C	7 days	40 days
PAHs	Field Blank[b]	Aqueous	One 1-liter amber glass jar	Store at 4°C	7 days	40 days
8 RCRA Metals	Field Sample	Soil	One 4-oz Whirl-Pak bag	None [c]	NA	28 days for mercury and 6 months for all other metals
8 RCRA Metals	Equipment Blank	Aqueous	One 1-liter HDPE container	Nitric acid (HNO_3) to pH<2; Store at 4 °C	NA	28 days for mercury and 6 months for all other metals
8 RCRA Metals	Field Blank[b]	Aqueous	One 1-liter HDPE container	Nitric acid (HNO_3) to pH<2; Store at 4 °C	NA	28 days for mercury and 6 months for all other metals

Notes:
[a] At each sample location designated for matrix spike/matrix spike duplicate (MS/MSD) analyses, one additional 4-ounce glass jar should be collected to provide sufficient volume for PAH analyses.
[b] Collected for each batch of ASTM Type II water. See Section 2.2 in Appendix F for additional details.
[c] Soil samples for Metals analysis will not be iced for transport, since they will require being at room temperature for specialized processing discussed in Appendix F, Section 3.5.
°C Degrees Celsius
HDPE High-density polyethylene
NA Not applicable
oz Ounce
PAH Polycyclic aromatic hydrocarbons
RCRA The RCRA eight metals are: arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury

Each sample will be identified using an alphanumeric system that identifies the sample type, sampling location, grid cell location, and sample date. Each sample collected will be identified with a three letter abbreviation of the city, followed by the designated cell number (3-digit). The Station identification (ID) will be this portion of the identifier. Next, a media code of "SF" will be used, corresponding to the surface soil sample collected. Finally, a six-digit number corresponding to the year (2-digit), month (2-digit), and day (2-digit) will be appended to finish out the sample ID. For example:

- Station ID 'ATH056' will apply to a sample collected in Athens, Georgia from the 56th cell of the grid.
- Sample ID 'ATH056-SF-150920' will apply to a surface soil sample collected in Athens, Georgia, from the 56th cell of the grid, and collected on September 20, 2015.

The sample ID may be followed by a three-character alphabetic identifier (DUP) to indicate a duplicate sample. Samples designated for matrix spike/matrix spike duplicate (MS/MSD) analysis will be identified on the field sampling sheet and clearly designated on the chain-of-custody (COC) form. During sampling activities, the following information will be documented using e-tablets for each sampling location (an example of the information that will be recorded in the electronic field form is presented in Appendix H). Hard copy, bound field forms will also be provided for use if an e-tablet is unable to be used.

- City and state of sampling location;
- Sample ID;
- Sample collection date and time;
- Sampler's name(s);
- Global positioning system (GPS) coordinates for the sampling location will be collected using the Bad Elf GPS in accordance with the EPA Region 4 SESD FBQSTP for *Global Positioning System* (SESDPROC-110-R4), June 23, 2015;
- Soil description, including the soil texture (sand, silt, clay), color descriptions, and moisture;
- Detailed description of the soil sampling location, including land use of the surrounding area (e.g. church, residential, commercial, industrial, municipal, roadside, school/university, public recreation); relationship of sampling location to any buildings or landmarks; surficial condition (on grassy area, next to active/busy roadway, etc.); location relative to major manufacturing areas with notable air emissions, especially those areas upwind of the sampling location relative to the prevailing winds;
- Digital photograph number(s); e-tablet software used automatically links photo numbers to a sampling location. If software used is not capable of this function, each sampling location will be photographed with a white board with the sample ID for reference. As much as practicable, field personnel will include in the photographs the sample location in relation to permanent landmarks in the event that the sampling location will need to be relocated for accessed in the future.

The appropriate number of QC samples will be collected during each sampling event (i.e. from each city), as shown in Table 5 below.

TABLE 5
NUMBER OF FIELD AND QUALITY CONTROL SAMPLES

Sample Type	Samples per City	Total Project Samples	Field Duplicate Samples per City [a]	Total Project Field Duplicate Samples	MS/MSD Assigned per City [a]	Total Project MS/MSD Assigned	Total Rinsate and Field Blank Samples (estimate)	Total Number of Samples to be analyzed
Soil (PAHs)	50	550	3	33				583
Soil (8 RCRA Metals)	50	550	3	33				583
Soil MS/MSD (PAHs)	Three samples will be assigned by the field event leader as MS/MSD and identified on the COC. An additional 4-ounce glass jar should be collected to provide sufficient volume for analyses.				3	33		
Soil MS/MSD (8 RCRA Metals)	Three samples will be assigned by the EPA lab in Athens, GA as MS/MSD. No additional material is needed to provide sufficient volume for analyses.				3	33		
Aqueous (PAHs)	See Section 2.2 in Appendix F for additional details.						47	47
Aqueous (8 RCRA Metals)							58	58

Notes:

Total sample counts are based on sampling eleven cities.

[a] Field duplicate and MS/MSD samples will be collected at a rate of one per 20 samples collected during each event. Field duplicates are separate from original samples while MS/MSD are assigned to original samples.

MS/MSD Matrix spike/matrix spike duplicate (for each sample location designated for MS/MSD analyses, one additional 4-ounce glass jar should be collected to provide sufficient volume for PAH analyses, while no additional material is need for 8 RCRA metals analysis)

Wherever feasible, dedicated sampling equipment will be used to minimize the need for field decontamination. In instances where dedicated sampling equipment is not used, equipment will be decontaminated prior to reuse in accordance with the EPA Region 4 SESD FBQSTP for *Field Equipment Cleaning and Decontamination,* (SESDPROC-205-R3), December 18, 2015; equipment rinsate blank samples will be collected to demonstrate proper decontamination techniques. All samples will be placed in a zip plastic bag and in a cooler on ice (as appropriate) until the samples are processed using EPA's Scribe software program for sample management. Sample handling procedures will be conducted in accordance with the EPA Region 4 SESD FBQSTP for *Packing, Marking, Labeling, and Shipping of Environmental and Waste Samples* (SESDPROC-209-R3), February 4, 2015; and the EPA Region 4 SESD FBQSTP for *Sample and Evidence Management* (SESDPROC-005-R2), January 29, 2013.

Samples collected for PAH analysis will be shipped overnight, under proper COC procedures, directly to an EPA CLP laboratory. Laboratory assignments will be reported in the trip reports generated for each city. Samples collected for metals analysis will be shipped to the EPA ORD-Las Vegas (ORD-LV) laboratory (944 East Harmon Avenue, Las Vegas, NV, 89119) for processing. The ORD-LV laboratory will dry, disaggregate, sieve to 2-millimeters (mm [10-mesh] sieve), re-containerize, and ship the samples to the EPA Region 4 SESD laboratory (980 College Station Road, Athens, GA, 30605) for analyses. The necessary labels, COCs, and shipping supplies will be provided to ORD-LV personnel by the sampling organization.

The EPA CLP laboratory will perform the PAH extraction and analysis in accordance with the EPA CLP Statement of Work (SOW) for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.2, August 2014 or SOM02.3, September 2015; PAH concentrations will be reported on a dry-weight basis. The EPA Region 4 SESD laboratory will perform RCRA eight metals analysis using the EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) Method 6010C (Inductively Coupled Plasma – Atomic Emission Spectrometry [ICP-AES]) for screening and EPA Method 200.8 (ICP-Mass Spectrometry [MS]) for confirmation; metals concentrations will be reported on a dry-weight basis.

7.0 DATA QUALITY OBJECTIVES

DQOs were established for this Urban Background Study to define the quantity and quality of the data to be collected to support the objectives of the sampling event. DQOs were developed using the seven-step process outlined in the following guidance documents: "EPA Requirements for Quality Assurance Project Plans," EPA QA/R-5, March 2001; "Guidance for Quality Assurance Project Plans," EPA QA/G-5, December 2002; and "Guidance on Systematic Planning Using the Data Quality Objectives Process," EPA QA/G-4, February 2006.

Step 1: State the Problem

Stakeholders: EPA Region 4, EPA ORD, and participating states and cities

Statement of the Problem: Eight RCRA metals and PAHs in surface soil are the COIs for this study. It is anticipated that low concentrations of the COIs have been widely deposited in urban areas via aerial deposition and surface runoff to surface soils over decades of urban land use, beyond the more localized impacts from point source releases from industrial activities and accidents. EPA defines anthropogenic background as "natural and human-made substances present in the environment as a result of human activities (not specifically related to the CERCLA release in question)" (EPA, 2002). Aerial deposition and surface runoff are the assumed pathways by which the COIs have entered the environment. While long-term urban background deposition mechanisms may have resulted in the presence of COIs at considerable depths in some areas, this study will focus its efforts to the top two inches of the soil column. In terms of risk of human exposure to urban background COIs, this soil horizon is considered the most relevant for evaluating urban background concentrations for this study. The Stakeholders of this Urban Background Study have proposed that soil sampling be conducted at eleven cities in seven participating states within EPA Region 4.

Step 2: Identify the Goals of the Study

Study Questions: What are the typical concentrations of the eight RCRA metals and PAHs in surface soil (0 to 2 inches below ground surface [bgs]) in cities (urban environments) within EPA Region 4?

Decision Statements: Collect numerous grab surface soil samples from locations within participating cities in the EPA Region 4 states and conduct laboratory analyses in accordance with this SAP/QAPP. Evaluate the analytical results to assess background concentrations for the COIs.

Step 3: Identify Information Inputs

Inputs: Analytical results for grab surface soil samples collected from participating cities in the EPA Region 4 states.

Step 4: Define Study Boundaries

Spatial Boundary: This Urban Background Study includes soil sampling activities conducted in eleven cities in seven participating states of EPA Region 4, which were identified by the Stakeholders.

Temporal Boundaries: The project schedule will be determined as the planning process continues.

Step 5: Develop the Analytical Approach

Analytical Methods: Laboratory analysis for surface soil samples will include (see Appendix E for reporting limits):

- Eight RCRA metals by SW-846 Method 6010C (ICP-AES) for screening and EPA Method 200.8 (ICP-MS) for confirmation. EPA Region 4 SESD regional reporting levels for arsenic (0.2 milligrams per kilogram [mg/kg]), barium (0.5 mg/kg), cadmium (0.1 mg/kg), chromium (0.5 mg/kg), lead (0.2 mg/kg), selenium (0.4 mg/kg), silver (0.5 mg/kg), and mercury (0.04 mg/kg) will be used.
- PAH extraction and analysis in accordance with the CLP SOW for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.2, August 2014 or SOM02.3, September 2015. The CLP contract-required quantitation limit (CRQL) for PAHs (170 micrograms per kilogram [ug/kg]) will be used, with a modified analysis used to lower the fluoranthene CRQL from 330 ug/kg to 170 ug/kg.

Comparison Criteria: No comparison criteria are proposed.

Decision Rules: Decisions made regarding the results will be determined by the Stakeholders.

Step 6: Specify the Performance or Acceptance Criteria

Because decisions made regarding the study's result will be determined by the Stakeholders, it is difficult to set overarching performance and acceptance criteria for the data collected during this study. It can be stated that, among the sources of error (including statistical sampling error and physical sampling error) contributing to the total error for this study and influencing decision-making, the larger source of error in the data will be from statistical sampling error[1]. The sampling design for this study is presented in this SAP and further detailed in Appendices D and J. This design, which has a direct influence on statistical sampling error, involves collecting a limited number of grab samples from randomly chosen locations in each city, from the top 2-inches of the soil horizon. Each Stakeholder may want to define spatial decision units (DU; as defined by the Interstate Technology Regulatory Council or IRTC) to minimize systematic (or, biased) statistical sampling error when using the study's results for specific applications.

Even though statistical sampling error is generally much larger than physical sampling error[2], this study will still take steps to minimize physical sampling error. Specific, well-documented procedures will be followed throughout this

[1] See Chapter 6 in "Guidance on Systematic Planning Using the Data Quality Objectives Process," EPA QA/G-4, EPA/240/B-06/001, February 2006.
[2] See above.

study to ensure that physical sample collection, sample handling, and sample processing and analysis will be performed consistently, so that sample contamination is minimized and laboratory analytical results achieve the desired sensitivity, accuracy, and precision. Specific sampling equipment and procedures will be used during sample collection, handling, and subsampling (the latter performed in the EPA Las Vegas laboratory to obtain dried, sieved, and subsampled aliquots for metals analysis) to preserve the representativeness of each sample relative to the environment it came from. These steps are discussed in Appendices F and G. *A representative sample contains a subset of all the contaminants of a population in exactly the same proportion as they are in the target population. Contaminant concentration in a representative sample provides an accurate and precise estimate of the true contaminant concentration in the target population. The population is the "whole" from which samples are taken to measure properties of interest*[3].

If the data is used for producing conclusions not directly resulting in decision making[4], statistical metrics will be evaluated such as the mean or median value, the upper confidence limit (UCL), or box-and-whisker plots to determine the distribution of results and precision. Acceptable criteria will depend on each Stakeholder and, depending on whether or not the data meet those criteria, may point to the need for additional sampling.

Step 7: Develop the Plan for Obtaining Data

Optimized Design: A total of 550 grab surface soil samples (0 to 2 inches bgs) will be collected during this Urban Background Study, including 50 samples collected from each of the eleven cities participating in the study. In addition, the appropriate number of QC samples will be collected during each sampling event, including field duplicate samples, MS/MSD samples, and field and rinsate blank samples, as appropriate. Samples will be submitted for laboratory analyses for eight RCRA metals (Regional Laboratory in Athens, Georgia) and PAHs (EPA CLP laboratory, to be determined).

[3] See "Incremental Sampling Methodology," Interstate Technology Regulatory Council, February 2012. On the web at: http://itrcweb.org/ism-1/.
[4] See Chapter 6 (Step 6B) in "Guidance on Systematic Planning Using the Data Quality Objectives Process," EPA QA/G-4, EPA/240/B-06/001, February 2006.

8.0 ANALYTICAL METHODOLOGY

All surface soil samples to be collected during this Urban Background Study will be submitted for analysis to either an EPA CLP laboratory or the EPA Region 4 SESD laboratory in Athens, Georgia. The analytical parameters for the soil samples are described below:

- The EPA Region 4 SESD laboratory will perform RCRA eight metals analysis using SW-846 Method 6010C (ICP-AES) for screening and EPA Method 200.8 (ICP-MS) for confirmation.
- The EPA CLP laboratory will perform the PAH extraction and analysis in accordance with the CLP SOW for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.2, August 2014 or SOM02.3, September 2015.

The eight RCRA metals data will be reviewed by the EPA Region 4 SESD Analytical Support Branch (ASB) in accordance with the Laboratory Operations and Quality Assurance Manual (LOQAM) (EPA Region 4 SESD ASB, 2015), which is available at: http://www.epa.gov/region4/sesd/asbsop/asb-loqam.pdf.

PAH data will be reviewed by the EPA Region 4 SESD Office of Quality Assurance (OQA), with technical support from the Environmental Services Assistance Team (ESAT) contractor, in accordance with the Data Validation Standard Operating Procedures for Organic Analysis (EPA Region 4 SESD, 2008), which is available at http://www.epa.gov/quality/data-validation-standard-operating-procedures-organic-analysis.

After the data has been reviewed, a written report and the electronic data deliverables for each analytical data package will be reported automatically from Element to the START Technical Team, the EPA Region 4 Technical Team Project Leader, and the Sample Control Coordinator. The electronic data deliverables will also be reported automatically from Element for upload to the EPA Region 4 Data Archival and ReTrieval (DART) database. The START Technical Team will export the Location EDD from Scribe, sign it in EQuIS Data Processor, and submit it to R4DART@epa.gov. The soil depths required for the analytical data upload will be sent by the START Technical Team to R4DART@epa.gov using the COC.xml export from Scribe. If this has not been done prior to analytical data reporting, the soil depths will be entered instead by edit of the DART-rejected analytical EDD. Appendix I provides a complete list of the data elements that will be entered into Scribe.

9.0 DISPOSAL OF INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) will only consist of disposable nitrile gloves, aluminum foil, and aluminum pans. These items are primarily used for sample collection, to prevent cross-contamination, and to provide personnel protection and sanitary conditions during sampling. Because the intention will be to collect soil samples from background areas with little expected contamination, disposable IDW can be considered nonhazardous. All IDW will be bagged and deposited in an industrial waste container in accordance with the EPA Region 4 SESD FBQSTP for *Management of Investigation Derived Waste* (SESDPROC-202-R3), July 3, 2014.

10.0 REPORTING

Upon completion of each city's sampling event, a brief trip report (i.e. 2 pages with field notes, laboratory assignments, and laboratory data package) will be prepared summarizing the field activities performed, including issues encountered, and presenting the validated analytical results. The outline and formatting for these reports will be determined as the planning process continues.

Once the field activities are completed in all the states, an all-city comprehensive report will be prepared to compile the analytical results and findings of the entire study. The outline and formatting for this report will be determined as the planning process continues.

A comprehensive database containing the analytical results, field observations, and sample locations will be maintained and stored in the project Scribe analytical result database and online GeoPlatform data mapping tool. The Scribe database containing the validated results has been published to Scribe.net; the results can be accessed by subscribing to the database using Scribe software (subscription ID 'R04 Urban Background Study' and password 'proj2804'). Information available on the GeoPlatform can be found at: http://epa.maps.arcgis.com/apps/dashboard/index.html#/b487c9cfd71544a78a3b20abc7e6a484.

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APPENDIX A

POTENTIAL STATE ACTIONS TO SUPPORT THE URBAN BACKGROUND STUDY

1) Review SAP/QAPP to ensure the sampling approach is appropriate and meets state standard operating procedures.
2) Propose three cities where sampling events could be conducted, ranked from highest priority to lowest.
3) Make the initial contact with each chosen city's and county's representatives to discuss EPA's request for property access.
4) Select sampling locations using the provided Google Earth file to evaluate their appropriateness based upon the criteria described in Section 6.0 of this SAP/QAPP.
5) If possible, perform reconnaissance at each proposed sampling location prior to field activities, to confirm their appropriateness based upon the criteria described in Section 6.0 of this SAP/QAPP. Collect GPS coordinates, pictures, and location descriptions (e.g. landmarks) that will help sampling teams accurately locate each chosen sampling location. Placing a stake to mark the location prior to the sampling event is also preferred.
6) Provide parcel data to EPA for integration into the electronic field forms to support field team property navigation.
7) Provide two to six personnel to serve as members of each city's sampling teams (two or three per city) to support collecting soil samples. Please note:

    a. States will support choosing alternative sample locations during each sampling event, as needed, based on field conditions encountered.
    b. States will not be required to provide any field equipment (sampling and personal protective equipment).
    c. States will support field sample collection, and if interested, data collection and photo documentation.

PARTICIPATING STATES	PRIMARY CITIES	BACKUP CITIES
Georgia	1) ~~Athens,~~ 2) Brunswick	3) Augusta
South Carolina	1) Columbia	2) Charleston, 3) Greenville
Kentucky	1) Louisville, 2) Lexington	3) Paducah
Tennessee	1) Memphis, 2) ~~Nashville~~	3) Knoxville
North Carolina	1) Raleigh	2) Charlotte, 3) Winston-Salem
Florida	1) Gainesville, 2) ~~Jacksonville~~ Tallahassee	3) West Palm Beach
Mississippi	1) Jackson	

Notes:
City names crossed through represent a record of State changes from the original list of primary and backup cities.

APPENDIX B

ACCESS LETTER TEMPLATE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

August 26, 2015

Sent via Email

Jean Spratlin
Clerk of Commission
Athens-Clarke County Unified Government
301 College Avenue, Room 204
Athens, Georgia 30601

Dear Ms. Spratlin:

The U. S. Environmental Protection Agency is conducting an Urban Background Study in seven southeastern states. This project is a collaborative effort between EPA Region 4 staff in Atlanta and Athens, EPA Office of Research and Development staff, and state environmental agency personnel. The study will entail the collection of surface soil samples in eleven cities over the next five months. Sampling in Athens, Georgia, our first city to be sampled, is scheduled for September 8, 9 and 10, 2015, and this letter is to request access to Athens-Clarke County properties to conduct the study.

Representatives from the EPA and its contractor, Tetra Tech, Inc. will collect the soil samples from approximately fifty randomly chosen locations in each city. When the EPA collects samples, access authorization is first obtained from any property owners. Our intent for this study is to identify sample locations in public right of ways and public spaces, preferably owned by local governments, in order to greatly reduce the number of people or entities from which we need to obtain access. In order to conserve staff and contractor time that it would take to identify the various private property owners and request their authorization for access, we are contacting the Athens-Clarke County Unified Government for access to primarily right of ways along Athens roads. Other sampling locations are on properties that are identified as being under the purview of the Tax Assessor according to the online parcel maps.

Soils that have been impacted by human activity over decades may contain a higher concentration of certain contaminants that are not related to any specific spills or releases. Soil samples collected in cities may contain elevated levels of metals, such as lead, and polynuclear aromatic hydrocarbons. We are interested in finding out these “urban background” or “anthropogenic background” concentrations. Because these increased contaminant concentrations are due to the result of urban activity and not specific site releases, it is challenging for environmental investigators to make good decisions about risk reduction.

If you would like a copy of our working document – the draft Sampling and Analysis Plan, which

describes the sampling activities to be conducted for the Urban Background Study, I will be glad to provide you with a copy. I expect the results of the study to be summarize in a final report that will be available approximately 60 days after the final city is sampled. This report will be furnished to you.

Access to approximately fifty areas within public rights-of-way or parcels of Athens-Clarke County property is being requested in order to allow the EPA, its contractors and possibly state representatives to be on your property to collect surface soil samples. This work is being done under an EPA Office of Research and Development grant. Please indicate consent to grant access to the properties by completing and returning the enclosed Access Authorization either via email or postal mail.

The EPA looks forward to your participation in this collaborative applied research project. Please do not hesitate to call me at 404-562-8923 or alfano.barbara@epa.gov if you have any questions.

Sincerely,

Barbara Alfano
EPA Region 4 Brownfields Coordinator

Enclosures

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

1. I, _____, am the authorized representative for the _____ government and can sign this access authorization allowing access onto public rights of way and _____ government property ("the properties").

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to the properties to conduct soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be for _____, 2015.

Date: _____ Signature: _____

Phone #: _____

APPENDIX C

SIGNED ACCESS LETTER SUMMARY

The table below summarizes the most recent status of properties that have granted permission to EPA to collect soil samples for use in this Urban Background Study. Access agreements that have been received are presented in this appendix. Fully executed access agreements will be included in the trip report generated for each city and the all-city comprehensive report.

PARTICIPATING STATES	PRIMARY CITIES	PROPERTY OWNER	ACCESS GRANTED DATE	APPENDIX REFERENCE NUMBER
Georgia	Brunswick	TBD	TBD	TBD
South Carolina	Columbia	TBD	TBD	TBD
Kentucky	Louisville	Metro Parks and KYDOT	9/28/2015	C-2 to C-7
Kentucky	Lexington	Public Rights of Way and Fayette Co Govt Property	11/4/2015	C-8
Tennessee	Memphis	TBD	TBD	TBD
North Carolina	Raleigh	NCDOT, NC St. Univ., City of Raleigh, Wake Co., NC Dept. of Ag & Consumer Svcs.	11/17/2015	C-9 to C-16
Florida	Gainesville	TBD	TBD	TBD
Florida	Tallahassee	TBD	TBD	TBD
Mississippi	Jackson	TBD	TBD	TBD

METRO PARKS
AND RECREATION

PERMIT
FOR UTILITY ACCESS AND ENCROACHMENT

PARK OR PARKWAY: Several, see below and attached paperwork

VALID FROM: 9/28/2029 **TO** 9/29/2015

AGENCY: KDEP - SFB **PERMIT APPLICATION NO.:** 1469

NOTES:
KDEP is requesting access to Rubel Park, 35th St Park, Tyler Park, Algonquin Park, Churchill Park, Huston Quin Park, Clifton Park, Russell Lee Park, Iroquois Park, Wayside Park, Sheppard Park, Watterson Lake Park, Story Ave. Park, South Central Park, Camp Taylor Memorial Park, Algonquin parkway, Eastern Parkway, and Southern Parkway in order to collect 4 ounce sample jars of soil from the 0-2" surface using a stainless steel spoon.

This is for the Urban Background study, that is attempting to quantify the long-term affects of urban existence, and to have better and more accurate scientific tools to draw from when making site and development decisions that are realistic and protective of both human health and the environment.

Addendum: On October 5th, Cheryl Harris with KDEP requested to add William Stansbury Park, George Rogers Clark Park, and William Harrison Park to the permit.

10-06-15

AUTHORIZED SIGNATURE/DATE
Jason T. Canuel, Asst. Director

Fung, Yuen-Chang

From: Adams, Glenn <Adams.Glenn@epa.gov>
Sent: Thursday, September 24, 2015 4:26 PM
To: Alfano, Barbara; Fung, Yuen-Chang
Cc: Sheri Adkins (EEC) (Sheri.Adkins@ky.gov); Frederick, Tim
Subject: RE: access request

FYI, I talked to one of our attorneys and they said the email is not the preferred option, but it is acceptable. We just need to keep it in our records like a signed access agreement.

Good work Sheri, et al

Glenn Adams, Chief
Scientific Support Section
EPA Region 4 Superfund Division
404-562-8771 (office)

From: Alfano, Barbara
Sent: Thursday, September 24, 2015 4:03 PM
To: DD.Fung@tetratech.com
Cc: Adams, Glenn
Subject: FW: access request

Sorry, you needed to see this. Unless Glenn has a problem with accepting an emailed access Okay, I think it is a go.

Barbara Alfano
Region 4 Brownfields Coordinator
U.S. Environmental Protection Agency
Sam Nunn Atlanta Federal Center
61 Forsyth Street, Atlanta GA 30303-8960
404-562-8923/alfano.barbara@epa.gov

From: Adkins, Sheri (EEC) [mailto:Sheri.Adkins@ky.gov]
Sent: Thursday, September 24, 2015 1:19 PM
To: Alfano, Barbara; Adams, Glenn
Subject: RE: access request

Hallelujah praise tha lort!

Okay. Deep Breath.

I'm going to try and reschedule some evaluations, working with Cheryl on getting point locations, and coming in over the weekend to get lat/long for Lexington. (I'm familiar enough with Lex to steer clear of what little industrial operations they have; lived there for several years).

I'm doing a full-fledged celebration on Friday of next week. Just sayin.

From: Alfano, Barbara [mailto:Alfano.Barbara@epa.gov]
Sent: Thursday, September 24, 2015 1:10 PM
To: Adkins, Sheri (EEC); Adams, Glenn
Subject: RE: access request

Looks like written access authorization to me.

Barbara Alfano
Region 4 Brownfields Coordinator
U.S. Environmental Protection Agency
Sam Nunn Atlanta Federal Center
61 Forsyth Street, Atlanta GA 30303-8960
404-562-8923/alfano.barbara@epa.gov

From: Adkins, Sheri (EEC) [mailto:Sheri.Adkins@ky.gov]
Sent: Thursday, September 24, 2015 1:07 PM
To: Alfano, Barbara; Adams, Glenn
Subject: FW: access request

Can we use this as a "go" for KDOT for Louisville and Lexington? We're good w/ it in KY, because our sampling doesn't meet the requirements for them to fool with access agreements.

From: Oatman, Susan (KYTC-D05)
Sent: Thursday, September 24, 2015 12:55 PM
To: Adkins, Sheri (EEC)
Subject: RE: access request

Sheri,

I just talked to our permits section this morning. If you are just taking minor samples, without the use of equipment, off of state ROW they don't need a formal permit. Please feel free to begin work on Monday. As I am sure you will, please stay safe out there and preferably use hi-vis clothing. If you need some vests, let me know.

Susan B. Oatman, P.E.
Environmental Coordinator
KYTC-District 5
8310 Westport Road
Louisville, KY 40242
502-210-5448

From: Adkins, Sheri (EEC)
Sent: Thursday, September 24, 2015 11:58 AM
To: Oatman, Susan (KYTC-D05)
Subject: RE: access request

Susan,

We just received permit approval to sample in the cells that have Louisville Parks that fall in them, but are about thirty cells short to meet goal – we're set to mobilize to collect Monday – Tuesday. Do you have an idea if the ability to sample the top 2" in ROWs may be possible within that time frame? I'm not trying to bother you, just working on the logistics of three sampling teams and travel from various parts of the SE to get it coordinated.

Thanks!
Sheri

From: Oatman, Susan (KYTC-D05)
Sent: Wednesday, September 23, 2015 10:59 AM
To: Adkins, Sheri (EEC)
Subject: RE: access request

Sheri,

Just to clarify, the samplings would be taken from KYTC roadway ROW within the grid area or did you want access to KYTC facility properties?

Susan B. Oatman, P.E.
Environmental Coordinator
KYTC-District 5
8310 Westport Road
Louisville, KY 40242
502-210-5448

From: Adkins, Sheri (EEC)
Sent: Wednesday, September 23, 2015 10:50 AM
To: Craig, Craig (KYTC); Lawson, O'Dail (KYTC)
Cc: Cummins, Chris (KYTC); Oatman, Susan (KYTC-D05); Barrick, Becky (KYTC-D07); Adams, Derek (KYTC-D07)
Subject: RE: access request

Thanks Craig!

Susan, Becky and Derek;

I just want to emphasize that this is only for a grant-based research project, merely looking to identify generic Urban Background levels throughout the region – it's not Superfund looking around for contamination – the sampling parameters expressly avoid signs of releases, with a bias towards "normal" soils. I can forward the sampling plan if you'd like to see the details. The samples from Louisville and Lexington will be added in with results from cities in the other SE Region states for statistical analysis to get an idea if there is a significant difference or not in urban soils vs. country soils. Past research in some European cities indicates that there may be a 10% difference in urban vs rural soils, but we don't have any studies over here to be able to quantify that in a useful manner. Three states/cities (Illinois/Chicago for one) already have urban numbers based on similar studies….this one differs from other urban background studies in that it's looking regionally, not just for a particular city or state.

I've included an access request cover letter for each city, as well as a screen shot of the estimated sample locations, for your review.

Please let me know what additional information you may need, I'll be happy to provide it as quickly as possible. I'm very excited about this study – I've got three people from other states and cities who are already requested the sampling plan and parameters so they can draw off of it for their own needs concerning Urban Background, to facilitate redevelopment and more accurate ways of dealing with

urban properties from an environmental standpoint. It is a great thing for KY to take the lead in this research, but we do need to get some dirt to get it moving…any assistance you can provide in that regard will be greatly appreciated.

Thank you for your time,
Sheri Adkins

From: Craig, Craig (KYTC)
Sent: Wednesday, September 23, 2015 10:27 AM
To: Adkins, Sheri (EEC); Lawson, O'Dail (KYTC)
Cc: Cummins, Chris (KYTC); Oatman, Susan (KYTC-D05); Barrick, Becky (KYTC-D07); Adams, Derek (KYTC-D07)
Subject: RE: access request

Sheri,
I would suggest starting with the Environmental Coordinator in each District. They should at least be able to point you to individual that handles the access agreements for their respective district. In this case Susan Oatman susan.oatman@ky.gov District 5 (Louisville) and Becky Barrick becky.barrick@ky.gov or Derek Adams Derek.adams@ky.gov District 7 (Lexington). I have cc'd them on this email. Hope this helps, and good luck with the research.

Craig

From: Adkins, Sheri (EEC)
Sent: Tuesday, September 22, 2015 10:44 AM
To: Lawson, O'Dail (KYTC); Craig, Craig (KYTC)
Subject: access request

Hey guys,
I hope you all are doing well…I think of "THE MATRIX" every time I go through Louisville where ya'lls bridges are going up. ☺

I'm writing to ask if you know who I would need to contact to get access to state road right of ways in Lexington and Louisville for a joint research project with EPA and the region 4 states.
There was grant funding available to conduct Brownfield/Superfund related research, and I tossed up the idea of doing an 'urban background' study to get a quantitative idea of what the general PAH and Pb/As levels are in urban areas as opposed to point-source levels from a particular release. It was chosen, and now we're almost done with the development and into the sampling stages…KY's place in queue moved up rather quicker than expected (Georgia had to postpone, so we got bumped).

We're looking to take fifty randomly chosen samples of the 0-2" surface soil in a 7.5x7.5 mile gridded overlay, and wish to avoid residential property because of the logistics of getting fifty different private access agreements, and avoid commercial property because…well, that's an even bigger endeavor. I'm speaking with Lexington and Louisville regarding getting access to city property (public parks, city street ROW, etc.) but recognize that getting some side of the road samples on state highways would be an easy route as well. we're only looking to take top two inches, enough for two four-oz. sample jars per location, so there won't be any traffic issues, restoration, etc.

Do you have a direction to point me to for an access request? I have the sampling documents and maps available if anyone wants to look at them. The labs who are offering free analysis (SESD in Athens and an EPA lab in Nevada) have the 28-31 available so hoping to sample then. Ergo, the sooner the better. I also have a standard access agreement that is time-limited etc. and so on.

Any help is greatly appreciated! We're coming up on crunch time and while the actual logistics of the sampling is pretty easy, I'm really trying to get legal access to some spots so we can move forward with the project. I need to have confirmed "okay" by Friday so the labs can be cancelled or approved in time.

Thanks!!

Sheri Adkins, P.G.
Supervisor, Federal Section

Superfund Branch
Division of Waste Management
200 Fair Oaks Lane, Frankfort KY 40601
502-564-6716 ext. 4734

ACCESS AUTHORIZATION

1. I, Susan L. Plueger, am the authorized representative for the Lexington-Fayette County Government and can sign this access authorization allowing access onto public rights of way and Lexington-Fayette County Government property ("the properties").

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives to have access to the properties to conduct surface soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the EPA Region 4/ORD Regional Urban Background Study and are not anticipated or intended to be used for any other purposes other than data points for the study.

3. The consent for access will be for November 4-6, 2015.

Date: 11-3-15 Signature: S L Plueger

Phone #: 859.227.6677

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

1. I, Priscilla Tyree Williams, Director, Facilities Management Division, am the authorized representative for the North Carolina Department of Transportation and can sign this access authorization allowing access onto the property identified by the latitude and longitude coordinates: 35.773859, -78.578929.

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to the properties to conduct soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be through November 30, 2015.

Date: November 9, 2015

Signature: _____
Director, Facilities Management Division
North Carolina Department of Transportation

Phone #919-707-4552

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

1. I, Mary Peloquin-Dodd, am the authorized representative for the NC State University ~~government~~ and can sign this access authorization allowing access onto public rights of way and NC State University ~~government~~ property ("the properties").

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to the properties to conduct soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be for November, 2015.

Date: 10/21/15

Signature: [signature] for Mary Peloquin-Dodd

Phone #: 919 515-4238

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

1. I, William Scott Payne, am the authorized representative for the PRCR Depart. / City of Raleigh government and can sign this access authorization allowing access onto public rights of way and PRCR Dept. / City of Raleigh government property ("the properties").

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to the properties to conduct soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be for Nov. 16 - 20, 2015.

Date: 11/12/15

Signature: [signature]

Phone #: 919. 996. 4825

Matt Nichols 12/4/2015

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

1. I, Richard L. Kelly, Int. Public Works Dir., am the authorized representative for the City of Raleigh, NC government and can sign this access authorization allowing access onto public rights of way and City of Raleigh, NC government property ("the properties").

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to the properties to conduct soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be for Nov. 15 - Dec. 31, 2015.

Date: 11/23/15 Signature:

Phone #: 919-996-5576

Matt Nichols 12/4/2015

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

I, Thomas Reid Elmore (District Supervisor), am the authorized representative for the North Carolina Department of Transportation, and can sign this access authorization allowing access onto public rights of way of the following State Maintained Roadways in Wake County, at the locations shown on the attached map:

#118 - Right of Way on Dawson Street (US70/US 401)
#145 - Right of Way on South Saunders Street (US 70/US 401)
#160 - Right of Way on Hammond Road (SR 2026)
64 - Right of Way on Wake Forest Road (SR 2000)
52 - Right of Way North Raleigh Boulevard (SR 2921)
90 - Right of Way McDowell Street (US 70/US 401)
#106 - Right of Way Edenton Street (SR 2298)
#107 - Right of Way North Raleigh Boulevard (SR 2921)
#122 - Right of Way Poole Road (SR 1007)

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter these right of ways. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to these right of ways to conduct soil sampling within the right of way. During the sampling, activities in the right of way may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be for the following dates: 11/16/2015 thru 12/30/2015.

Date: 11/26/15 Signature: TR Elmore

Phone #: 919-733-3213

Matt Nichols 12/4/2015

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

1. I, R Blair Hinkle, am the authorized representative for the COR Stormwater Program government and can sign this access authorization allowing access onto public rights of way and COR Stormwater Program government property ("the properties").

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to the properties to conduct soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be for November, 2015.

Date: 11-13-15 Signature: [signature]

Phone #: 919-996-4011

Matt Nichols 12/4/2015

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

1. I, Matthew Southern, am the authorized representative for the Wake County government and can sign this access authorization allowing access onto public rights of way and Historic Oak View government property ("the properties").

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to the properties to conduct soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be for November 17-19th, 2015.

Date: 11/10/15

Signature: Matthew Southern

Phone #: 919-212-0484

Matt Nichols 12/04/2015

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

ACCESS AUTHORIZATION

1. I, **G. Kent Yelverton**, am the authorized representative for the **North Carolina Department of Agriculture & Consumer Services** and can sign this access authorization allowing access onto public rights of way and **the Raleigh Farmers' Market located at 1201 Agriculture Street, Raleigh, North Carolina** ("the properties").

2. I grant authorization to the United States Environmental Protection Agency (EPA), its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to enter the properties. This authorization allows the EPA, its officers, employees, contractors and other authorized representatives and the state environmental agency representatives to have access to the properties to conduct soil sampling of the properties. During the sampling, activities at the properties may include taking notes and taking photographs. These activities are being conducted as part of the Urban Background Study.

3. The consent for access will be for the period **November 16th to November 20th**, 2015.

Date: 11/10/15

Signature: G. Kent Yelverton

G. Kent Yelverton, Director
NCDA&CS Property & Construction Division

Phone #: 919-807-4366

Matt Nichols 12/4/2015

APPENDIX D

GRID PLACMENT AND SAMPLE LOCATION SELECTION

Step 1: Add grid to a map in Google Maps Pro of the city to be sampled via the supplied KMZ file.

Step 2: Using the random numbers generated for the assigned city, identify the first 50 randomly assigned grids generated as the initial sampling locations. The grid numbers can be identified by clicking on a square in the supplied grid. In the example below, the Grid Number is 80.

Step 3: The local sampling teams should determine if each of the randomly selected grids has an appropriate sampling location as described in Section 6.0 of the SAP. If not, the next randomly generated grid number should be used as a replacement for the unusable grids.

Random Integer Set Generator

You requested 11 sets with 100 unique random integers in each, taken from the [1,196] range. The integers in each set were not sorted. The numbers highlighted in Yellow are the 50th number of each set (50 cells are to be sampled from each location).

Here are your sets:

1. ~~**Athens, GA**~~ **Winston-Salem, NC**: 121, 22, 40, 63, 192, 34, 175, 48, 113, 67, 36, 23, 108, 60, 195, 64, 45, 78, 120, 169, 146, 37, 160, 15, 143, 77, 158, 18, 172, 112, 29, 185, 100, 109, 170, 141, 82, 122, 181, 159, 68, 174, 20, 96, 98, 104, 16, 53, 117, 69, 47, 94, 79, 87, 103, 35, 25, 50, 28, 119, 61, 54, 134, 42, 13, 130, 137, 144, 90, 149, 153, 196, 145, 110, 105, 93, 73, 184, 173, 114, 163, 55, 9, 88, 124, 136, 17, 147, 95, 133, 72, 92, 75, 152, 123, 43, 131, 62, 182, 14

2. **Louisville, KY**: 20, 157, 144, 173, 116, 35, 189, 163, 13, 46, 12, 61, 131, 184, 110, 123, 70, 172, 72, 165, 136, 119, 167, 76, 151, 107, 58, 60, 40, 16, 21, 135, 121, 122, 188, 164, 111, 118, 85, 44, 41, 50, 149, 65, 17, 156, 192, 127, 193, 181, 78, 114, 134, 62, 69, 142, 171, 91, 139, 92, 55, 24, 126, 196, 53, 30, 96, 125, 104, 86, 179, 8, 106, 155, 42, 59, 11, 67, 4, 158, 117, 166, 183, 148, 185, 129, 137, 162, 103, 3, 152, 178, 191, 81, 7, 75, 140, 48, 150, 79

3. **Lexington, KY**: 49, 192, 133, 147, 195, 155, 172, 119, 187, 88, 177, 194, 72, 30, 69, 137, 169, 159, 94, 65, 185, 42, 123, 104, 161, 34, 3, 146, 36, 87, 1, 167, 110, 18, 15, 7, 115, 118, 54, 102, 93, 122, 140, 153, 179, 105, 143, 48, 76, 101, 124, 57, 170, 97, 154, 20, 196, 139, 165, 68, 114, 23, 190, 28, 41, 16, 180, 89, 59, 4, 70, 173, 71, 175, 60, 151, 92, 108, 150, 135, 157, 90, 61, 56, 82, 166, 46, 2, 117, 127, 100, 134, 136, 12, 50, 183, 62, 188, 174, 63
4. **Columbia, SC**: 136, 68, 73, 162, 133, 21, 127, 128, 48, 193, 67, 34, 35, 63, 183, 130, 161, 61, 74, 196, 94, 7, 195, 132, 172, 43, 135, 57, 150, 65, 171, 24, 31, 165, 174, 72, 115, 117, 114, 30, 152, 22, 1, 187, 190, 90, 108, 11, 113, 188, 25, 122, 75, 52, 82, 14, 58, 44, 140, 138, 121, 36, 6, 168, 84, 26, 101, 147, 45, 191, 46, 157, 12, 103, 42, 169, 62, 102, 194, 120, 33, 18, 118, 149, 123, 163, 13, 155, 100, 69, 189, 76, 180, 92, 105, 88, 19, 151, 154, 143
5. **Raleigh, NC**: 107, 44, 99, 176, 121, 106, 1, 9, 84, 118, 134, 152, 90, 133, 46, 39, 55, 10, 87, 132, 115, 26, 160, 150, 172, 185, 111, 105, 122, 194, 30, 35, 125, 67, 21, 140, 174, 57, 70, 73, 149, 93, 91, 173, 11, 127, 74, 167, 38, 129, 53, 58, 195, 137, 103, 144, 119, 130, 59, 142, 177, 33, 54, 117, 181, 60, 17, 186, 151, 171, 164, 36, 189, 52, 34, 62, 18, 188, 45, 113, 15, 92, 85, 27, 168, 32, 43, 104, 120, 78, 148, 165, 25, 170, 147, 124, 28, 145, 64, 110
6. **Nashville, TN**: 29, 124, 192, 9, 89, 132, 180, 126, 174, 128, 129, 35, 79, 113, 187, 134, 51, 72, 150, 114, 18, 85, 117, 69, 144, 190, 159, 97, 157, 127, 13, 86, 14, 110, 32, 59, 162, 189, 123, 184, 183, 41, 45, 3, 80, 33, 7, 122, 136, 34, 185, 111, 58, 141, 90, 74, 104, 47, 98, 160, 71, 25, 31, 173, 168, 193, 30, 175, 88, 20, 57, 116, 53, 102, 191, 1, 142, 2, 76, 24, 119, 172, 153, 109, 166, 155, 186, 43, 42, 106, 120, 167, 171, 115, 103, 55, 140, 63, 60, 40
7. **Memphis, TN**: 116, 153, 172, 74, 71, 25, 176, 89, 80, 33, 145, 30, 163, 169, 67, 78, 182, 72, 18, 189, 143, 146, 28, 54, 58, 102, 121, 2, 24, 21, 194, 10, 50, 35, 106, 22, 9, 158, 155, 129, 13, 61, 68, 133, 127, 186, 32, 7, 6, 130, 141, 60, 65, 37, 48, 135, 12, 45, 82, 188, 69, 167, 36, 79, 159, 97, 166, 40, 178, 77, 11, 161, 162, 43, 181, 98, 4, 95, 53, 125, 164, 8, 103, 66, 56, 109, 81, 31, 114, 85, 90, 88, 157, 144, 17, 27, 139, 171, 156, 185
8. **Jackson, MS**: 76, 101, 165, 6, 123, 31, 56, 13, 36, 29, 110, 89, 156, 50, 127, 34, 194, 97, 55, 7, 40, 108, 48, 100, 152, 113, 167, 159, 98, 143, 24, 196, 122, 154, 45, 65, 189, 191, 134, 174, 181, 158, 102, 85, 23, 73, 38, 179, 117, 139, 8, 83, 141, 87, 42, 41, 27, 155, 119, 120, 91, 138, 70, 107, 43, 114, 148, 92, 2, 78, 54, 193, 61, 17, 30, 79, 26, 184, 5, 190, 33, 105, 25, 93, 133, 14, 18, 15, 3, 160, 195, 81, 21, 60, 46, 51, 57, 74, 1, 162
9. **Brunswick, GA**: 139, 179, 73, 178, 156, 44, 170, 40, 111, 39, 105, 50, 98, 87, 126, 120, 123, 70, 8, 168, 94, 191, 149, 51, 49, 187, 33, 47, 166, 59, 130, 13, 124, 116, 85, 185, 113, 75, 159, 54, 30, 1, 86, 102, 16, 78, 14, 104, 155, 66, 136, 169, 163, 55, 90, 157, 37, 101, 125, 28, 160, 95, 189, 57, 154, 3, 92, 121, 22, 171, 60, 69, 110, 53, 41, 99, 48, 106, 88, 83, 81, 114, 7, 107, 11, 172, 196, 103, 186, 112, 82, 24, 2, 176, 193, 190, 148, 97, 135, 5
10. ~~**Jacksonville**~~ **Tallahassee, FL**: 18, 88, 19, 85, 66, 180, 82, 156, 163, 23, 75, 177, 155, 26, 91, 83, 7, 20, 50, 57, 128, 175, 116, 151, 172, 98, 49, 92, 122, 71, 123, 47, 31, 188, 194, 28, 179, 168, 79, 95, 4, 158, 121, 52, 39, 184, 186, 148, 78, 154, 120, 169, 72, 25, 46, 3, 30, 93, 43, 1, 125, 40, 135, 144, 139, 81, 159, 22, 110, 73, 77, 170, 146, 100, 191, 141, 140, 67, 45, 160, 17, 108, 89, 192, 60, 174, 181, 5, 96, 54, 150, 137, 11, 129, 94, 42, 145, 195, 185, 101
11. **Gainesville, FL**: 43, 183, 81, 53, 176, 105, 55, 135, 2, 26, 76, 193, 21, 111, 15, 186, 63, 154, 110, 127, 181, 65, 190, 170, 128, 42, 185, 60, 54, 149, 59, 187, 136, 152, 51, 28, 78, 24, 93, 161, 173, 153, 189, 171, 11, 77, 12, 10, 66, 7, 57, 98, 141, 90, 13, 46, 14, 87, 23, 27, 75, 19, 38, 100, 151, 80, 150, 157, 192, 191, 137, 30, 107, 156, 179, 68, 95, 47, 44, 133, 143, 196, 162, 169, 39, 172, 6, 134, 113, 108, 89, 41, 35, 119, 92, 194, 9, 70, 58, 20

Timestamp: 2015-07-28 12:02:20 UTC
Random numbers selected using http://random.org

Exhibit 1
Example Sample Grid (Louisville, Kentucky)

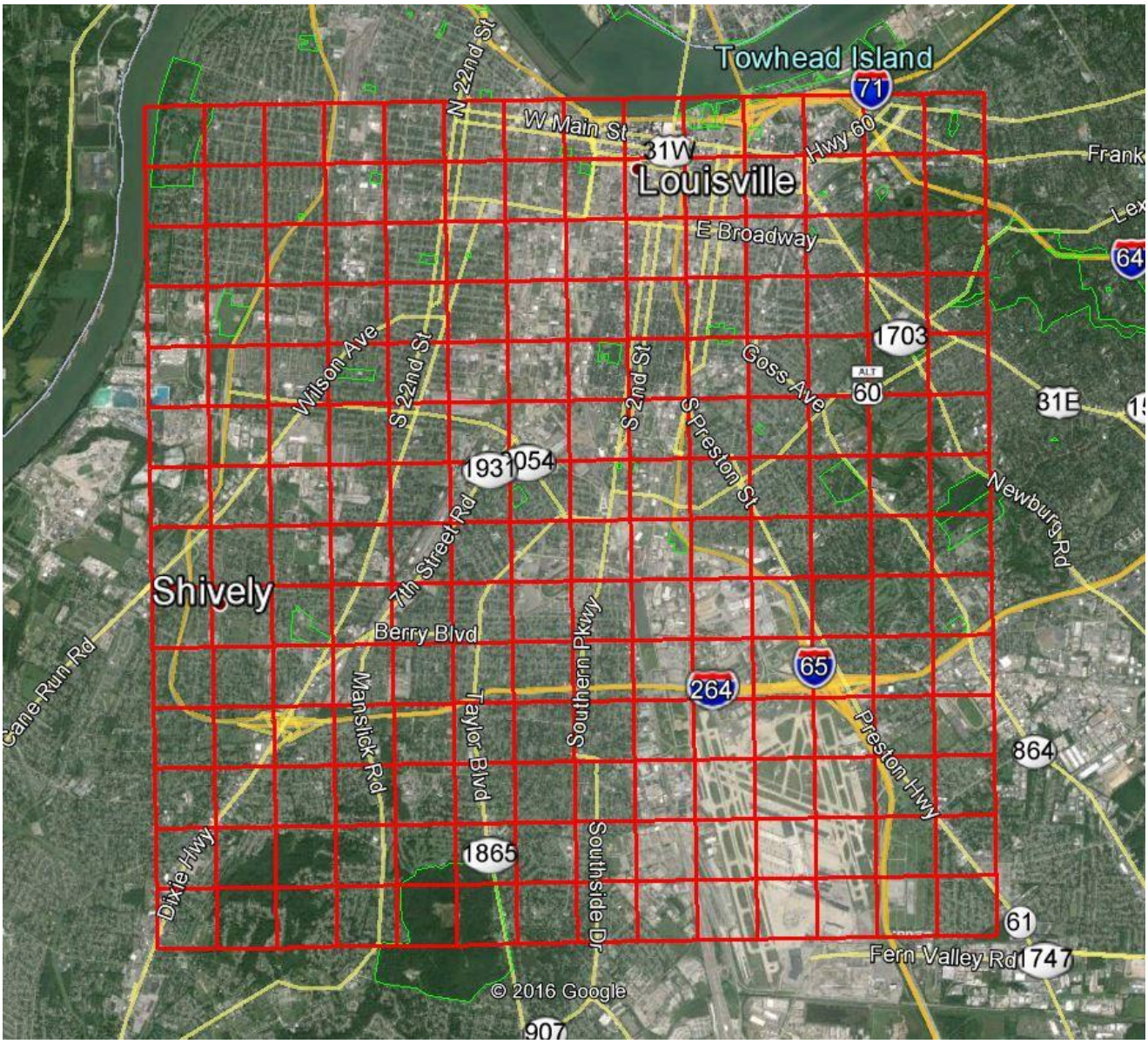
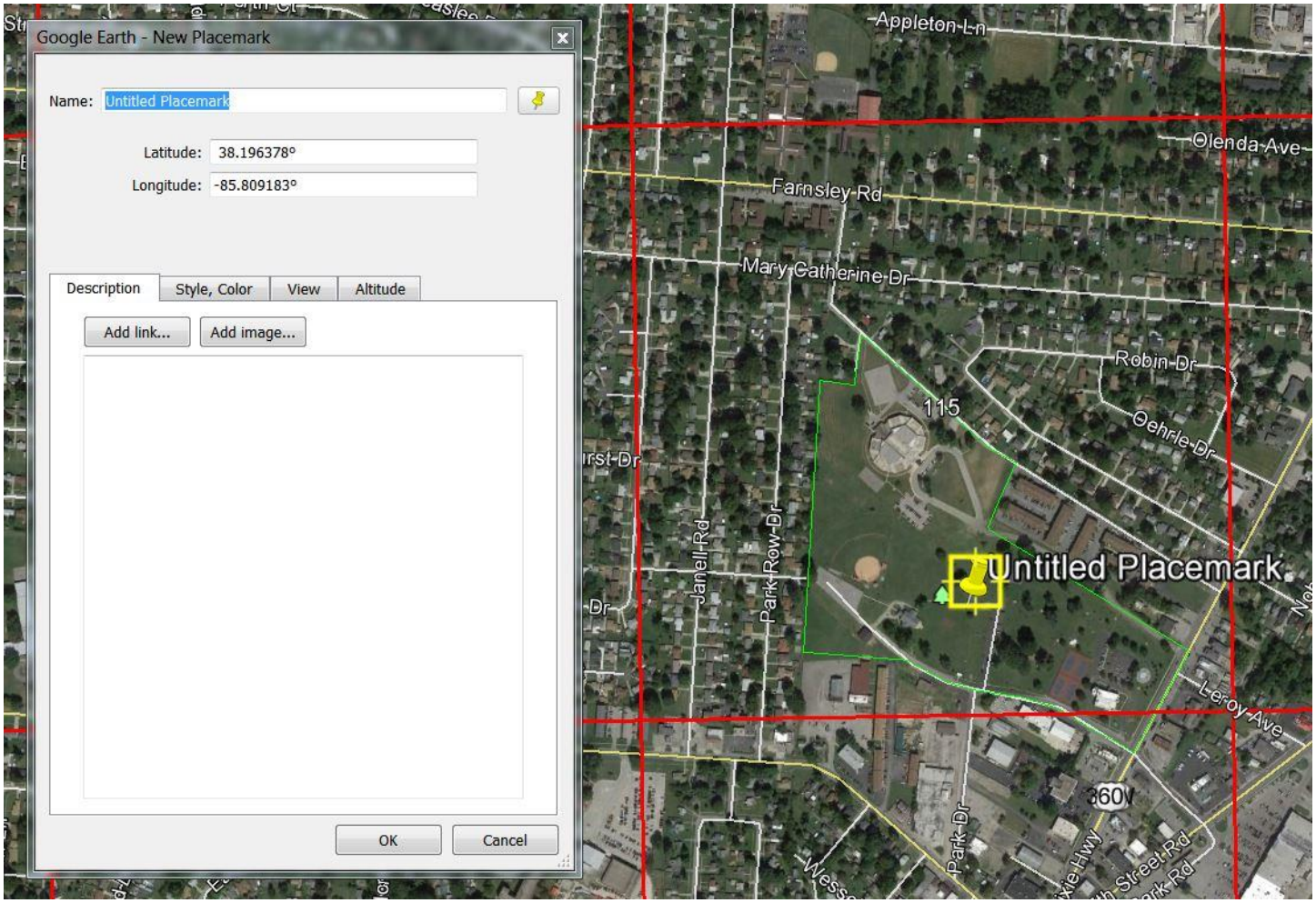


Exhibit 2
Example of Cell with Proposed Sample Location within Louisville, Kentucky Grid



APPENDIX E

ANALYTICAL REPORTING LIMITS

METALs	CAS No.	ASB LOQAM Soil (mg/kg)
arsenic	7440-38-2	0.2
barium	7440-39-3	0.5
cadmium	7440-43-9	0.1
chromium	7440-47-3	0.5
lead	7439-92-1	0.2
selenium	7782-49-2	0.4
silver	7440-22-4	0.5
mercury	7439-97-6	0.04
PAHs	**CAS No.**	**SOM02.2/SOM02.3 Modified Analysis CLP CRQLs Low Soil (ug/kg)**
2-methylnaphthalene	91-57-6	170
acenaphthene	83-32-9	170
acenaphthylene	208-96-8	170
anthracene	120-12-7	170
benzo(a)anthracene	56-55-3	170
benzo(a)pyrene	50-32-8	170
benzo(b)fluoranthene	205-99-2	170
benzo(g,h,i)perylene	191-24-2	170
benzo(k)fluoranthene	207-08-9	170
chrysene	218-01-9	170
dibenzo(a,h)anthracene	53-70-3	170
fluoranthene	206-44-0	170
fluorene	86-73-7	170
indeno(1,2,3-cd)pyrene	193-39-5	170
naphthalene	91-20-3	170
phenanthrene	85-01-8	170
pyrene	129-00-0	170

SOM Semivolatile Target Compound/Analyte Lists and Corresponding CRQLs
http://www.epa.gov/superfund/programs/clp/som-svtarget.htm#som12

Analytical Support Branch Laboratory Operations and Quality Assurance Manual (pg 98-99)
http://www.epa.gov/region4/sesd/asbsop/asb-loqam.pd

Date: 08/10/2015	**MA:** 2519.0	**Title:** SVOA Analysis for PAH Only
Method Source: SOM02.2	**Method:** Semivolatiles	
Matrix: Soil and Water		

Summary of Modification

The purpose of this modified analysis is to analyze soil and water samples for the specific 17 PAH analytes only in Exhibit C Section 3.0 at the specified CRQLs in Section I. Unless specified by this modification, all analyses, Quality Control (QC), and reporting requirements specified in the SOW listed in your current EPA agreement remain unchanged and in full force and effect.

I. Analyte Modifications **Not applicable** ☐

Analyte	CAS Number	Water CRQL (ug/L)	Soil CRQL (ug/kg)
Naphthalene	91-20-3	5.0	170
2-Methylnaphthalene	91-57-6	5.0	170
Acenaphthylene	208-96-8	5.0	170
Acenaphthene	83-32-9	5.0	170
Fluorene	86-73-7	5.0	170
Phenanthrene	85-01-8	5.0	170
Anthracene	120-12-7	5.0	170
Fluoranthene*	206-44-0	5.0	170
Pyrene	129-00-0	5.0	170
Benzo (a) anthracene	56-55-3	5.0	170
Chrysene	218-01-9	5.0	170
Benzo (b) fluoranthene	205-99-2	5.0	170
Benzo (k) fluoranthene	207-08-9	5.0	170
Benzo (a) pyrene	50-32-8	5.0	170
Indeno(1,2,3-cd)pyrene	193-39-5	5.0	170
Dibenzo(a,h)anthracene	53-70-3	5.0	170
Benzo(g,h,i)perylene	191-24-2	5.0	170

**Designated as SOW PAH target analyte with lower CRQLs.*

II. Calibration and QC Requirements **Not applicable** ☐

The Laboratory shall

- Perform a five-point initial calibration to establish the linear calibration ranges on GC/MS for the target analytes in Section I. The recommended ICAL standard concentrations are at 5.0, 10, 20, 40 and 80 ng/uL for all analytes in Section I.
- Add the same DMC and IS solutions at the same concentrations specified in the SOW to the ICAL standards.
- Perform the Continuing Calibration Verification (CCV) consisting of mid-point ICAL standard (CS3) for the analytes in Section I at the same frequency as specified in the SOW.
- Optionally, perform the same ICAL and CCV standards specified for the SVOA analysis in the SOW, with one additional low point ICAL standard for the SOW target analyte, Fluoranthene, at 5.0 ng/uL concentration.
- Include the RRF in the additional low point ICAL standard for the SOW target analyte, Fluoranthene, when calculating the mean RRF and %RSD.
- Note that ICAL/CCV RRF, ICAL Percent Relative Standard Deviation (%RSD) and CCV %D for the target analytes in Section I and the associated DMCs shall remain the same as specified in the SOW.
- Prepare and analyze the method blank at the same frequency and sequence as specified in the SOW. The concentration of any analyte in Section I shall not exceed the CRQL in the method blank.
- Add the same DMC solution at the specified concentration specified for SVOA analysis in the SOW to the samples and blanks. DMC %R technical acceptance criteria specified in the SOW shall remain in effect.
- Perform any required dilutions as specified in SOW.
- Note that the MS/MSD analysis is not required for the water rinsate samples.
- Note that all other technical acceptance criteria for ICALs, CCVs, blanks and samples remain the same as specified in the SOW.

Preparation and Method Modifications	**Not applicable** ☐
The Laboratory shall: • Perform an MDL study for the target analytes in Section I. • Perform GPC clean up procedure as specified in the SOW.	
Special Reporting Requirements	**Not applicable** ☐
The Laboratory shall: • **Report the CRQLs listed in Section I, adjusted according to the equation listed in Exhibit D, even if the level of the corresponding target analytes in the low-point calibration standard is below the CRQLs listed in Section I.** • Submit the MDL study results for target analytes in Section I as specified in the SOW. If the Laboratory has not previously submitted MDL results during the current contract year for the target analytes in Section I above, compliant MDL study results shall be submitted concurrently with the deliverables for this MA to the recipients specified in SOW Exhibit B, Table 1, Row G. • Modify all applicable hardcopy forms to include only the target analytes in Section I - and the required DMCs, ISs as appropriate. This includes Forms 1, 2, 3, 6, 7 and 8. • Include the additional ICAL standard for the SOW target analyte, Fluoranthene, in Form 6 and identify the corresponding standard with EPA sample number SSTD001## where ## can be alphanumerical. • Note that TICs are not required to be reported for PAH analysis. • Include the same information on the EDD as in the hardcopy. • Include the original and background-subtracted spectra of the associated peaks for the - SOW target analyte, Fluoranthene, in Section I from the low point ICAL standard in the data deliverable.	

Note: The 8/10/2015 summary of modification applies to the Louisville, Kentucky, and Lexington, Kentucky sampling events.

Date: 11/11/2015	**MA:** 2519.1	**Title:** Semivolatile Analysis for PAH Only
Method Source: SOM02.3	**Method:** Semivolatiles	
Matrix: Soil and Water		

Summary of Modification

The purpose of this modified analysis is to analyze soil and water samples for the specific 17 PAH analytes only in Exhibit C Section 3.0 at the specified CRQLs in Section I. Unless specified by this modification, all analyses, Quality Control (QC), and reporting requirements specified in the SOW listed in your current EPA agreement remain unchanged and in full force and effect.

V. Analyte Modifications **Not applicable** ☐

Analyte	CAS Number	Water CRQL (ug/L)	Soil CRQL (ug/kg)
Naphthalene	91-20-3	5.0	170
2-Methylnaphthalene	91-57-6	5.0	170
Acenaphthylene	208-96-8	5.0	170
Acenaphthene	83-32-9	5.0	170
Fluorene	86-73-7	5.0	170
Phenanthrene	85-01-8	5.0	170
Anthracene	120-12-7	5.0	170
Fluoranthene*	206-44-0	5.0	170
Pyrene	129-00-0	5.0	170
Benzo (a) anthracene	56-55-3	5.0	170
Chrysene	218-01-9	5.0	170
Benzo (b) fluoroanthene	205-99-2	5.0	170
Benzo (k) fluoroanthene	207-08-9	5.0	170
Benzo (a) pyrene	50-32-8	5.0	170
Indeno(1,2,3-cd)pyrene	193-39-5	5.0	170
Dibenzo(a,h)anthracene	53-70-3	5.0	170
Benzo(g,h,i)perylene	191-24-2	5.0	170

**Designated as SOW PAH target analyte with lower CRQLs.*

I. Calibration and QC Requirements **Not applicable** ☐

The Laboratory shall

- Perform a five-point initial calibration to establish the linear calibration ranges on GC/MS for the target analytes in Section I. The recommended ICAL standard concentrations are at 5.0, 10, 20, 40 and 80 ng/uL for all analytes in Section I.
- Add the same DMC and IS solutions at the same concentrations specified in the SOW to the ICAL standards.
- Perform the Continuing Calibration Verification (CCV) consisting of mid-point ICAL standard (CS3) for the analytes in Section I at the same frequency as specified in the SOW.
- Optionally, perform the same ICAL and CCV standards specified for the SVOA analysis in the SOW, with one additional low point ICAL standard for the SOW target analyte, Fluoranthene, at 5.0 ng/uL concentration.
- Include the RRF in the additional low point ICAL standard for the SOW target analyte, Fluoranthene, when calculating the mean RRF and %RSD.
- Note that ICAL/CCV RRF, ICAL Percent Relative Standard Deviation (%RSD) and CCV %D for the target analytes in Section I and the associated DMCs shall remain the same as specified in the SOW.
- Prepare and analyze the method blank at the same frequency and sequence as specified in the SOW. The concentration of any analyte in Section I shall not exceed the CRQL in the method blank.
- Add the same DMC solution at the specified concentration specified for SVOA analysis in the SOW to the samples and blanks. DMC %R technical acceptance criteria specified in the SOW shall remain in effect.
- Perform any required dilutions as specified in SOW.
- Note that the MS/MSD analysis is not required for the water rinsate samples.
- Note that all other technical acceptance criteria for ICALs, CCVs, blanks and samples remain the same as specified in the SOW.

II. Preparation and Method Modifications	**Not applicable** ☐
The Laboratory shall: • Perform an MDL study for the target analytes in Section I. • Perform GPC clean up procedure as specified in the SOW.	
III. Special Reporting Requirements	**Not applicable** ☐
The Laboratory shall: • **Report the CRQLs listed in Section I, adjusted according to the equation listed in Exhibit D, even if the level of the corresponding target analytes in the low-point calibration standard is below the CRQLs listed in Section I.** • Submit the MDL study results for target analytes in Section I as specified in the SOW. If the Laboratory has not previously submitted MDL results during the current contract year for the target analytes in Section I above, compliant MDL study results shall be submitted concurrently with the deliverables for this MA to the recipients specified in SOW Exhibit B, Table 1, Row G. • Modify all applicable hardcopy forms to include only the target analytes in Section I - and the required DMCs, ISs as appropriate. This includes Forms 1, 2, 3, 6, 7 and 8. • Include the additional ICAL standard for the SOW target analyte, Fluoranthene, in Form 6 and identify the corresponding standard with EPA sample number SSTD001## where ## can be alphanumerical. • Note that TICs are not required to be reported for PAH analysis. • Include the same information on the EDD as in the hardcopy. • Include the original and background-subtracted spectra of the associated peaks for the - SOW target analyte, Fluoranthene, in Section I from the low point ICAL standard in the data deliverable.	

Note: The 11/11/2015 summary of modification applies to the Raleigh, North Carolina sampling event the subsequent events.

APPENDIX F

SOIL SAMPLING PROCEDURES

1.0 General Precautions

1.1 SAFETY

Proper safety precautions must be observed when collecting surface soil samples. A high-vis safety vest and safety glasses must be worn at all times. Cell phones will be used to communicate between sampling teams. First aid kits will be provided to each sampling team. If emergency room or urgent care support is needed, please seek the nearest location and contact the designated sample event leader as soon as possible.

1.2 PROCEDURAL PRECAUTIONS

The following precautions should be considered when collecting soil samples:

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample.
- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.
- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.
- Documentation of field sampling is done in a bound logbook and in electronic tablets. Appendix H describes the information that should be collected in each collection device.
- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as air bills, bills of lading, etc., shall be retained by the project leader in the project files.
- Sample cuttings should be returned to the borehole upon completion of the sample collection. Any 'turf plug' generated during the sampling process should be returned to the borehole.
- Verify the necessary quantity of sampling supplies and shipping material are available for the samplers to complete each city. The list of materials is shown on the following pages.

Sampling Supplies	Quantity Per City
Aluminum Pans	60
Stainless Steel Spoons	60
4-oz Amber Glass Jars (24/case)	60 (2.5 cases)
4-oz Whirl-Pak Bags (500/box)	60
1-liter Poly Containers with Nitric Acid Preservative (12/case)	4
1-liter Amber Glass Jars with no Preservatives (12/case)	4
M Cobalt X Gloves (100/box)	1 box
L Cobalt X Gloves (100/box)	1 box
XL Cobalt X Gloves (100/box)	2 boxes
Pint Ziplocs (20/box)	4 boxes
Gallon Ziplocs (38/box)	1 box
Garbage bags	8
Coolers	4
Temp Blank Bottles	4
Vermiculite or Bubble Wrap	2 bags
Custody Seals	120
FedEx Cooler Tags	4
Strapping Tape	1 roll
Paper Towels	3 rolls

Sampling Supplies (continued)	Quantity Per City
Sponges	6
Yellow lid case (1 for each team)	3
iPads with Bad Elf external GPS (1 for each team)	3
3 Logbooks (quantity reused in each city)	3
Fine Tip Sharpies	6
Fat Tip Sharpies	3
Aluminum Foil	3 boxes
FedEx Tube Boxes	6
Turf Profiler Samplers	6
12 x 12 Kimwipes (196/box)	3 boxes
Liquinox Containers	3 small bottles
Spray Bottles (1 for luminox solution, 1 for ASTM Type II rinse)	6
5-Gallon Buckets with Lids (1 for gross decon, 1 for luminox rinse)	6
Wagons (1 for each team)	3
1 Printer	1
Waterproof Labels (Avery 5523)	120 sheets
Subsamplers [quantity reused in each city]	6
1st Aid Kits	3
Sunscreen	3 bottles
Bug Repellent	3 bottles
Safety Glasses (1 for each team member)	Not provided
Safety Vests (1 for each team member)	Not provided
Hardcopy SAP/QAPP	3

2.0 Special Sampling Considerations

2.1 SPECIAL PRECAUTIONS FOR TRACE CONTAMINANT SOIL SAMPLING

- A clean pair of new, non-powdered, disposable gloves will be worn each time a different sample is collected and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other member(s) collect the samples.
- Samplers must use new, verified/certified-clean disposable or non-disposable equipment cleaned according to procedures contained in the SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC- 205), for collection of samples for trace metals or organic compound analyses.

2.2 QUALITY CONTROL

Equipment rinsate blanks and field blanks should be collected when equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by sampling tools or equipment used to process samples for subsampling. SESD Operating Procedure for Field Sampling Quality Control (SESDPROC-011) contains other procedures that may be applicable to soil sampling investigations. The table on the following page lists the types and frequency of QC samples that will be collected.

2.3 RECORDS

Field notes, recorded in a bound field logbook and an electronic tablet, as well as chain-of-custody documentation will be generated as described in the SESD Operating Procedure for Logbooks (SESDPROC-010) and the SESD Operating Procedure for Sample and Evidence Management (SESDPROC-005).

Rinsate Blank Example Designation	Frequency of Collection	Analysis Parameters	Associated Sampling Devices	Use During Field Event	Cleaning	Projected Total of Rinsate and Field Blank Samples
FIELD TEAM QC SAMPLES						
LOU-EB-ALPHA	1 / Team / City (*meets 1/20 sampling frequency for three teams and 50 sample locations*)	Inorganics and Organics	Turf Profile Sampler	Repeated use	Decon after each location	33
			Aluminum Sub-sampler	Repeated use	Decon after each location	
			Stainless Steel (S.S.) Spoon[a]	1-time use	Decon after each city	
			Aluminum Pan[a]	1-time use	No Decon	
LAB TEAM QC SAMPLES						
LOU-EB-VEGAS	1 3-Point Composite/ City (*meets 1/20 sampling frequency for 50 samples)*	Inorganics	S.S. Pan	Repeated use	Decon after each sample	11
			Riffle Splitter			
			Scoop			
			S.S. Sieve			
OFFICE TEAM QC SAMPLES						
USB-EBXX-WHIRL	1 / 100 / lot	Inorganics	Whirl-Pak (2 oz & 4 oz)	1-time use	No Decon	4[b] *(four bulk orders)*
USB-EBXX-PAN	1 / 100 / lot	Inorganics and Organics	Aluminum Pan[a]	1-time use	No Decon	4[b] *(four bulk orders)*
	1 / roll		Aluminum Foil	1-time use	No Decon	
	1 / 48 / lot		S.S. Spoon[a]	Repeated use	Decon lot before 1st event	
USB-EBXX-JAR	1 / 100 / lot	Organics	4-oz Certified Clean Amber Jar	1-time use	No Decon	4[b] *(four bulk orders)*
USB-EBXX-WATER (Field Blank)	1 / lot	Inorganics and Organics	ASTM Type II Water	1-time use	No Decon	6 *(six bulk orders)*

Notes:

The presence or absence of organic contaminants in the 1-L amber certified clean glass jars, and of inorganic contaminants in the 1-L poly certified clean w/ nitric acid preservative containers, will be evaluated through review of the field blank results.

a S.S. spoons and aluminum pans were purchased new for the study and were initially decontaminated and rinsate-sampled in the office to ensure the lot was free of contamination before sampling was performed in the first three cities of the study (Louisville, KY, Lexington, KY, and Raleigh, NC). The S.S. spoons and aluminum pans used for sampling in all other cities will subsequently be rinsate-sampled in the field, and so are also included in this table under the Field Team QC Samples header.

b Each rinsate sample represents a composite of multiple units of each type of item rinsed (see Addendum 1 to Appendix J).

3.0 Manual Soil Sampling Method

3.1 GENERAL

The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials. Samples should not be collected of material that appears to be coarse or fine grain gravel. Surface soils are classified as soils between ground surface and 2 inches for the Urban Background Study. When compositing, make sure that each composite location (aliquot) consist of equal volumes.

3.2 AMS TURF PROFILER HAND CORING DEVICE

The device will collect a consistent 3.5 inch wide, 1 inch thick, and 7 inch deep core. The devices have been modified so a consistent 4 inch depth is pushed each time. The turf plug and root zone are removed and the top half of the remaining core is collected in an aluminum pan. This method will keep the sample aliquot at equal volumes and account for any soil compression.

The following table show how many cores will be collected at each sample location and how it will be containerized before shipment to assigned organic and inorganic labs.

Sample Location Analysis	Number of Soil Cores Required for Homogenization	4-oz Amber Glass Jar for PAH Analysis	4-oz Whirl-Pak for 8 RCRA Metals Analysis
PAHs & 8 RCRA Metals	2	1	1
PAHs & 8 RCRA Metals with MS/MSD	3	2	1

3.3 SAMPLE HOMOGENIZATION

1. Place the sample into an aluminum homogenization pan and mix thoroughly. All soil samples must be thoroughly mixed to ensure that the sample is as representative as possible of the sample media. The most common method of mixing is referred to as quartering. The quartering procedure should be performed as follows:

- The material in the sample pan should be divided into quarters and each quarter should be mixed individually.
- Two quarters should then be mixed to form halves.
- The two halves should be mixed to form a homogenous matrix.

This procedure should be repeated several times until the sample is adequately mixed.

2. Place the sample into an appropriate, labeled container(s) by using the one-dimensional Japanese slabcake sub-sampling procedure (Gerlach and Nocerino, 2003). A one-dimensional Japanese slabcake is produced by pouring the sample into a line using at least 20 passes back and forth to distribute the sample particles over the line. Use the provided cardboard tube-box lined with clean aluminum foil to hold the one-dimensional slabcake.
3. Use the 0.5 inch square scoop to cut across the line to remove a subsample aliquot. Each aliquot of a composite sample should be of the same approximate volume and equally spaced apart. Combine as many of these aliquots as needed to accomplish the mass reduction (Gerlach and Nocerino, 2003).
4. Repeat this sub-sampling cut across the line until each container is filled.

3.4 SAMPLE SHIPMENT

The assigned labs for each city are emailed to the START Technical Team prior to each sampling event. The lab assignments will be attached to each trip report.

The 4-oz amber glass jars will be sent to the assigned CLP lab for PAH analysis. The 4-oz Whirl-Pak bags designated for 8 RCRA metals analysis will undergo additional processing and should be sent to the EPA National Exposure Research Laboratory at:

Lab Address	944 E. Harmon Avenue Las Vegas, NV 89119-6748	Brian Schumacher 702.798.2242

Ensure coolers shipped to the assigned laboratory are package properly by following the steps below.

1. Each container should have a signed and dated custody seal over the lid and container.
2. Each container should be sealed in a Ziploc bag.
3. The ice should be double bagged.
4. The cooler should be lined with a trash bag (contractor bags work best).
5. If the cooler has any spouts, they should be taped up, both on the inside and the outside.
6. Each cooler should have a labeled Temp Blank.
7. Make sure the Temp Blank is buried in the ice, so that it stays really cold.
8. Knot or tape the trash bag closed.
9. Tape closed both ends of the cooler. I usually do a few rounds of duct tape first, then follow with strapping tape or you can use just strapping tape.
10. Place a signed and dated custody seal between the lid and the cooler over the duct tape, then cover the seals with the strapping tape. The custody seals must be visible.
11. Add a cooler tag to the handle with a zip tie.
12. Secure the FedEx shipping label to the cooler tag.

FIELD TEAMS SHOULD SKIP TO APPENDIX G FOR DECON PROCEDURES

SOIL SAMPLING PROCEDURES FOR LAB USE AND OFFICE USE FROM THIS POINT FORWARD

3.5 EPA VEGAS LAB SAMPLE PREPARATION

The samples designated for metals analysis will be shipped to Las Vegas where they will be dried, sieved, sub-sampled, and re-containerized. Once prepared, the samples will be delivered to the EPA Region 4 SESD laboratory in Athens, Georgia for eight RCRA metals analysis.

The sample preparation will consist of four steps.

1. Samples are air dried on butcher paper for a minimum of 24-hrs.
2. Samples are passed through a number 10 stainless-steel sieve with a nominal opening size of 2 millimeters. Any material that passes will be captured in a stainless-steel bowl. A stainless-steel spoon is used disaggregate the sample and stir the material inside the sieve to allow all the particles less than 2 millimeter to pass. The material that is retained will be discarded and the material that passes will be sub-sampled.
3. A riffle splitter will be used to generate five 0.5-gram aliquots for metals analysis. Riffle splitting generally divides the sample into two equal portions by directing the sample portions into opposite pans with alternating chutes. It can be used sequentially to further subdivide a sample into smaller aliquots (Gerlach and Nocerino, 2003).
4. Each sample will be re-containerized into six 2-oz Whirl-Paks as listed in the table below.

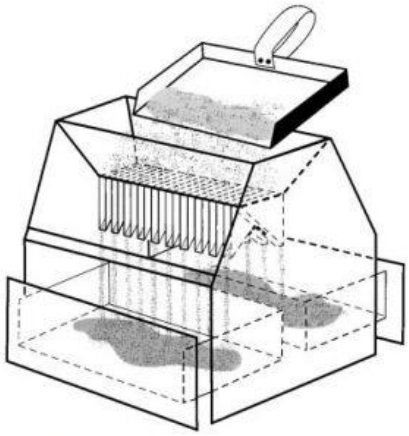


Figure 1. The basic components of a riffle splitter include the scoop, an even number of chutes, or riffles, and a pair of collection pans.

2-oz Whirl-Pak for 8 RCRA Metals Analysis	Sample Analysis
One 30-gram mass	Percent Solids
Five 0.5 gram mass	8 RCRA Metals (no additional mass is needed for MS/D samples designated by the Regional Lab in Athens, GA)

Notes:
For metals analysis, the percent solids results for the first city (Louisville, Kentucky) soil samples were shown to be nearly 100 percent as result of the soil processing conducted in the EPA Vegas lab. Because all samples will be processed similarly, percent solids analysis were determined by EPA to be unnecessary and will not be performed on soil samples collected in all subsequent sampling events for metals analysis.

The necessary shipping material will be provided to the EPA National Exposure Research Laboratory. The list of materials is shown below.

Shipping Material	Quantity Per Sample
2-oz Whirl-Pak	6
Quart-size zip plastic bag	1
Pre-printed sample labels	1
Custody Seals	1
Shipping Material	**Quantity Per Cooler**
Gallon-size zip plastic bag (for double bagged ice)	10
Large Plastic Bag (to wrap samples, ice, and vermiculite packing)	1
Vermiculite Packing	1 bag
Cooler	Reuse original container
FedEx Cooler Tag and cable tie	Reuse original container
FedEx Label Pouch	1 per cooler
Pre-printed FedEx shipping labels	Emailed when requested
Pre-printed Chain of Custody (for shipment to the EPA Regional Lab in Athens, GA)	Emails when requested
Custody Seals	2
Strapping Tape	1 roll

Samples designated for 8 RCRA metals analysis will be sent to the EPA Region 4 SESD lab at:

Lab Address	980 College Station Road Athens, GA 30605

APPENDIX G

DECONTAMINATION PROCEDURES

1.0 General Precautions

1.1 SAFETY

At a minimum, the following precautions should be taken in the field during these cleaning operations:

- When conducting field cleaning or decontamination using laboratory detergent, safety glasses with splash shields or goggles, and nitrile gloves will be worn.
- No eating, smoking, drinking, chewing, or any hand to mouth contact should be permitted during cleaning operations.

2.0 Introduction to Field Equipment Cleaning and Decontamination

2.2 HANDLING PRACTICES AND CONTAINERS FOR CLEANING SOLUTIONS

Improperly handled cleaning solutions may easily become contaminated. Storage and application containers must be constructed of the proper materials to ensure their integrity. Following are acceptable materials used for containing the specified cleaning solutions:

- Detergent must be kept in clean plastic, metal, or glass containers until used. It should be poured directly from the container during use.
- Tap water may be kept in tanks, hand pressure sprayers, squeeze bottles, or applied directly from a hose.
- Organic-free water must be stored in clean glass or Teflon® containers prior to use. It may be applied using Teflon® squeeze bottles.

2.3 DISPOSAL OF CLEANING SOLUTIONS

Procedures for the safe handling and disposition of investigation derived waste (IDW); including used wash water and rinse water are in SESD Operating Procedure for Management of Investigation Derived Waste (SESDPROC-202).

3.0 Field Equipment Decontamination Procedures

3.1 GENERAL

Sufficient equipment should be transported to the field so that an entire study can be conducted without the need for decontamination. Aluminum pans and nitrile gloves will not be decontaminated and should only be used once before disposal. When equipment must be decontaminated in the field, the following procedures are to be utilized.

3.2 SAMPLING EQUIPMENT USED FOR THE COLLECTION OF TRACE ORGANIC AND INORGANIC COMPOUNDS

(USE THESE PROCEDURES TO DECONTAMINATE THE AMS TURF PROFILER AND 0.5 INCH SQUARE SCOOPS BETWEEN SAMPLING LOCATIONS. THESE PROCEDURES WILL ALSO BE USED TO DECONTAMINATE STAINLESS-STEEL SPOONS SENT BACK TO THE TETRA TECH OFFICE.)

For samples undergoing trace organic or inorganic constituent analyses, the following procedures are to be used for all sampling equipment or components of equipment that come in contact with the sample:

1. Remove any loose particles using a paper towel.
2. Clean with tap water and Luminox® detergent using a brush, if necessary, to remove particulate matter and surface films.
3. Rinse thoroughly with tap water.
4. Rinse thoroughly with organic-free water and place on a clean foil-wrapped surface to air-dry. If time does not permit air-drying, use the provided lint-free Kimwipes to dry the device.
5. All equipment must be wrapped with foil. If the equipment is to be stored overnight before it is wrapped in foil, it should be covered and secured with clean, unused plastic sheeting.

(THE EPA LABORATORY WILL USE THESE PROCEDURES TO DECONTAMINATE THE RIFFLE SPLITTER, SCOOPS, SIEVES, AND COLLECTION PANS BETWEEN PROCESSING EACH INORGANIC SAMPLE.)

For samples undergoing trace inorganic constituent analyses, the following procedures are to be used for all sampling equipment or components of equipment that come in contact with the sample:

1. Remove any loose particles in a fume hood using compressed air.
2. Clean with tap water and Citranox® detergent using a brush, if necessary, to remove particulate matter and surface films. Rinse thoroughly with tap water.
3. Rinse thoroughly with organic-free water and place on a clean foil-wrapped surface to air-dry or by the use of convection-drying oven. If time does not permit air-drying or convection-drying, use the provided lint-free Kimwipes to dry the device.
4. All equipment must be wrapped with foil. If the equipment is to be stored overnight before it is wrapped in foil, it should be covered and secured with clean, unused plastic sheeting.

3.3 SAMPLE COLLECTION EQUIPMENT CONTAMINATED WITH ENVIRONMENTAL MEDIA

(USE THESE PROCEDURES TO DECONTAMINATE THE STAINLESS-STEEL SPOONS BEFORE SENDING BACK TO THE TETRA TECH OFFICE.)

Equipment used to collect samples of environmental media from investigation sites should be field cleaned before returning from the study. Based on the condition of the sampling equipment, one or more of the following options must be used for field cleaning:

1. Wipe the equipment clean;
2. Water-rinse the equipment;
3. Wash the equipment in detergent and water followed by a tap water rinse.

Where field cleaning operations are not feasible, equipment can be containerized, bagged or sealed so that no odor is detected and returned to the Tetra Tech office without being field cleaned. If possible, Tetra Tech personnel should be notified that equipment will be returned without being field cleaned. It is the project leader's responsibility to evaluate the nature of the sampled material and determine the most appropriate cleaning procedures for the equipment used to sample that material.

3.4 HANDLING OF DECONTAMINATED EQUIPMENT

After decontamination, equipment should be handled only by personnel wearing clean gloves to prevent re-contamination. In addition, the equipment should be moved away (preferably upwind) from the decontamination area to prevent re-contamination. If the equipment is not to be immediately re-used it should be covered with plastic sheeting or wrapped in aluminum foil to prevent re-contamination. The area where the equipment is kept prior to re-use must be free of contaminants.

APPENDIX H

SOIL SAMPLING FIELD FORM

The electronic tablet will be used collect the sample information shown in the field form below. The logbook should be used document the start and end times each day, sample team names and phone numbers, and the sample locations completed each day.

Site Information			
City, State:	Louisville, Kentucky	Cell No.	**104**

Sample Location Details			
Land Use:	Park	Prevailing Wind Direction:	S

Surface Condition:	Grass

Nearby Permanent Landmark(s):
William Harrison park

Notable Emission Sources Nearby:
Minor Roadway (2 lanes of traffic)

Latitude	38.204756	Longitude	-85.786915

Soil Description			
Color:	Light Brown	Moisture:	Moist

Texture:	Silty

Soil Sample			
Sample ID:	LOU104-SF-150929	Sampled By:	Sherry Weedman

Date:	9/29/2015	Time:	15:36:00	QC Sample:	Field sample

Photographic Log	
Count:	6

Notes:

Photo No. 1		
Direction: Northeast	Panoramic view from sample location	Device Photo No. UBS-729
Photo No. 2		
Direction: Southwest	Panoramic view from sample location	Device Photo No. UBS-732

Photo No. 3			Photo No. 5		
Direction:	Soil Profile	Device Photo No. UBS-744	Direction:	Homogenized Sample	Device Photo No. UBS-738
Photo No. 4			Photo No. 6		
Direction:	Ground Surface at Sample Location	Device Photo No. UBS-735	Direction: North	Sample Location Landmark	Device Photo No. UBS-741

SOIL SAMPLING FIELD FORM
DATA ELEMENTS

Soil Sampling Data Elements				
iForm Builder Field	**Description**	**Data Type**	**Length**	**Required?**
Site Information				
City_State	City and state sampling location drop down list (select one item)	Text	30	Yes
	Brunswick, Georgia Columbia, South Carolina Gainesville, Florida Jackson, Mississippi Lexington, Kentucky Louisville, Kentucky Memphis, Tennessee Nashville, Tennessee Raleigh, North Carolina Tallahassee, Florida			
Cell_Number	Cell number from 1 to 196 selected from location on associated map	Numeric	3	Yes
Sampling Location Details				
Land_Use	Land use of general area were sample is collected (select the one most appropriate)	Text	25	Yes
	Park School/University Church Municipal Commercial Industrial Roadside Residential			
Surface_Condition	Surface condition at sample location	Text	25	Yes
	Grass Patchy grass No grass			
Nearby Landmark	Enter building, street intersection, or permanent landmark in relation to sample location to aid future relocation.	Text	100	Yes

Soil Sampling Data Elements				
iForm Builder Field	**Description**	**Data Type**	**Length**	**Required?**
Prevailing_Winds	Predetermined by sampling planning team. This direction my not match the wind direction at the time of sampling. Source: http://www.ncdc.noaa.gov/sites/default/files/attachments/wind1996.pdf Louisville & Lexington, KY – South	Text	3	No
Nearby_Emission_Sources	Line-of-sight sources determined by the sampling team.	Text	30	No
	Major Roadway (more than 2 lanes of traffic) Minor Roadway (2 lanes of traffic) Railroad Flight Path Light Industry Other (allow used to type in the field)			
Latitude	Select refresh to populate latitude from Bluetooth connected GPS unit	Numeric	20	Yes
Longitude	Select refresh to populate longitude from Bluetooth connected GPS unit	Numeric	20	Yes
GPS_PDOP	Position Dilution of Precision auto-populated from Bluetooth connected GPS unit	Numeric	20	Yes
Sample Identification				
Samp_No	Sample number consists of the city abbreviation, cell number, media type, and date (yymmdd). [e.g. ATH196-SF-150908]	Text	25	Yes
City_Abb	Three letter abbreviation will be auto-populated based on city and state selection.	Text	3	Yes
	BRU Brunswick, Georgia COL Columbia, South Carolina GAI Gainesville, Florida JSN Jackson, Mississippi LEX Lexington, Kentucky LOU Louisville, Kentucky MEM Memphis, Tennessee RAL Raleigh, North Carolina TAL Tallahassee, Florida			
SampleMedia	Two media types are applicable; surface soils (0”-2”) and equipment rinsate blank. Only surface soils will be associated with the sampling from	Text	2	Yes
	SF EB			

Soil Sampling Data Elements				
iForm Builder Field	**Description**	**Data Type**	**Length**	**Required?**
Samp_Depth	Sampling depth starting point relative to ground surface. This will be auto-populated as 0 for all soil samples	Numeric	1	Yes
Samp_Depth_To	Sampling depth ending point relative to ground surface. This will be auto-populated as 2 for all soil samples	Numeric	1	Yes
Samp_Depth_Units	Sampling depth units will be inches for all samples	Text	20	Yes
Sampler	Sampler name (First Name space Last Name)	Text	30	Yes
SampleDate	The date the sample was taken is auto-populated from the device clock	DateTime	10	Yes
SampleTime	Time sample taken (hh:mm) auto-populated from device clock and editable by the sampler	Text	5	Yes
SampleCollection	Sample collection method will be "grab" for all soil samples	Text	30	Yes
SampleType	Sample Type (select one item)	Text	30	Yes
	Field sample Field duplicate Equipment Rinsate			
MS_MSD	Matrix Spike/Matrix Spike Duplicate (Y or N)	Text	1	Yes
Soil Description				
Soil_Color	Color of soil sample (select one shade and one color)	Text	20	Yes
	Light Dark Brown Gray White (e.g. FL sand) Red (e.g. GA clay)			
Soil_Moisture	Moisture of soil sample	Text	20	Yes
	Dry Moist Saturated			
Soil_Texture	Soil texture of soil sample	Text	20	Yes
	Sandy Silty Clay			
Photographic Log				
Photo & Direction	File path to a related file or image. No limit to max number of photos. See output form for layout	Text	255	Yes

Soil Sampling Data Elements				
iForm Builder Field	**Description**	**Data Type**	**Length**	**Required?**
	2 panoramic photos standing from either side of sample 1 photo of sample in soil profiler 1 photo of ground surface at sample location (draw red box around sample location) 1 photo of homogenized sample 1 photo of sample location standing near the landmark (draw red box around sample location)			
Notes	General comments	Text	255	No

APPENDIX I

SAMPLING AND LOCATION DATA ELEMENTS IN SCRIBE ANALYTICAL DATABASE

The coordinates for each sampling location must be submitted to R4DART in order for analytical electronic data deliverables to be loaded. Once you've completed all sampling activities, create an Excel spreadsheet exported from Scribe with the following information (these should be the column headers):

- Location ID (this will be your Station ID)
- Latitude (in decimal degrees)
- Longitude (in decimal degrees)
- Accuracy (see below)
- Location Type (see below)

Accuracy should list one of the following for each location:

- <1 meter (this is usually Trimble data)
- 1-5 meters
- 5-10 meters
- >10 meters
- Eye Ball Map (this is if you use Google Earth to get the coordinates)
- Survey (this is if you have the location surveyed, such as a monitoring well)

Location Type should list one of the following for each location:

- Surface Soil
- Subsurface Soil
- Sediment
- Surface Water
- Groundwater
- Potable Water
- If you collected both a surface water sample and a sediment sample from a location, use Sediment as the type
- If you collected both a soil sample and a groundwater sample from a location, use Groundwater as the type
- If you collected both surface soil and subsurface soil from a location, use Surface Soil

Send the completed spreadsheet to the START Sample Coordinator (jessica.vickers@tetratech.com) and to check the EDD using the EQuIS Data Processor (EDP) checker and uploading in the complete Location EDD to R4DART@epa.gov.

Sampling Locations Data Elements					
Scribe Field	**Description**	**Data Type**	**Length**	**Primary Key?**	**Required?**
Location	Sampling Location Code/Monitoring Location Code (PK)	Text	30	PK	Yes
Longitude	Longitude	Numeric	0	No	No
Latitude	Latitude	Numeric	0	No	No
Coord_Sys_Desc	Coordinate system	Text	70	No	No
Datum	Geopositioning datum associated with the coordinates. (i.e. NAD83)	Text	50	No	No
GeoMethod	Geopositioning method used to establish the coordinates. (i.e. GPS)	Text	30	No	No
GPS_Collected_By	Collector of GPS Data	Text	30	No	No
GPS_Comment	GPS comment recorded	Text	50	No	No
GPS_CorrectionType	GPS Correction Type (i.e. uncorrected; corrected)	Text	50	No	No
GPS_Date	GPS Date Recorded	Date Time	0	No	No
GPS_PDOP	Position Dilution of Precision	Numeric	0	No	No
Location_Image_Path	File path to a related file or image	Text	255	No	No
LocationComment	Location Comment	Text	250	No	No
LocationDescription	Location Description further describes the Location Code.	Text	100	No	No
LocationZone	Location Zone describes the area impacted relative to the site.	Text	25	No	No
PropertyID	Property ID (FK)	Text	50	No	No

Sampling Data Elements (Soil, Water)					
Scribe Field	**Description**	**Data Type**	**Length**	**Primary Key?**	**Required?**
Samp_No	Sample Number. Scribe requires a unique sample number (Required)	Text	25	PK	Yes
Analyses	Lab Analyses for this sample (i.e. PAHs, Arsenic, Lead) (FK)	Text	64	No	No
COC	Chain of Custody Number (FK)	Text	30	No	No
Coll_Method	Collection Method	Text	30	No	No
Color	Sample Color	Text	25	No	No
Container	Sample Container	Text	30	No	No
EventID	EventID. Use to group data by sampling events. Defaults to 'Sampling' (i.e. Athens, GA; Louisville, KY)	Text	50	No	No
Activity	Sampling Activity	Text	50	No	No
Matrix	Sample Matrix (i.e. Soil; Rinsate)	Text	40	No	No
MS_MSD	Matrix Spike/Matrix Spike Duplicate (Y or N)	Text	1	No	No
No_Container	Number of Containers	Numeric	0	No	No
Preservation	Sample Preservation	Text	30	No	No
SampleDate	Date Sample Taken	DateTime	0	No	No
Samp_Depth	Sampling Depth	Numeric	0	No	No
Samp_Depth_To	Sampling Depth	Numeric	0	No	No
Samp_Depth_Units	Sampling Depth Units	Text	20	No	No
Sampler	Sampler Name	Text	30	No	No
SampleTime	Time Sample Taken (hh:mm)	Text	5	No	No
SampleMedia	(i.e. Soil; Aqueous)	Text	30	No	No
SampleCollection	Sample Collection Method (i.e. Grab, Composite, Discrete Interval)	Text	30	No	No
SampleType	Sample Type (i.e. Field Sample, Field Duplicate, Lab QC, Rinsate)	Text	30	No	No
Soil_Descr	Soil Description (i.e. Sandy/Silty/Clay)	Text	25	No	No
Sub_Location	Sampling Sub Location (i.e. Grid Cell Number)	Text	25	No	No
CLP_Sample_No	CLP Sample Number	Text	25	No	No

APPENDIX J

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN SECTION A: PROJECT PLANNING ELEMENTS		
A1. Title (*Project Name*):	Urban Background Study	
Project Location:	EPA Region 4: Selected Urban Locations	
Project Requestor and Organization:	Brian Schumacher US EPA Office of Research and Development National Exposure Research Laboratory Environmental Sciences Division 944 East Harmon Avenue Las Vegas, NV 89119	
Project Requestor's Signature:	schumacher.brian@epa.gov Digitally signed by schumacher.brian@epa.gov DN: cn=schumacher.brian@epa.gov Date: 2016.04.14 06:51:20 -07'00'	Date:
Project Leader's Name, Position, and Organization:	Didi Fung, Project Manager, Tetra Tech, Inc. (Tetra Tech)	
Project Leader's Signature:	Didi Fung	Date: 2/17/2016
Technical Reviewer's Name and Position:	John Schendel, Tetra Tech Quality Assurance (QA) Manager	
Technical Reviewer's Signature:	John Stephen Schendel Digitally signed by: John Stephen Schendel DN: CN = John Stephen Schendel email = john.schendel@tetratech.com C = US O = Tetra Tech EMI OU = Tetra Tech Duluth, GA Date: 2016.04.13 18:09:32 -05'00'	Date:
Section Chief/DAO's Name and Position:	Nardina Turner, Environmental Protection Agency (EPA) Sample Control Coordinator	
Section Chief/DAO's Signature:	NARDINA TURNER Digitally signed by NARDINA TURNER Date: 2016.04.14 08:06:30 -04'00'	Date:
A2. Table of Contents	N/A	
A3. Distribution List	Contained in Section 3.0 and Table 1 of the SAP	

A4. Project Personnel	**Organization**	**Responsibilities**
	Contained in Section 3.0, Table 1, and Figure 1 of the SAP	
A5. Problem Definition	State environmental agencies and EPA Regions are tasked with ensuring that sites with elevated levels of contaminants are remediated or have their exposure risks controlled or managed. Contaminant data are screened against risk-based concentrations, but complicating this process are background and ubiquitous anthropogenic influences on contaminant concentrations that should also be considered in decision-making. Urban areas that have been heavily impacted by	

(Objectives) and Background:	humans for decades have potentially been exposed to numerous non-point sources of contaminants that over time may contribute to an overall higher level of some contaminants. Soil samples collected in any large, long-established city may contain elevated levels of certain contaminants such as metals and polycyclic (or, polynuclear) aromatic hydrocarbons (PAHs), due to human activity. This is commonly referred to as "urban background." Because these increased contaminant concentrations are due to urban activity and not necessarily to more localized, site-specific releases, it often becomes challenging to address the presence of these typical urban contaminants at sites where investigation, remediation, and risk management are occurring. This study is a joint effort between EPA Region 4, EPA Office of Research and Development (ORD), and Region 4 states, and is funded by an ORD Regional Applied Research Effort (RARE) grant. This project is designed to develop values for contaminant "urban background" concentrations and to develop a data collection and analysis process that can be consistently replicated. This study will result in the following products: (1) Quality Assurance Project Plan (QAPP), (2) Sampling and Analysis Plan (SAP), (3) Scribe Database, and (4) Online GeoPlatform Data Mapping Tool.
A6. Project Description:	A total of 550 surface soil samples are proposed for this Urban Background Study. This total includes 50 samples collected from each of the eleven cities participating in the study. In addition, the appropriate number of quality control (QC) samples will be collected. Samples will be collected from a depth of 0 to 2 inches below ground surface (bgs) using a grid pattern over each identified urban location. An example of the grid pattern is shown on **Exhibit 1** and **2** in Appendix D of this SAP/QAPP. Target sampling locations will be chosen using a random point grid sampling method. A grid is drawn over the map of an urban area. The size of the grid will remain the same (7 miles by 7 miles), no matter what the size of the city is, in order to maintain spatial uniformity across cities. Consequently, grids over smaller cities may extend into rural areas and include limited rural area sampling. Within each grid, the size of each cell will be 0.5 mile by 0.5 mile. Cell numbers selected for sampling will be generated with a random integer set generator. The generator request includes 11 sets of 100 unique random integers between the numbers 1 and 196. The first 50 unique cell numbers reported by the generator are used to identify target sampling locations. If sampling locations within a cell are determined unsuitable (such as an area without natural environment), then sampling within the cell may be rejected and the next randomly-generated cell number in the grid may be added to the cells selected for sampling. Target sampling locations will be determined by EPA Region 4, EPA ORD, and representatives from the participating states and cities. If necessary, a reconnaissance of the locations will be conducted to determine their applicability to this Urban Background Study (see Appendix D of this SAP/QAPP).

Decision(s) to be made based on data:	Determination of "background" concentrations of eight RCRA metals and PAHs for the urban areas included in the study.
Applicable regulatory information, action levels, etc.	No comparison criteria are proposed.
Field Study Date:	Variable dates to be determined as planning continues.
Projected Lab Completion Date:	Six weeks following the completion of each field sampling event in an urban area.
Projected Report Completion Date:	Trip reports will be prepared after each field sampling event, within three weeks of receiving the validated analytical data. The all-city comprehensive report will be submitted within three months after completion of the final field sampling event.

A7. Quality Objectives and Criteria

All samples/sample locations will meet the field investigation objectives and purposes summarized in Section A5 and A6 of this QAPP. DQOs are discussed in Section 7.0 of the SAP.

A8. Special Training/Certifications

Sampling team members must have participated in several surface soil sampling projects in addition to completing a full review of the site-specific SAP/QAPP before supporting the Urban Background Study. See Health and Safety Plan for further information regarding special training and certifications.

A9. Documents and Records

For this project, the EPA Contractor and other field sampling team members will implement the following procedures pertaining to Documents and Records:

EPA Region 4 Science and Ecosystem Support Division (SESD) Field Branches Quality System and Technical Procedures (FBQSTP) for *Logbooks*, SESDPROC-010-R5, May 30, 2013.

Tetra Tech Region 4 START Quality Management Plan (QMP) dated November 2015: *Documents and Records*, Section 5.0.

Tetra Tech Region 4 START QMP dated November 2015: *Assessment and Response*, Section 9.0.

SECTION B: DATA GENERATION AND ACQUISITION

B1. Sampling Design

Laboratory analyses will include eight RCRA metals and PAHs.

The following matrix lists the proposed numbers and types of samples to be collected for each participating city. Sample locations are described in Section A6 of this QAPP.

Media:	**Number of Samples for Each City**:	**Analyses**:
Soil	50 plus 3 field duplicates; three samples will also be selected for MS/MSD analysis	8 RCRA Metals
	50 plus 3 field duplicates; three samples will also be selected for MS/MSD analysis	PAHs
Aqueous *(includes rinsate and field blanks, See Section 2.2 in Appendix F for additional details)*	58/11 = 5.3	8 RCRA Metals
	47/11 = 4.3	PAHs

B2. Sampling Methods, General Procedures

The following SESD field measurement and sampling procedures will be followed during this field study, as applicable:

EPA Region 4 SESD FBQSTP for *Soil Sampling,* SESDPROC-300-R3, August 21, 2014.

EPA Region 4 SESD FBQSTP for *Field Equipment Cleaning and Decontamination*, SESDPROC-205-R3, December 18, 2015

EPA Region 4 SESD FBQSTP for *Field Equipment Cleaning and Decontamination at the FEC*, SESDPROC-206-R3, December 18, 2015

Tetra Tech Region 4 START Quality Assurance Project Plan (QAPP) dated May 2012: *Inspection/Acceptance Requirements for Supplies and Consumables*, Section 2.8.

EPA's *Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers,* December 1992.

Quality Certified (QC) Class sample containers that meet EPA standards and ASTM Type II organic-free reagent water will be procured from Environmental Sampling Supply, http://www.essvial.com/Vial_Lot_Control_Numbers.aspx.

B3. Sampling Handling and Custody

All samples will be collected and handled according to the procedures listed in Section B2 of this QAPP. After collection, samples will managed according to the following:

EPA Region 4 SESD FBQSTP for *Packing, Marking, Labeling and Shipping of Environmental and Waste Samples,* SESDPROC-209-R3, February 4, 2015.

EPA Region 4 SESD FBQSTP for *Sample and Evidence Management*, SESDPROC-005-R2, January 29, 2013.

EPA Region 4 Superfund SOP for *Sample and Evidence Management*, SFPROC-004-R0, September 2015.

EPA Region 4 SESD FBQSTP for *Management of Investigation Derived Waste*, SESDPROC-202-R3, July 3, 2014.

B4. Analytical Methods

The following is a brief description of the analytical methods for this field investigation:

SESD:	Samples will be analyzed in accordance with the EPA Region 4 SESD Analytical Support Branch (ASB) Laboratory Operations and Quality Assurance Manual (LOQAM), April 2, 2015. Eight RCRA Metals will be analyzed by SW-846 Method 6010C (ICP-AES) for screening and EPA Method 200.8 (ICP-MS) for confirmation; regional reporting levels will be used for arsenic (0.2 milligrams per kilogram [mg/kg]), barium (0.5 mg/kg), cadmium (0.1 mg/kg), chromium (0.5 mg/kg), lead (0.2 mg/kg), selenium (0.4 mg/kg), silver (0.5 mg/kg), and mercury (0.04 mg/kg).
CLP:	Samples will be extracted and analyzed by a Contract Laboratory Program (CLP) laboratory in accordance with the EPA CLP Statement of Work (SOW) for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.2, August 2014 or SOM02.3, September 2015. The contract required quantitation limit (CRQL) for PAHs (170 micrograms per kilogram [ug/kg]) will be used, with a modified analysis used to lower the fluoranthene CRQL from 330 ug/kg to 170 ug/kg.

B5. Quality Control

The following is a brief description of field and laboratory QC measures to be implemented during this field investigation:

Field:	Field QC measures will be in accordance with the EPA Region 4 SESD FBQSTP for *Field Sampling Quality Control*, SESDPROC-011-R4, February 5, 2013. Soil samples for Metals analysis will not be iced for transport, since they will require being at room temperature for specialized processing discussed in Appendix F, Section 3.5. Temperature blanks will be placed in each sample cooler containing ice. A field duplicate sample will be collected at approximately 5 percent (one in twenty) of the surface soil sample locations. The field duplicate will be collected by moving approximately one foot north from each of the previously sampled aliquots collected for the original sample. Rinsate blanks and field blanks will be collected from soil coring devices, aluminum sub-samplers, pans, scoops, spoons, sample containers, and related materials used by field sampling teams to collect the samples, to ensure the supplies do not contain trace concentrations of contaminants. For each city/sampling event, approximately four rinsate blanks may be collected for analyses of PAHs and approximately five rinsate blanks may be collected for analyses of eight RCRA metals. Additional details are discussed in the SAP, Table 5 and Section 2.2 of Appendix F. If PAHs and Metals are detected in the equipment rinsate blanks, Tetra Tech will follow the data validation guidance details in Section D of this QAPP.
Laboratory:	Specific laboratory QC measures are specified in the EPA Region 4 SESD ASB LOQAM, April 2, 2015 and in the CLP Statement of Work SOM02.2, August 2014 or SOM02.3, September 2015. Regional reporting levels will be used for arsenic (0.2 mg/kg), barium (0.5 mg/kg), cadmium (0.1 mg/kg), chromium (0.5 mg/kg), lead (0.2 mg/kg), selenium (0.4 mg/kg), silver (0.5 mg/kg), and mercury (0.04 mg/kg). CRQLs for PAHs (170 ug/kg) will be used.

B6. Instrument/Equipment Testing, Inspection and Maintenance

If sampling equipment is damaged, contact the START project manager Didi Fung and replacement items will be procured. Spare sampling equipment will be provided to each sampling team.

EPA Region 4 SESD FBQSTP for Global Positioning System, SESDPROC-110-R4, June 23, 2015.

All field measurement instruments and equipment will be maintained in accordance with the EPA Region 4 SESD FBQSTP for *Equipment Inventory and Management*, SESDPROC-108-R5, August 13, 2015.

B7. Instrument/Equipment Calibration and Frequency

All field measurement instruments and equipment are calibrated according to the EPA Region 4 SESD FBQSTP for *Equipment Inventory and Management*, SESDPROC-108-R5, August 13, 2015 and according to specific procedures included within the defined operating procedures for each instrument. This study does not involve equipment requiring calibration.

B8. Inspection/Acceptance for Supplies and Consumables

All critical supplies and consumables for this field investigation are inspected and maintained in accordance with the following procedures:

Tetra Tech Region 4 START Quality Assurance Project Plan (QAPP) dated May 2012: *Inspection/Acceptance Requirements for Supplies and Consumables,* Section 2.8.

EPA Region 4 SESD FBQSTP for *Field Sampling Quality Control,* SESDPROC-011-R4, February 5, 2013.

The EPA Contractor and other field sampling team members are responsible for ensuring that these requirements are met.

B9. Non-direct Measurements:

The use of non-direct measurements from previous investigations is not part of the current study scope of work.

B10. Data Management

The field project leader will be responsible for ensuring that all requirements for data management are met. All data generated for this field investigation, whether hand-recorded or recorded and stored in an electronic data logger, will be recorded, stored and managed according to the following procedures:

EPA Region 4 SESD FBQSTP for *Logbooks,* SESDPROC-010-R5, May 30, 2013.

Tetra Tech Region 4 START QMP dated November 2015: *Documents and Records,* Section 5.0.

A Scribe database will contain all the validated analytical results produced from the Urban Background Study. This includes sample location, name, date, time, requested analysis, chain-of-custody number, and results. The START project manager or assigned representative will be responsible for sending the required COC.xml and the EQuIS Data Processor (EDP) verified Location EDD to R4DART@epa.gov. After results for each sampling event have been validated and imported into the Scribe database, it will be uploaded to Scribe.net so all stakeholders can download and review the most recent information.

SECTION C: ASSESSMENT/OVERSIGHT AND SECTION D: DATA VALIDATION/USABILITY

No field audits are planned for this study. EPA-scheduled monthly conference calls with all the stakeholders, listed in Section 3.0 of the SAP, will provide regular project status updates.

Initial acceptance of the data will be determined through the data review and verification process, as outlined below.

- The eight RCRA metals data will be reviewed by the EPA Region 4 SESD Analytical Support Branch (ASB) in accordance with the Laboratory Operations and Quality Assurance Manual (LOQAM), which is available at: http://www.epa.gov/region4/sesd/asbsop/asb-loqam.pdf.
- PAH data will be reviewed by the EPA Region 4 SESD Office of Quality Assurance (OQA), with technical support from the Environmental Services Assistance Team (ESAT) contractor, in accordance with the Data Validation Standard Operating Procedures for Organic Analysis, which is available at http://www.epa.gov/quality/data-validation-standard-operating-procedures-organic-analysis.

Any rejected data and the reasons for rejection will be summarized in the validation report narrative. In addition, EPA will designate the appropriate personnel to ensure that sample result concentrations were detected down to the sample- and analyte-specific method reporting limits (MRL) and to review QC sample data against field sample data to determine if additional qualifications are warranted.

Tetra Tech START will conduct additional validation of the soil sample results if analytes are detected in the equipment rinsate blanks. The addendums to this QAPP, referenced below, will explain the approach used to convert each type of rinsate blank's mass/volume concentration to a soil-equivalent mass/mass concentration, which can then be compared to the associated soil sample concentrations. This comparison will result in one of the actions listed in Table below. Findings will be reported in the trip reports generated for each city and in the all-city comprehensive report.

- Addendum 1 – Equipment Rinsate Blanks collected of sample containers and sampling equipment
- Addendum 2 – Equipment Rinsate Blanks collected by Field Teams
- Addendum 2 – Equipment Rinsate Blanks collected by the EPA Las Vegas laboratory

Equipment Rinsate Blank Actions on Soil Sample Data

Converted Rinsate Blank Result as Compared to Sample Result	Data Validation Action on Sample Result
Blank > Sample	Qualify as unusable (R)
Blank < Sample < 5X Blank	Report as non-detected (U) at Sample level
5X Blank < Sample < 10X Blank	Qualify as estimated, biased high (J+)
10X Blank < Sample	No qualification

Tetra Tech START will contribute to an assessment of how well the data that was collected during this study reconciles with the project-specific DQOs. As part of this assessment, Tetra Tech will document and summarize variations and deviations from the sampling and analysis plan and evaluate their effects, if any, on the data and associated DQOs. The EPA senior managers, project managers, and QA manager, however, will have ultimate responsibility in determining whether or not the study's DQOs have been met.

****Footnotes**: This Quality Assurance Project Plan (QAPP) has been prepared and approved according to the *EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5; EPA/240/B-01/003)*, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC, March 2001. This document will be used to ensure that the environmental data collected for this project are of the type and quality for the intended purposes.

TETRA TECH

February 11, 2106

Addendum 1 to Appendix J: Quality Assurance Project Plan
Urban Background Study
EPA Contract No. EP-S4-14-03
TTD No. TT-12-001

Steps will be taken to ensure equipment used for this study is free of contaminants and that the decontamination procedure eliminates cross contamination during sample collection, handling, and preparation. **This addendum addresses the calculations that will be performed to determine if the results from those rinsate samples collected by the office team bear any impact on the results for soil samples collected or contained using the equipment.** Dedicated containers are ordered in bulk quantities to allow for equipment rinsate sampling prior to the field events. Table 1 list the field equipment rinsate blank samples that should be collected by the office team, and their frequencies of collection. The collection frequency goal of 1 percent or (one in one hundred) for containers was adopted from the 1992 EPA Specifications and Guidance for Contaminant-Free Sample Containers.

Table 1. Rinsate Samples to Be Collected in the Office and Associated Field Equipment/Containers

Rinsate Blank Example Designation	First Round Collection Frequency per Item[a]	Analysis Parameters	Associated Sampling Devices and Containers	Use During Field Event	Cleaning
OFFICE TEAM RINSATE BLANK QC SAMPLES					
UBS_EBXX_WHIRL	1:167	Inorganics	Whirl-Pak (2 oz & 4 oz)	1-time use	No Decon
UBS_EBXX_PAN	1:80	Inorganics and Organics	Aluminum Pan	1-time use	No Decon
	1:roll		Aluminum Foil	1-time use	No Decon
	1:48		S.S. Spoon	Repeated use	Decon after each event
UBS_EBXX_JAR	1:80	Organics	4-oz Certified Clean Amber Jar	1-time use	No Decon

Notes:
a The minimum collection frequency goal is 1 rinsate blank sample per 100 units of each particular item.

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EQUIPMENT BLANK ASSUMPTIONS AND ACTIONS

To compare for quality control purposes the environmental soil sample analytical results to aqueous equipment blank analytical results, the equipment blank results will be converted from aqueous mass/volume units to soil-equivalent mass/mass units using the following assumptions.

1) The first assumption is that roughly *only enough* water is used to rinse a set of unused sampling equipment or containers to produce an approximate 1-liter or 2-liter aqueous equipment rinsate blank sample. The volume of water used depends on whether only one analysis (either RCRA metals or PAHs) is requested (collect 1 liter) or both analyses (both RCRA metals and PAHs) are requested (collect 2 liters that are split into two 1-liter volumes, one for each analysis). The important thing to know is the *total volume of water used to rinse the equipment*, and not just the volumes that were submitted for analysis. With this assumption, the analytically-determined concentration of an analyte in the equipment rinsate blank is converted to an absolute mass of the analyte by taking the product of its concentration with a total equipment rinsate blank sample volume of 1 liter (for analysis of either metals or PAHs) or 2 liters (for analysis of both metals and PAHs).

2) The second assumption involves the following estimates of the *total volumes* (in ounces) of soil that would either (1) come into contact with the combined set of sampling equipment rinsed to produce the rinsate blank sample, or, (2) fill the combined set of soil sample containers rinsed to produce the rinsate blank sample. The following volume estimates are based on the procedures conducted during the first round of rinsate blank sampling; volume estimates may vary from these values in the future based on actual procedures followed during future rinsate blank collection rounds. For the UBS_EBXX_WHIRL sample, 24 ounces of soil would contact 6, 2-ounce whirl-paks and 3, 4-ounce whirl-paks. For the UBS_EBXX_PAN sample, assume an estimated 36 ounces of soil would come into contact with three sets of sampling equipment. For the UBS_EBXX_JAR sample, 12 ounces of soil would contact 3, 4-ounce amber jars.

3) The third assumption is that the absolute mass of the analyte derived from the first assumption, which will be assumed to have come entirely from the set of sampling equipment or containers that was rinsed, would have been completely entrained in the approximate volume of soil (in ounces), as estimated in the second assumption, that would have come into contact with the rinsed set of sampling equipment or containers.

With the second and third assumptions, the absolute mass of the analyte derived from the calculation resulting from the first assumption is divided by the *mass of soil* that would have come into contact with the rinsed set of sampling equipment or containers (as estimated above in the second assumption). A conversion factor of 1 U.S. fluid ounce = 29.5735 cubic centimeters (cm^3) may be used to convert from ounces to cm^3. An average or typical bulk mass dry density for soil may then be used to convert from cm^3 to grams (g) mass of soil. Conservatively, the bulk mass dry density of clay, 1.2 g/cm^3, is used (see table at right). These calculations will produce a soil-equivalent mass/mass unit value for the equipment rinsate blank sample against which actual environmental soil sample results can be compared.

TABLE 2.1 Typical Values of Dry Density of Various Soil Types and Concrete

Soil Type	Dry Density, ρ_b (g/cm^3)
Sand	1.52
Sandy loam	1.44
Loam	1.36
Silt loam	1.28
Clay loam	1.28
Clay	1.20
Concrete	2.40

Note: The dry density of most soils varies within the range of 1.1-1.6 g/cm^3 (Hillel 1980b).

Sources: Linsley et al. (1982); Poffijn (1988).

Of course, careful consideration should be given to this comparison and how the soil sample results should be qualified relative to the soil-equivalent mass/mass equipment blank results. All available information, including the assumptions provided here, should be used in assessing how likely that environmental soil sample results are representative of the environment sampled as opposed to resulting from influence from the sampling protocol and the sampling equipment used.

This comparison will result in one of the data validation actions listed in Table 3. Findings resulting from this comparison and the actions taken will be reported in the trip report generated for each city and in the all-city comprehensive report.

Table 3. Equipment Rinsate Blank Actions on Soil Sample Data

Converted Rinsate Blank Result as Compared to Sample Result	Data Validation Action on Sample Result
Blank > Sample	Qualify as unusable (R)
Blank < Sample < 5X Blank	Report as non-detected (U) at Sample level
5X Blank < Sample < 10X Blank	Qualify as estimated, biased high (J+)
10X Blank < Sample	No qualification

TETRA TECH

February 11, 2016

Addendum 2 to Appendix J: Quality Assurance Project Plan
Urban Background Study
EPA Contract No. EP-S4-14-03
TTD No. TT-12-001

Steps will be taken to ensure equipment used for this study is free of contaminants and that the decontamination procedure eliminates cross-contamination during sample collection, handling, and preparation. **This addendum addresses the calculations that will be performed to determine if the results from those rinsate samples that are collected by each field team bear any impact on the results for soil samples collected using the equipment.** Sampling equipment used repeatedly must be decontaminated before reuse. Table 1 list the field equipment rinsate blank samples that should be collected by the field teams, and their frequencies of collection.

Table 1. Rinsate Samples to Be Collected in the Field and Associated Field Equipment

Rinsate Blank Example Designation	Frequency of Collection	Analysis Parameters	Associated Sampling Devices	Use During Field Event	Field Cleaning
FIELD TEAM RINSATE BLANK QC SAMPLES					
LOU-EB-ALPHA	1/team/city	Inorganics and Organics	Turf Profile Sampler	Repeated use	Decon after each sample
			Aluminum Sub-sampler		

EQUIPMENT BLANK ASSUMPTIONS AND ACTIONS

To compare for quality control purposes the environmental soil sample analytical results to aqueous equipment blank analytical results, the equipment blank results will be converted from aqueous mass/volume units to soil-equivalent mass/mass units using the following assumptions.

1) The first assumption is that roughly *only enough* water is used to rinse a set of unused sampling equipment to produce an approximate 2-liter aqueous equipment rinsate blank sample that is split into two 1-liter volumes for analysis for RCRA metals and PAHs. The important thing to know is the *total volume of water used to rinse the equipment*, and not just the volumes that were submitted for analysis. With this assumption, the analytically-determined concentration of an analyte in the equipment rinsate blank is converted to an absolute mass of the analyte by taking the product of its concentration with a total equipment rinsate blank sample volume of 2 liters.

2) The second assumption is that an estimated 12 ounces of soil is collected from the environment for each soil sample, and that this is the *total volume of collected soil that comes into contact with the sampling equipment* during sampling (rather than just the volumes of soil that were submitted for analysis).

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3) The third assumption is that the absolute mass of the analyte derived from the first assumption, which will be assumed to have come entirely from the set of sampling equipment that was rinsed, was completely entrained in this approximate 12 ounces of collected soil.

With the second and third assumptions, the absolute mass of the analyte derived from the calculation resulting from the first assumption is divided by the *mass of soil* that was collected from the environment for each sample (equivalent to approximately 12 ounces). A conversion factor of 1 U.S. fluid ounce = 29.5735 cubic centimeters (cm^3) may be used to convert from ounces to cm^3. An average or typical bulk mass dry density for soil may then be used to convert from cm^3 to grams (g) mass of soil. Conservatively, the bulk mass dry density of clay, 1.2 g/cm^3, is used (see table at right). These calculations will produce a soil-equivalent mass/mass unit value for the equipment rinsate blank sample against which actual environmental soil sample results can be compared.

TABLE 2.1 Typical Values of Dry Density of Various Soil Types and Concrete

Soil Type	Dry Density, ρ_b (g/cm^3)
Sand	1.52
Sandy loam	1.44
Loam	1.36
Silt loam	1.28
Clay loam	1.28
Clay	1.20
Concrete	2.40

Note: The dry density of most soils varies within the range of 1.1-1.6 g/cm^3 (Hillel 1980b).

Sources: Linsley et al. (1982); Poffijn (1988).

Of course, careful consideration should be given to this comparison and how the soil sample results should be qualified relative to the soil-equivalent mass/mass equipment blank results. All available information, including the assumptions provided here, should be used in assessing how likely that environmental soil sample results are representative of the environment sampled as opposed to resulting from influence from the sampling protocol and the sampling equipment used.

This comparison will result in one of the data validation actions listed in Table 3. Findings resulting from this comparison and the actions taken will be reported in the trip reports generated for each city and in the all-city comprehensive report.

Table 3. Equipment Rinsate Blank Actions on Soil Sample Data

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TETRA TECH

February 11, 2016

Addendum 3 to Appendix J: Quality Assurance Project Plan
Urban Background Study
EPA Contract No. EP-S4-14-03
TTD No. TT-12-001

Steps will be taken to ensure equipment used for this study is free of contaminants and that the decontamination procedure eliminates cross contamination during sample collection, handling, and preparation. **This addendum addresses the calculations that will be performed to determine if the results from those rinsate samples collected by the EPA lab in Las Vegas, Nevada bear any impact on the results for soil samples that were processed by the equipment used at the EPA Las Vegas lab.** Sampling equipment used repeatedly must be decontaminated before reuse. Table 1 list the field equipment rinsate blank samples that should be collected by the EPA Las Vegas lab, and their frequencies of collection.

Table 1. Rinsate Samples to Be Collected at the EPA Las Vegas Lab and Associated Equipment

Rinsate Blank Example Designation	Proposed Collection Frequency	Analysis Parameters	Associated Devices	Use During Processing	Cleaning
LAB TEAM RINSATE BLANK QC SAMPLES					
LOU-EB-VEGAS	1/20 samples	Inorganics	Pan Riffle Splitter Scoop Sieve	Repeated use	Decon after each sample

EQUIPMENT BLANK ASSUMPTIONS AND ACTIONS

To compare for quality control purposes the environmental soil sample analytical results to aqueous equipment blank analytical results, the equipment blank results will be converted from aqueous mass/volume units to soil-equivalent mass/mass units using the following assumptions.

1) The first assumption is that roughly *only enough* water is used to rinse a set of unused sample processing equipment to produce an approximate 1-liter aqueous equipment rinsate blank sample for analysis for RCRA metals. The important thing to know is the *total volume of water used to rinse the equipment*, and not just the volume that is submitted for analysis. With this assumption, the analytically-determined concentration of an analyte in the equipment rinsate blank is converted to an absolute mass of the analyte by taking the product of its concentration with a total equipment rinsate blank sample volume of 1 liter.

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2) The second assumption is that each sample that is processed using a set of equipment contains an estimated 4 ounces of soil, and that this is the *total volume of soil that comes into contact with the sample processing equipment* during the sub-sampling process (rather than just the volume of soil that was ultimately submitted for analysis).

3) The third assumption is that the absolute mass of the analyte derived from the first assumption, which will be assumed to have come entirely from the set of sample processing equipment that was rinsed, was completely entrained in this approximate 4 ounces of processed soil.

With the second and third assumptions, the absolute mass of the analyte derived from the calculation resulting from the first assumption is divided by the *mass of soil* that was processed for each sample (equivalent to approximately 4 ounces). A conversion factor of 1 U.S. fluid ounce = 29.5735 cubic centimeters (cm^3) may be used to convert from ounces to cm^3. An average or typical bulk mass dry density for soil may then be used to convert from cm^3 to grams (g) mass of soil. Conservatively, the bulk mass dry density of clay, 1.2 g/cm^3, is used (see table at right). These calculations will produce a soil-equivalent mass/mass unit value for the equipment rinsate blank sample against which actual environmental soil sample results can be compared.

TABLE 2.1 Typical Values of Dry Density of Various Soil Types and Concrete

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Note: The dry density of most soils varies within the range of 1.1-1.6 g/cm^3 (Hillel 1980b).

Sources: Linsley et al. (1982); Poffijn (1988).

Of course, careful consideration should be given to this comparison and how the soil sample results should be qualified relative to the soil-equivalent mass/mass equipment blank results. All available information, including the assumptions provided here, should be used in assessing how likely that environmental soil sample results are representative of the environment sampled as opposed to resulting from influence from the sampling protocol and the sampling equipment used.

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APPENDIX K

HEALTH AND SAFETY PLAN

Location: Various Cities EPA Region 4 States	**Client Contact: Brian Schumacher/ Felicia Barnett**	**Telephone: 702-798-2242**
EPA ID No. NA	**Prepared By:John Riedlinger**	**Date Prepared: 9/24/2015**
Project No. TT-12-001	**Dates of Activities: 9/28/2012 -2/29/2016** (HASP is not valid for periods longer than 12 months)	**Emergency Response** ☐ Yes ☒ No

Objectives:

The primary purpose of this study is to collect data that will provide the necessary context to understand the background concentrations and distributions of urban contaminants in the selected cities located in participating EPA Region 4 states.

Site Type: *Check as many as applicable.*

☐ Active	☐ Landfill	☒ Inner-City
☐ Inactive	☐ Railroad	☐ Rural
☐ Secured	☒ Residential	☐ Remote
☒ Unsecured	☒ Industrial	☐ Other (*specify*)

Project Scope of Work and Site Background

This project is a joint effort between EPA Region 4, EPA's Office of Research and Development (ORD), and states within EPA Region 4; this project is funded by an ORD Regional Applied Research Effort (RARE) grant.

Urban areas that have been heavily impacted by human activity for decades may contribute to an overall higher localized level of some contaminants that are not related to any specific spills or releases. Soil samples collected in any large, long-established city may contain elevated levels of certain contaminants, such as metals and polynuclear aromatic hydrocarbons (PAH), that are commonly referred to as "urban background" or "anthropogenic background." Because these increased contaminant concentrations are to the result of urban activity and not specific site releases, it can be challenging to account for the contribution to urban background at sites where investigation, remediation, and risk management of contaminated media are occurring.

The primary purpose of this study is to collect data that will provide the necessary context to understand the background concentrations and distributions of urban contaminants in selected cities located in participating EPA Region 4 states. Another goal of this project is to develop a consistent and robust data collection and analysis process that can be replicated in other states, EPA regions, and tribal lands.

Health and Safety Approver Comments or Additional Instructions: Urban areas can be dangerous. Use the buddy system at all times and ensure that phones remain charged. A draft SWP regarding dangerous and aggressive animals is attached. Although, samples are collected by hand from shallow depths (~4" bgs), it is recommened that the sample location be inspected and, if possible, the soil be probed with a stick, plasic fork or similar nonconductive probe to identify any subsurface debris, utilities, etc. that me present a hazard to the sampler.

Health and Safety Plan Approver Signature: Chris Draper **Date:** APPROVED By Chris Draper at 12:11 pm, Sep 27, 2015

Note: A minimum of two persons with appropriate training and medical surveillance must be on site for any fieldwork subject to Level 2 HASP requirements.

Initial Isolation and Protective Action Distances (for emergency response operations only):

Establishment of Work Zones; including exclusion, contamination reduction, and support zones; is required for ALL HAZWOPER projects. Non-HAZWOPER, however, each work area/sampling location should be inspected and any recognized physical or biological hazards clearly-communicated to the field team and controlled to the extent practicable.

See the SAP/QAPP for specific waste management practices to be followed regarding IDW, spent PPE, etc.

Spill control shall be conducted in accordance with the requirements of SWP 5-14, *Spill and Discharge Control Practices*.

Wind Speed and Direction (approach from upwind) Use www.weather.com or www.wunderground.com		**Temperature (ºF)**	**Relative Humidity (%)**	**Probability of Precipitation (%)**	**Weather Forecast (such as partly cloudy, snow, etc.)**
Speed (mph):	**From Direction:**				

Capture weather information daily on Tailgate Safety Briefing form or in site logbook

On-Site Supplies: ☒ First Aid Kit ☐ Fire Extinguisher ☐ Air Horn ☐ Oral Thermometer ☐ Noise Dosimeter

Known or Anticipated Site Hazards or Concerns:

☒ Work on active roadway	☐ Overhead utilities	☐ Energized electrical systems
☐ Work over or near water	☒ Buried Utilities	☒ Portable hand tool use
☐ Explosion or fire hazard	☐ Surface or underground storage tanks	☐ Portable electrical tool use
☐ Oxygen deficiency	☒ General slips, trips, falls	☐ Machine guarding
☐ Unknown or poorly characterized chemical hazards	☒ Uneven, muddy, rugged terrain	☐ Portable fire extinguisher use
☐ Inorganic chemicals	☐ Lift (man lift, cherry picker) use	☐ Driving personal vehicles
☐ Organic chemicals	☐ Industrial truck (forklift) use	☐ All-terrain vehicle use
☐ Asbestos	☐ Wood or metal ladder use	☐ Injury and Illness Prevention Program (California only)
☐ Respirable particulates	☐ Dangerous goods shipped by air	☐ Ergonomics (California only)
☐ Respirable silica	☐ Elevated work (over 6’ high)	☐ Work in strip or shaft mines
☐ Blasting and explosives	☐ Heavy equipment use or operation	☐ Client-specific safety requirements (attach to HASP)
☐ Non-ionizing radiation (lasers, UV)	☐ Construction work	☐ Confined space entry and/or rescue
☐ Ionizing radiation (alpha, beta, gamma, etc.)	☐ Excavation or trenching	☐ Methamphetamine lab
☒ Heat stress	☐ Benching, shoring, bracing	☒ Biological hazards (i.e. ticks, snakes, poisouos plants)
☒ Cold stress	☐ Scaffold use	☐ Mold
☒ Sun Exposure	☐ High noise	☐ *Other (insert)*

Explosion or Fire Potential: ☐ High ☐ Medium ☒ Low ☐ Unknown

Chemical Products Tetra Tech EM Inc. Will Use or Store On Site: (Attach a Material Safety Data Sheet [MSDS] for each item.)

☒ Alconox or Liquinox	☐ Calibration gas (Methane)	☐ Hydrogen gas	☐ Isopropyl alcohol
☐ Hydrochloric acid (HCl)	☐ Calibration gas (Isobutylene)	☐ Household bleach (NaOCl)	☐ HazCat Kit
☒ Nitric acid (HNO_3)	☐ Calibration gas (4-gas mixture)	☐ Sulfuric acid (H_2SO_4)	☐ Mark I Kits (*number?*) _____
☐ Sodium hydroxide (NaOH)	☒ Eyewash solution (potable water)	☐ Hexane	☐ Other (*specify*) _____

WARNING: Eyewash solution shall be readily available on ALL projects where corrosives (acids or bases) are used, including sample preservatives

Applicable Safety Programs and Safe Work Practices (SWP). Attach to HASP:

- ☒ DCN 2-04 Hearing Conservation Program (always checked)
- ☐ DCN 4-05 Trenching and Excavation Safety
- ☐ DCN 4-08 Asbestos Protection Program
- ☐ DCN 4-09 Haulage and Earth Moving
- ☐ DCN 4-10 Lead Protection Program
- ☒ SWP DCN 5-01 General Safe Work Practices
- ☐ SWP DCN 5-02 General Safe Work Practices HAZWOPER
- ☐ SWP DCN 5-03 Safe Work Practices for Office Employees
- ☐ SWP DCN 5-04 Safe Drilling Practices
- ☐ SWP DCN 5-05 Safe Direct Push (GeoProbe) Practices
- ☐ SWP DCN 5-06 Working Over or Near Water
- ☐ SWP DCN 5-07 Use of Heavy Equipment
- ☐ SWP DCN 5-08 Special Site Hazards (Firearms, Remote Sites, Mines, aircraft, etc.)
- ☐ SWP DCN 5-09 Safe Electrical Work Practices
- ☐ SWP DCN 5-10 Fall Protection Practices
- ☐ SWP DCN 5-11 Portable Ladder Safety
- ☐ SWP DCN 5-12 Drum and Container Handling Practices
- ☐ SWP DCN 5-13 Flammable Hazards and Ignition Sources
- ☒ SWP DCN 5-14 Spill and Discharge Control Practices (always checked)
- ☒ SWP DCN 5-15 Heat Stress
- ☒ SWP DCN 5-16 Cold Stress
- ☒ SWP DCN 5-17 Biohazards
- ☐ SWP DCN 5-18 Underground Storage Tank Removal Practices
- ☒ SWP DCN 5-19 Safe Lifting Procedures
- ☐ SWP DCN 5-22 Hydrographic Data Collection
- ☒ SWP DCN 5-26 Prevention of Sun Exposure
- ☐ SWP DCN 5-27 Respirator Cleaning Practices
- ☐ SWP DCN 5-28 Safe Use Practices for Use of Respirators
- ☐ SWP DCN 5-35 Underground Utilities, including 5-35F, Ground Disturbance Permit
- ☐ SWP DCN 5-36 Drill Rigs
- ☒ SWP 05-51 Hand Tools
- ☒ SWP DCN 5-XX Dangerous and Aggressive Animals_DRAFT

Tasks Performed At Job Site that are NOT Covered by SWPs

NOTE: Many AHA's can be found on the Health & Safety intranet site at: https://int.tetratech.com/sites/EMI/hs/Activity%20Hazard%20Analysis%20Documents/Forms/AllItems.aspx

Attach Activity Hazard Analysis (AHA) for each non-covered task

- ☒ Turf Sampling
- ☐ (non-covered task)
- ☐ (non-covered task)
- ☐ (non-covered task)
- ☐ (non-covered task)

Tetra Tech Employee Training and Medical Requirements:

Basic Training and Medical

- ☐ Initial 40 Hour Training
- ☐ 8-Hour Supervisor Training (one-time)
- ☐ Current 8-Hour Refresher Training
- ☐ Current Medical Clearance (including respirator use)
- ☐ Current First Aid Training and CPR Training
- ☐ Current Respirator Fit-Test

Other Specific Training and Medical Surveillance Requirements

- ☐ Confined Space Training
- ☐ Level A Training
- ☐ Radiation Training
- ☐ OSHA 10-hour Construction Safety Training
- ☐ OSHA 30-hour Construction Safety Training
- ☐ Asbestos Awareness Training
- ☐ Asbestos B-Reader X-Ray
- ☐ Blood Lead Level and ZPP Pre, during and Post-Project
- ☐ Urinary Arsenic Level Pre and Post-Project
- ☐ Other _____
- ☐ Other _____

Materials Present or Suspected at Site	Highest Observed Concentration (specify units and sample medium)	Exposure Limit (specify ppm or mg/m^3)	IDLH Level (specify ppm or mg/m^3)	Primary Hazards of the Material (explosive, flammable, corrosive, toxic, volatile, radioactive, biohazard, oxidizer, or other)	Symptoms and Effects of Acute Exposure	Photoionization Potential (eV)
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
Specify Information Sources:						

Note: In the Exposure Limit column, include Ceiling (C) and Short-Term Exposure Limits (STEL) if they are available. Also, use the following short forms and abbreviations to complete the table above.

A = Air
Ca = Carcinogenic
eV = Electron volt
U = Unknown

IDLH = Immediately dangerous to life or health
mg/m^3 = Milligram per cubic meter
NA = Not available
NE = None established

PEL = Permissible exposure limit
ppm = Part per million
REL = Recommended exposure limit
S = Soil

TLV = Threshold limit value
GW = Groundwater
SW = Surface water
Sed = Sediment

Note: If no contingency level of protection is selected, all employees covered under this plan must evacuate the immediate site area if air contaminant levels require upgrading PPE. Level A field work typically requires a Level 3 HASP. This information is available on the chemical hazards page of this HASP.

Field Activities Covered Under this HASP:

Task Description	Level of Protection[1]		Date of Activities
	Primary	Contingency	
1 Site walkthrough, visual assessment, photograph and documentation	☐ A ☐ B ☐ C ☒ D	☐ A ☐ B ☐ C ☐ D	
2 Turf sample collection	☐ A ☐ B ☐ C ☒ D	☐ A ☐ B ☐ C ☐ D	
3	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
4	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
5	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	

Site Personnel and Responsibilities (include subcontractors):

Employee Name and Office Code / Location	Task(s)	Responsibilities
Didi Fung		• Project Manager: Manages the overall project, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with client as necessary. Additionally, For projects lasting longer than one consecutive week on-site, the PM is responsible for conducting one field audit using Form AF-1.
TBD at pre job meeting in each city.		• Field Team Leader: Directs field activities, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with the Project Manager and the client as necessary
TBD at pre job meeting in each city.		• Site Safety Coordinator (SSC): Ensures that appropriate personal protective equipment (PPE) is available, enforces proper use of PPE by on-site personnel and subcontractors; suspends investigative work if personnel are or may be exposed to an immediate health hazard; implements and enforces the HASP; identifies and controls site hazards when possible; communicates site hazards to all personnel; and reports any deviations observed from anticipated conditions described in the health and safety plan to the health and safety representative.
		• Alternate Site Safety Coordinator (if any)
Sherry Weedman, Dale Von Busch, Brian Vasser, Helen Mayoral, ToddTaylor, Eric Huss		• Field Personnel: Completes tasks as directed by the project manager, field team leader, and SSC, and follows the HASP and all SWPs and guidelines established in the Tetra Tech, Inc., Health and Safety Manual.
		• Tetra Tech-hired subcontractor personnel on site (a subcontract SSC MUST be identified by name): Completes tasks as outlined in the project scope of work in accordance with the contract. Participates in all Tetra Tech on-site safety meetings and follows all procedures and guidelines established in this HASP, as well as the company health and safety plan and program.

Note:
1. See next page for details on levels of protection

NOTE: Contingency level of protection section should be completed only if the upgraded level of protection is immediately available at the job site. If no contingency level of protection is denoted, all employees covered under this HASP must evacuate the immediate site area if air contaminant levels would require an upgrade of PPE.

Protective Equipment: (Indicate type or material as necessary for each task.)

Task	Primary Level of Protection (A,B,C,D)	PPE Component Description (Primary)	Contingency Level of Protection (A, B, C, D)	PPE Component Description (Contingency)
1	D	Respirator type: none Cartridge type (if applicable): none CPC material: none Glove material(s): Nitrile Boot material: safety-toe boots Other: safety glasses, hardhat (as neeed), Class 2 or better high-visibilty vests	D	Modify level D ensemble as appropriate based on site conditions (i.e. rain, snow, mud, etc.)
2	D	Respirator type: none Cartridge type (if applicable): none CPC material: none Glove material(s): Nitrile Boot material: safety-toe boots Other: safety glasses, hardhat (as neeed), Class 2 or better high-visibilty vests	D	Modify level D ensemble as appropriate based on site conditions (i.e. rain, snow, mud, etc.)
3		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: '		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: '
4		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: '		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: '
5		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: '		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: '

Respirator Notes:
Respirator cartridges may only be used for a maximum time of 8 hours or one work shift, whichever is less, and must be discarded at that time. For job sites with organic vapors, respirator cartridges may be used as described in this note as long as the concentration is less than 200 parts per million (ppm), the boiling point is greater than 70 °Celsius, and the relative humidity is less than 85 percent. If any of these levels are exceeded, a site-specific respirator cartridge change-out schedule must be developed and included in the HASP using Tetra Tech Form RP-2 (Respiratory Hazard Assessment Form)

Notes:
All levels of protection must include eye, head, and foot protection.
CPC = Chemical protective clothing
Thermoluminescent Dosimeter (TLD) Badges must be worn during all field activities on sites with radiation hazards. TLDs must be worn under CPC.

Monitoring Equipment: All monitoring equipment on site must be calibrated before and after each use and results recorded in the site logbook				
Instrument (Check all required)	**Task**	**Instrument Reading**	**Action Guideline**	**Comments**
☐ Combustible gas indicator model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	0 to 10% LEL	Monitor; evacuate if confined space	
		10 to 25% LEL	Potential explosion hazard; notify SSC	
		>25% LEL	Explosion hazard; interrupt task; evacuate site; notify SSC	
☐ Oxygen meter model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	>23.5% Oxygen	Potential fire hazard; evacuate site	
		23.5 to 19.5% Oxygen	Oxygen level normal	
		<19.5% Oxygen	Oxygen deficiency; interrupt task; evacuate site; notify SSC	
☐ Radiation survey meter model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Normal background	Proceed	Annual exposure not to exceed 1,250 mrem per quarter Background reading must be taken in an area known to be free of radiation sources.
		Two to three times background	Notify SSC	
		>Three times background	Radiological hazard; interrupt task; evacuate site; notify RSO	
☐ Photoionization detector model: ☐ 11.7 eV ☐ 10.6 eV ☐ 10.2 eV ☐ 9.8 eV ☐ Other (specify): _____	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Any response above background to 5 ppm above background	Level B is recommended Level C[a] may be acceptable	These action levels are for unknown gases or vapors. After the contaminants are identified, action levels should be based on the specific contaminants involved.
		> 5 to 500 ppm above background	Level B	
		> 500 ppm above background	Level A	
☐ Flame ionization detector model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Any response above background to 5 ppm above background	Level B is recommended Level C[a] may be acceptable	These action levels are for unknown gases or vapors. After the contaminants are identified, action levels should be based on the specific contaminants involved.
		>5 to 500 ppm above background	Level B	
		>500 above background	Level A	
☐ Detector tube models:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify: < 1/2 the PEL > 1/2 the PEL	Specify:	The action level for upgrading the level of protection is one-half of the contaminant's PEL. If the PEL is reached, evacuate the site and notify a safety specialist
☐ Other (specify):	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify:	Specify:	

Notes:
eV= electron volt LEL=Lower explosive limit mrem=Millirem PEL=Permissible exposure limit ppm=Part per million
a. Level B is required when chemical hazards are present, but are uncharacterized. Level C may be acceptable for certain tasks in some situations. If you are uncertain, consult your Safety Manager.

Project-Specific Industrial Hygiene Requirements

OSHA-Regulated Chemicals*:

Check any present on the job site in any medium (air, water, soil)

- ☒ No chemicals below are located on the job site
- ☐ Friable Asbestos
- ☐ Silica, crystalline
- ☐ alpha-Napthylamine
- ☐ Methyl chloromethyl ether
- ☐ 3,3'-Dichlorobenzidine (and its salts)
- ☐ bis-Chloromethyl ether
- ☐ beta-Napthylamine
- ☐ Benzidine
- ☐ 4-Aminodiphenyl
- ☐ Ethyleneimine
- ☐ beta-Propiolactone
- ☐ 2-Acetylaminoflourene
- ☐ 4-Dimethylaminoazobenzene
- ☐ N-nitrosomethylamine
- ☐ Vinyl chloride
- ☐ Inorganic arsenic
- ☐ Lead
- ☐ Chromium (VI)
- ☐ Cadmium
- ☐ Benzene
- ☐ Coke oven emissions
- ☐ 1,2-Dibromo-3-chloropropane
- ☐ Acrylonitrile
- ☐ Ethylene oxide
- ☐ Formaldehyde
- ☐ Methylenedianiline
- ☐ 1,3-Butadiene
- ☐ Methylene chloride

* NOTE: Many states, including California and New Jersey, have chemical-specific worker protection requirements and standards for many chemicals and known or suspected carcinogens.

Emergency Contacts:	**Telephone No.**
WorkCare and Incident Intervention	888.449.7787, or 800.455.6155
Tetra Tech EMI 24-hour Anonymous Hazard Reporting Line	866.383.8070
U.S. Coast Guard National Response Center	800.424.8802
InfoTrac	800.535.5053
Poison Control	800.222.1222
Fire department	911
Police department	911

Personnel Call-Down List:

Job Title or Position:	**Name**	**Cell Phone:**
Safety Manager	Chris Draper	615-969-1334
Project Manager:	Didi Fung	678-775-3095
Field Team Leader:		
Site Safety Coordinator (SSC):		
Subcontractor SSC:		

Medical and Site Emergencies:

Signal a site or medical emergency with three blasts of a loud horn (car horn, fog horn, or similar device). Site personnel should evacuate to the area of safe refuge designated on the site map.

Hospital Name: No hospital route due to multiple sample locations in various cities.

Address:

General Phone:

Emergency Phone: 911

Ambulance Phone: 911

Hospital called to verify emergency services are offered? YES ☐ NO ☐

Reference site maps included for each city, but rely on cell phones for directions to nearest facility with the approproriate level of healthcare services available.

Note: This page must be posted on site.

Decontamination Procedures

The site safety coordinator overseas implementation of project decontamination procedures and is responsible for ensuring they are effective.

Personnel Decontamination

Level D Decon - ☐ Wet ☒ Dry

Level C Decon - ☐ Wet ☐ Dry

Level B Decon – Briefly outline the level B decontamination methods to be used on a separate page attached to this HASP.

Level A Decon – A Level 3 HASP is required. Notify your Safety Manager.

Equipment Decontamination

All tools, equipment, and machinery from the Exclusion Zone (hot) or Contamination Reduction Zone (warm) are decontaminated in the CRZ before they are removed to the Support Zone (cold). Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure, cross-contamination, and chemical incompatibilities.

Respirator Decontamination

Respirators are decontaminated in compliance with SWP 5-27 and should be included with this HASP.

Waste Handling for Decontamination

Procedures for decontamination waste disposal meet all applicable local, state, and federal regulations.

Decontamination Equipment

- ☒ Washtubs
- ☒ Buckets
- ☒ Scrub brushes
- ☐ Pressurized sprayer
- ☒ Detergent [Type]
- ☐ Solvent [Type]
- ☐ Household bleach solution

  Concentration/Dilution: _____
- ☒ Deionized water
- ☐ Disposable sanitizer wipes
- ☐ Potable eyewash/drench/wash water
- ☐ Wire brush
- ☒ Spray bottle
- ☐ Tubs / pools
- ☐ Banner/barrier tape
- ☐ Plastic sheeting
- ☐ Tarps and poles
- ☒ Trash bags
- ☐ Trash cans
- ☐ Duct tape
- ☒ Paper towels
- ☐ Folding chairs
- ☐ Other

Emergency Response Planning

During the pre-work briefing and daily tailgate safety meetings, all on-site employees will be trained in the provisions of emergency response planning, site communication systems, and site evacuation routes.

In the event of an emergency that necessitates evacuation of a work task area or the site, the following procedures will take place.

- The Tetra Tech SSC will contact all nearby personnel using the on-site communications to advise the personnel of the emergency.
- The personnel will proceed along site roads to a safe distance upwind from the hazard source.
- The personnel will remain in that area until the SSC or an authorized individual provides further instructions.

In the event of a severe spill or a leak, site personnel will follow the procedures listed below.

- Evacuate the affected area and relocate personnel to an upwind location.
- Inform the Tetra Tech SSC, a Tetra Tech office, and a site representative immediately.
- Locate the source of the spill or leak, and stop the flow if it is safe to do so.
- Begin containment and recovery of spilled or leaked materials.
- Notify appropriate local, state, and federal agencies.

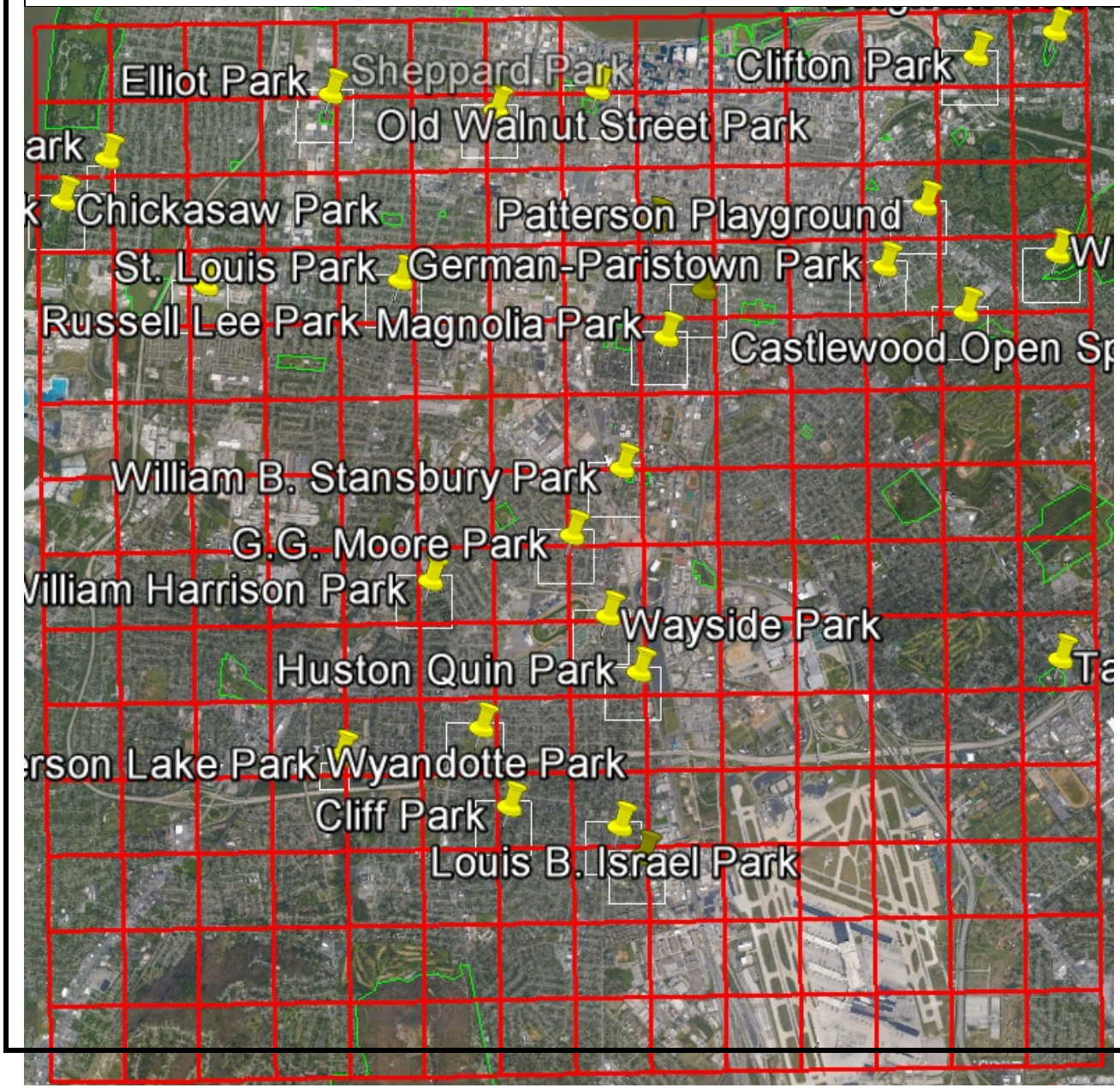
In the event of severe weather, site personnel will follow the procedures listed below.

- Site work shall not be conducted during severe weather, including high winds and lightning.
- In the event of severe weather, stop work, lower any equipment (drill rigs) and evacuate the affected area.
- Severe weather may cause heat or cold stress. Refer to SWPs 5-15 and 5-16 for additional information.

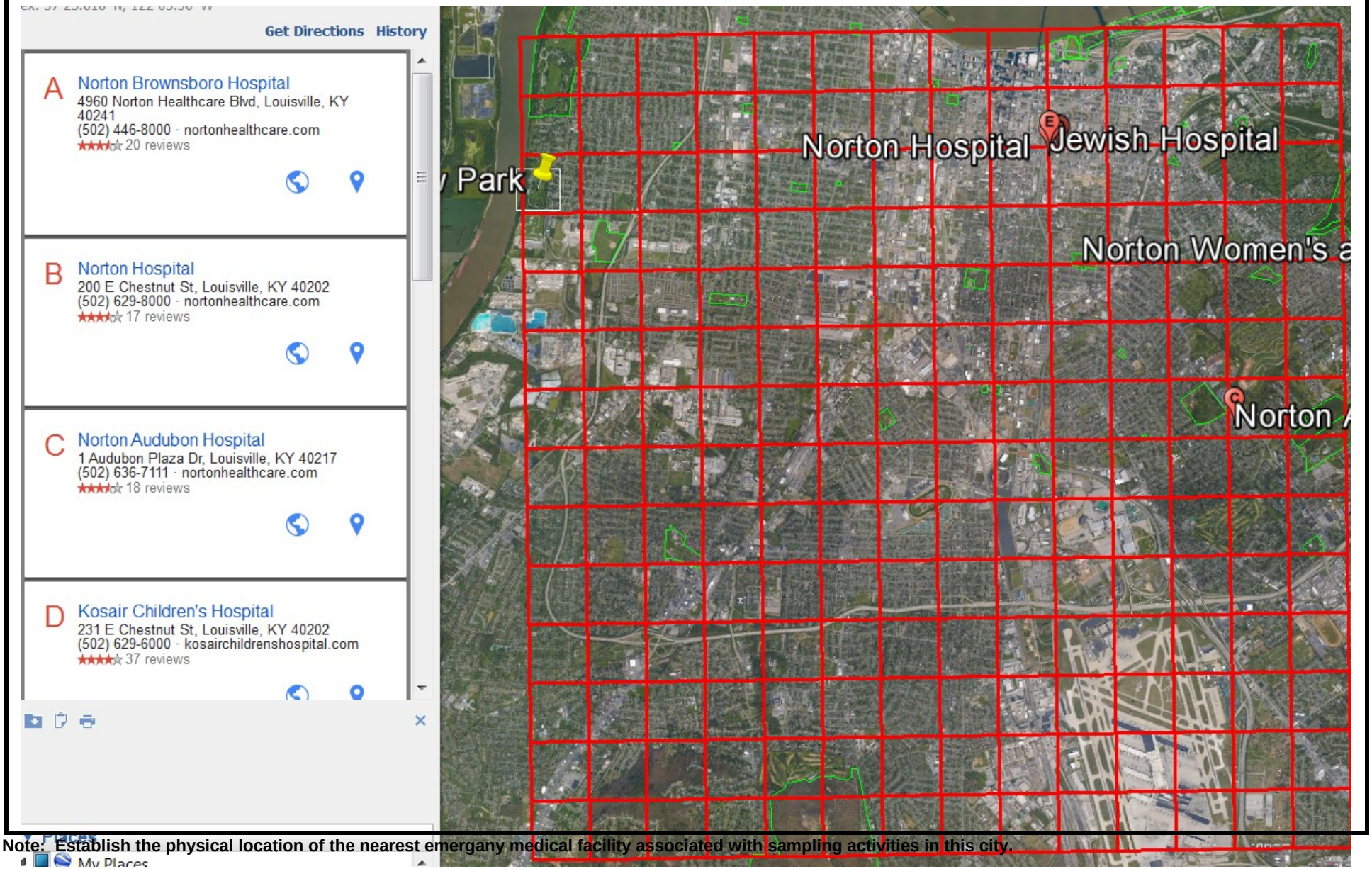
All personnel working on Tetra Tech projects are expected to and responsible for reporting ANY unsafe conditions, behaviors or incidents -- including injuries, illnesses, fires, spills/releases, property damages and near-misses -- they face or encounter while performing their work. According to TtEMI's reporting procedures, for non-emergency incidents you should:

- Notify WorkCare and Incident Intervention at 888.449.7787, or 800.455.6155
- Notify your Office, Project or Safety Manager via phone immediately.
- Complete a "Tetra Tech Incident Report" (Form IR) within 24 hours and send it to your Safety Manager. If an injury or illness has occurred, the Form IR-A must also be completed.
- Additional reports may be necessary

Louisville, KY Site Map

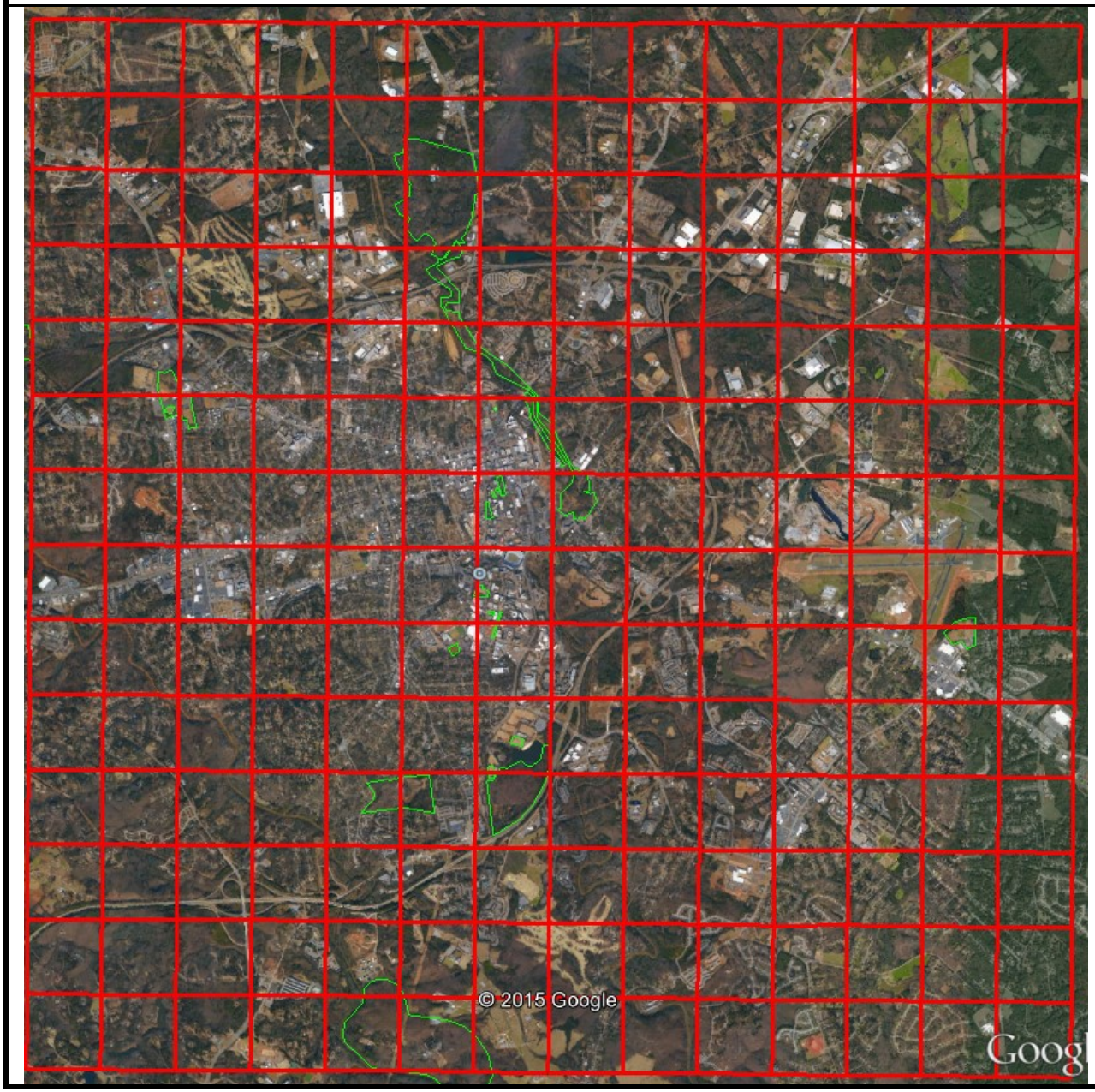


Louisville, KY Hospital Map

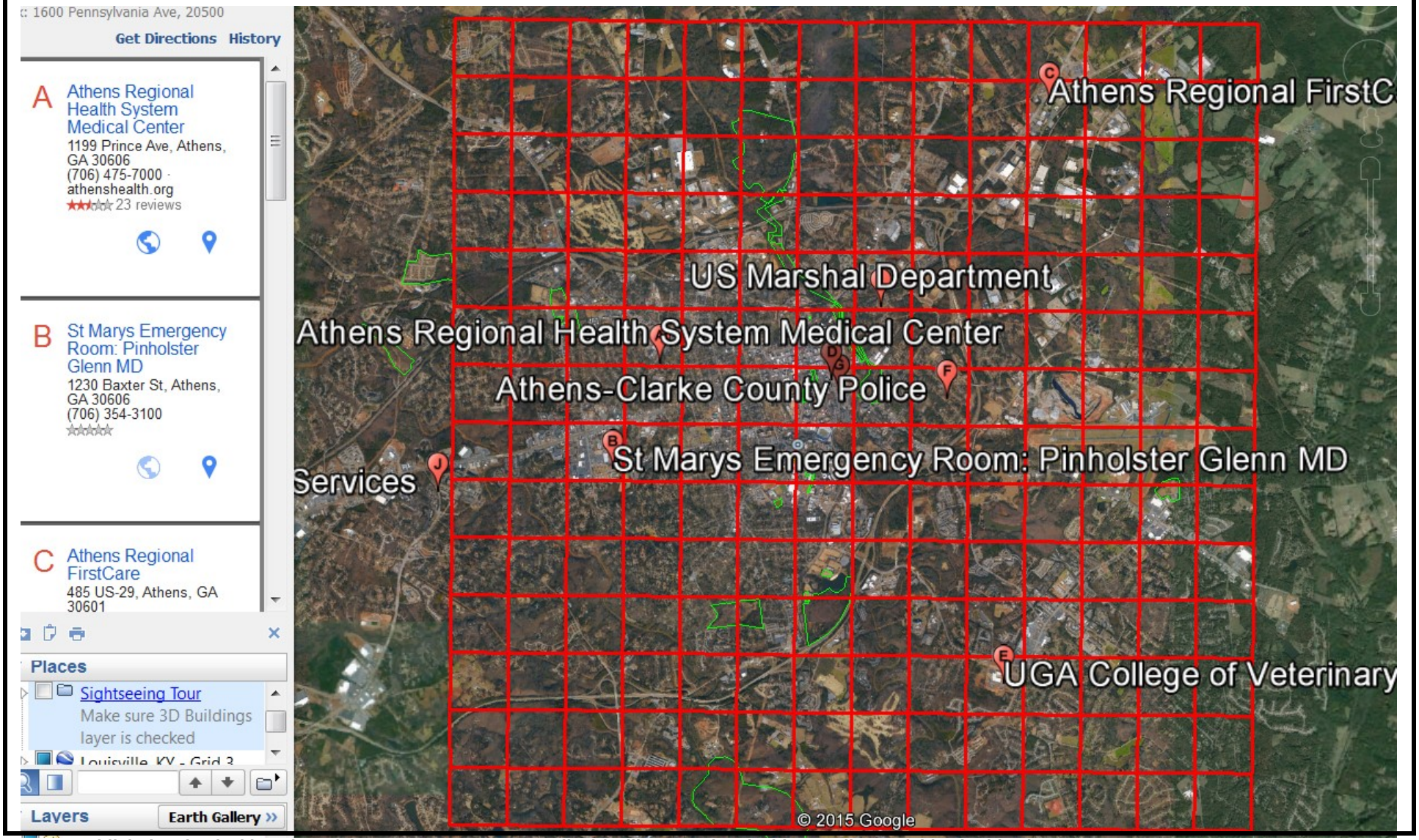


Note: Establish the physical location of the nearest emergany medical facility associated with sampling activities in this city.

Athens, GA Site Map

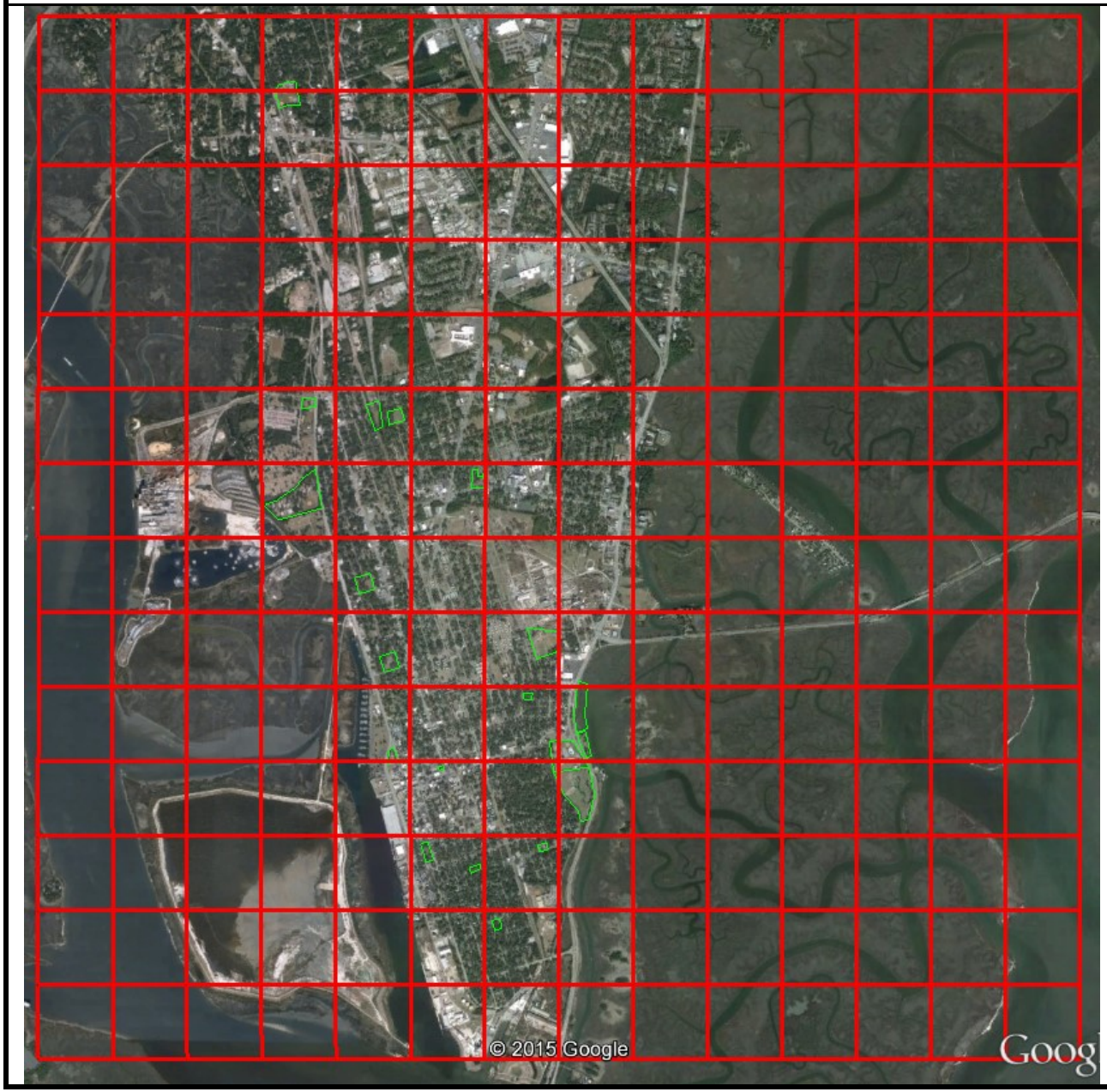


Athens, GA Hospital Map

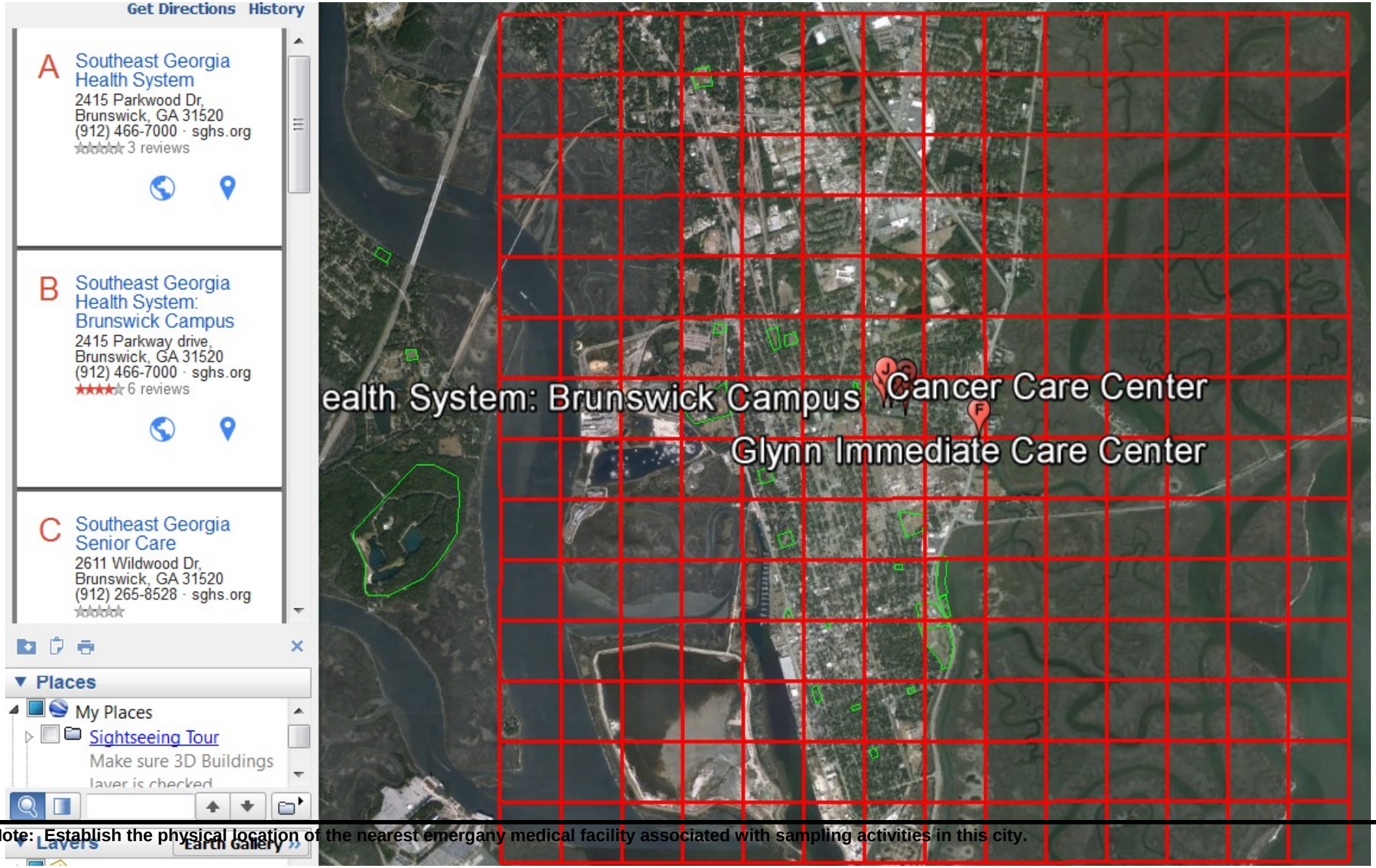


Note: Establish the physical location of the nearest emergany medical facility associated with sampling activities in this city.

Brunswick,GA Site Map

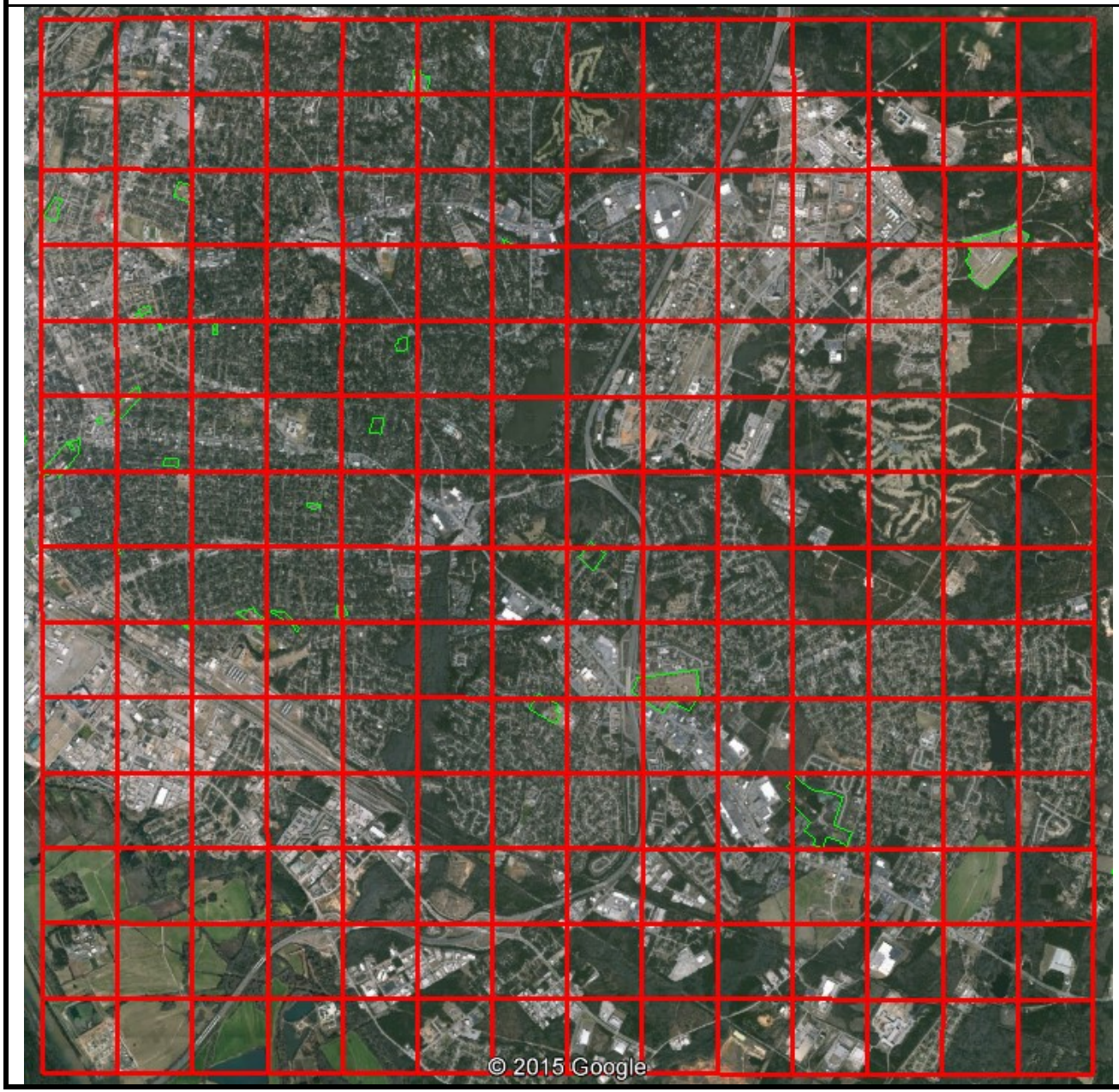


Brunswick, GA Hospital Map

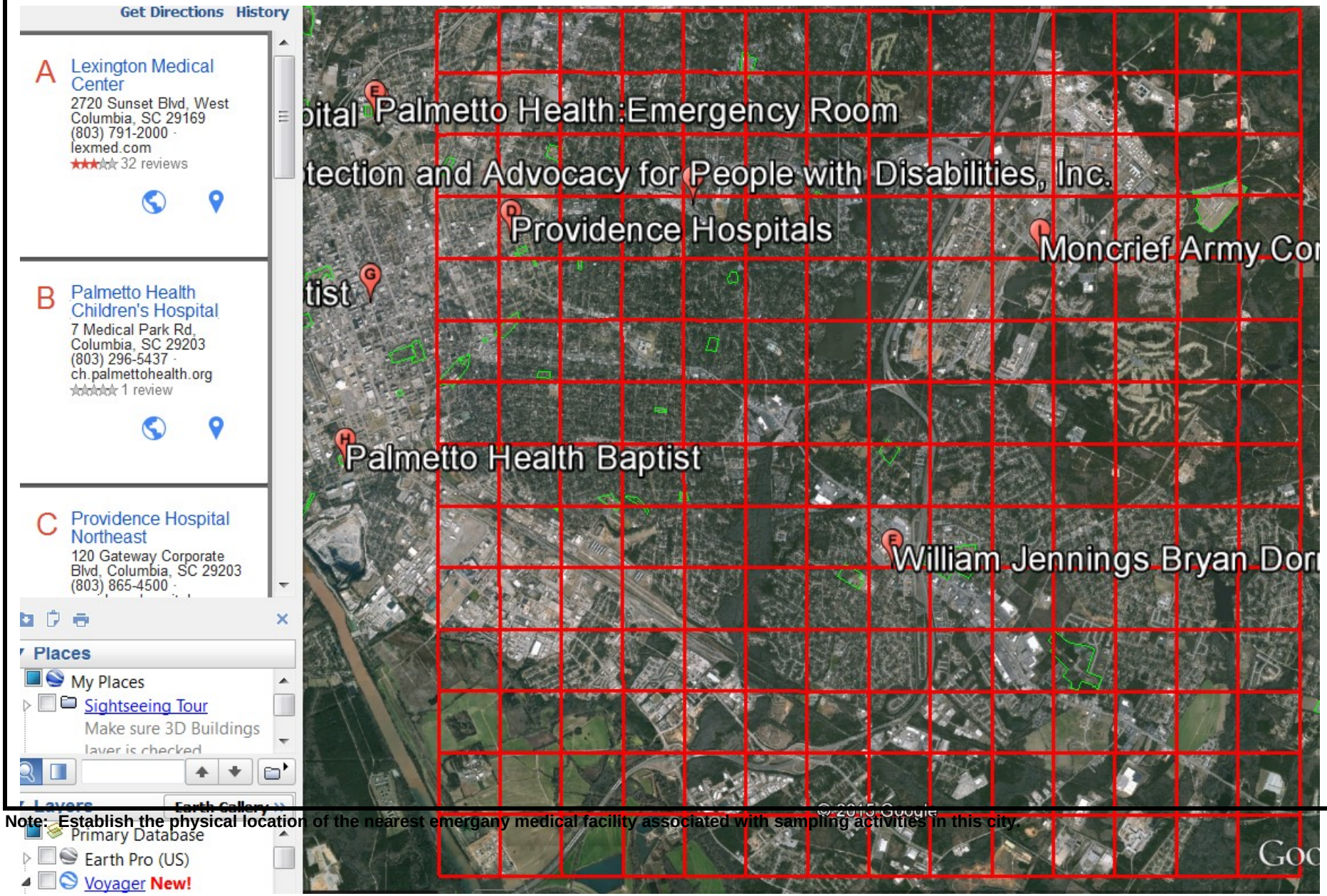


Note: Establish the physical location of the nearest emergany medical facility associated with sampling activities in this city.

Columbia, SC Site Map

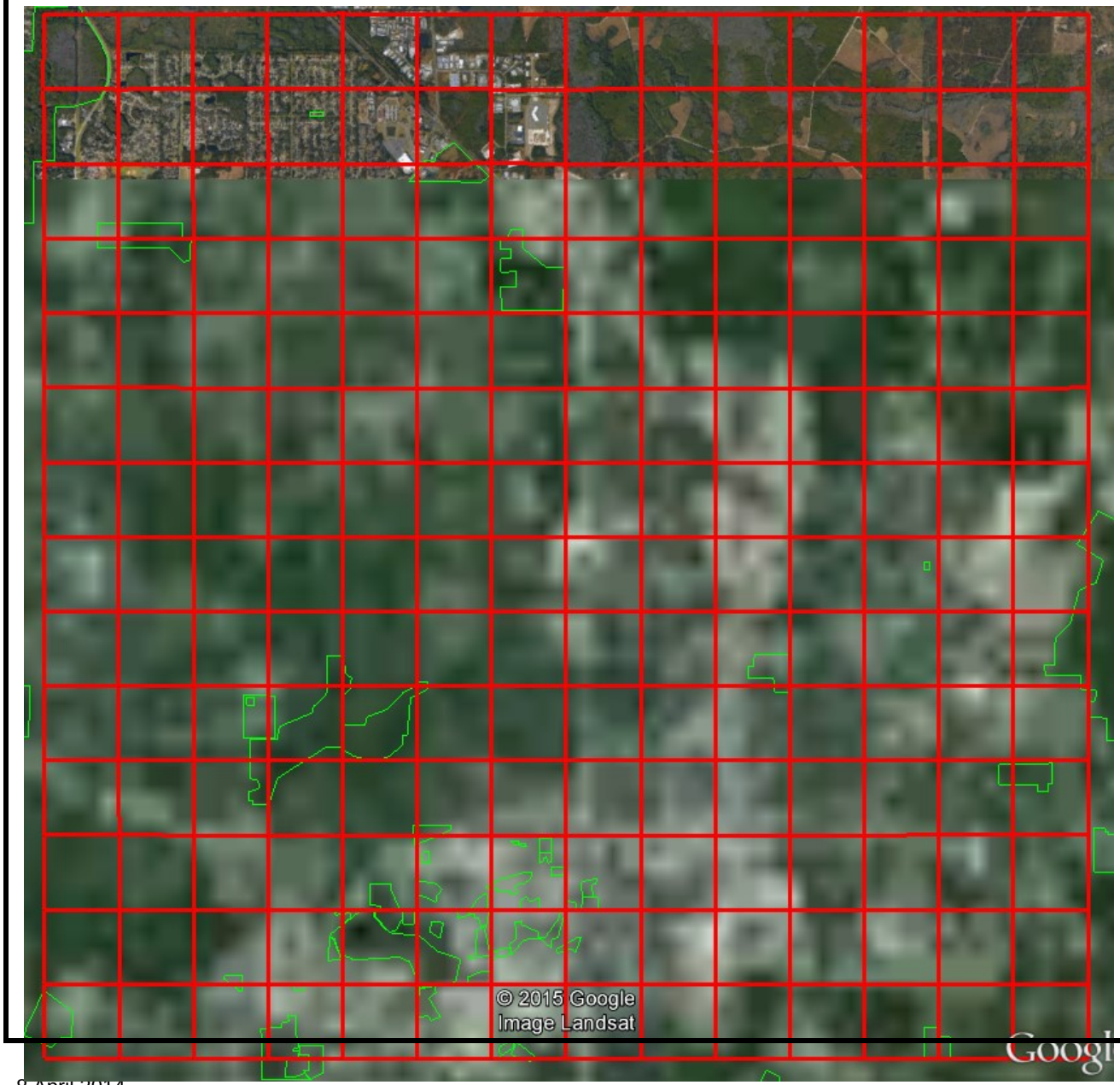


Columbia, SC Hospital Map

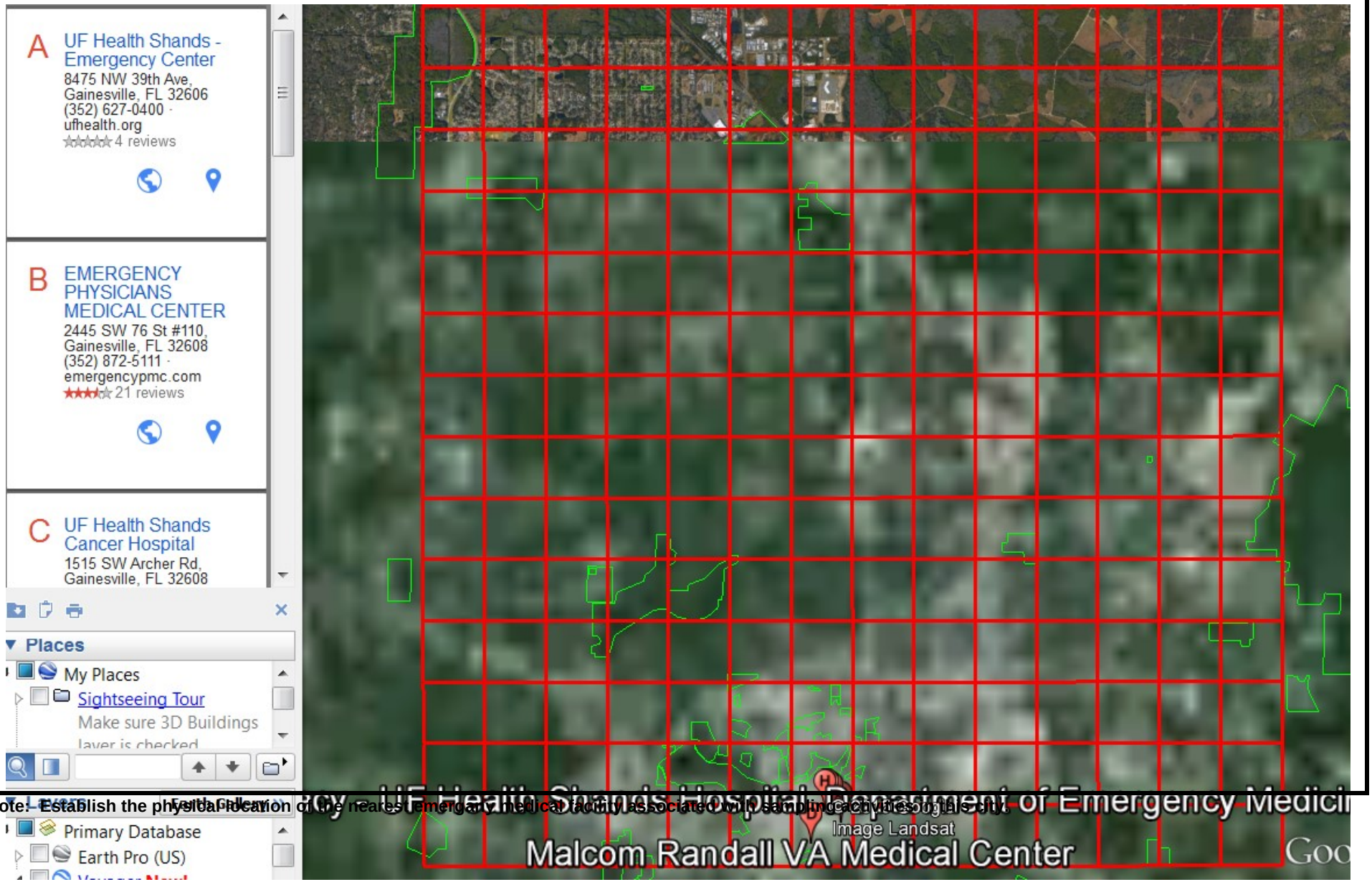


Note: Establish the physical location of the nearest emergany medical facility associated with sampling activities in this city.

Gainsville, FL Site Map

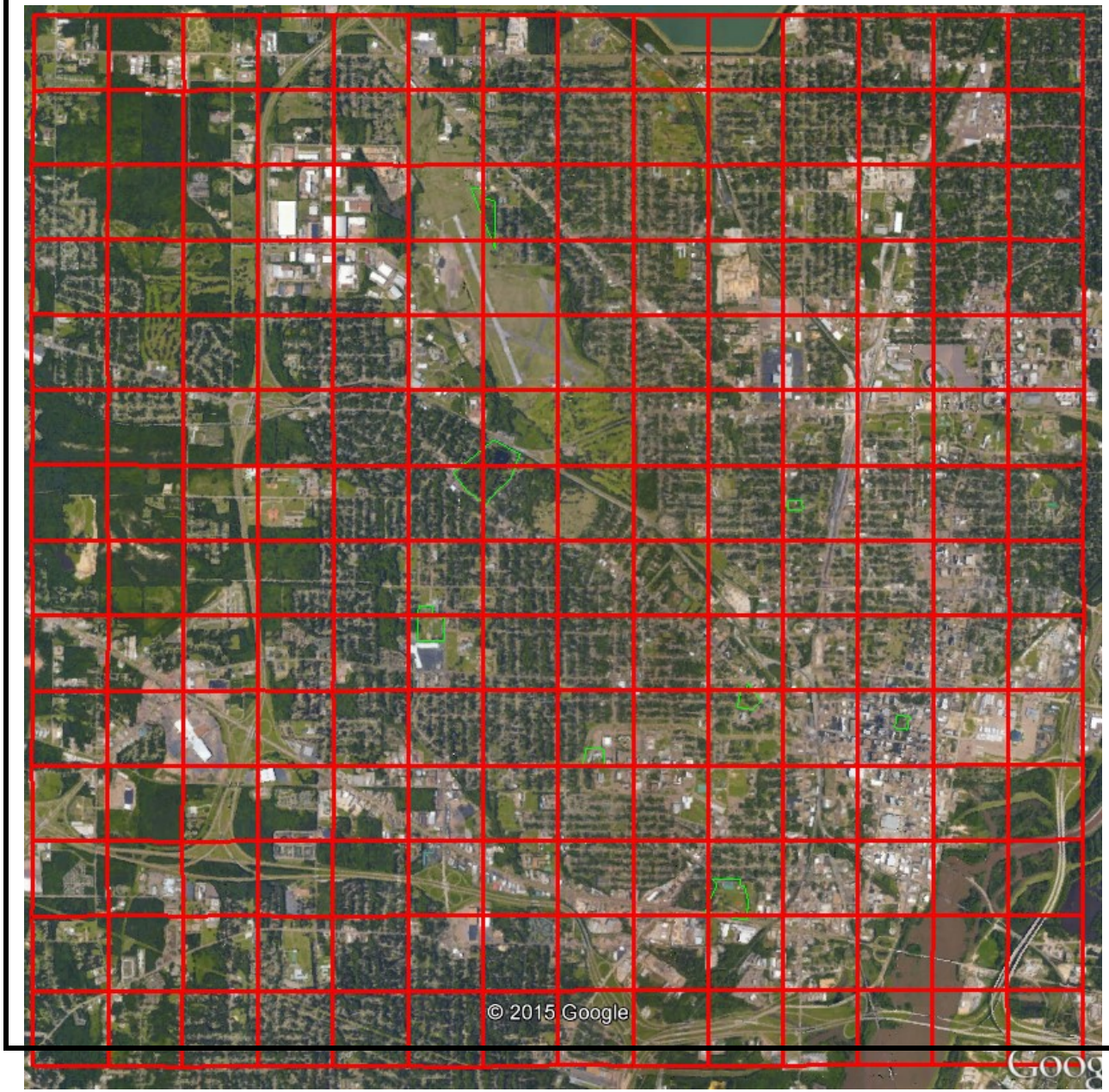


Gainsville, FL Hospital Map

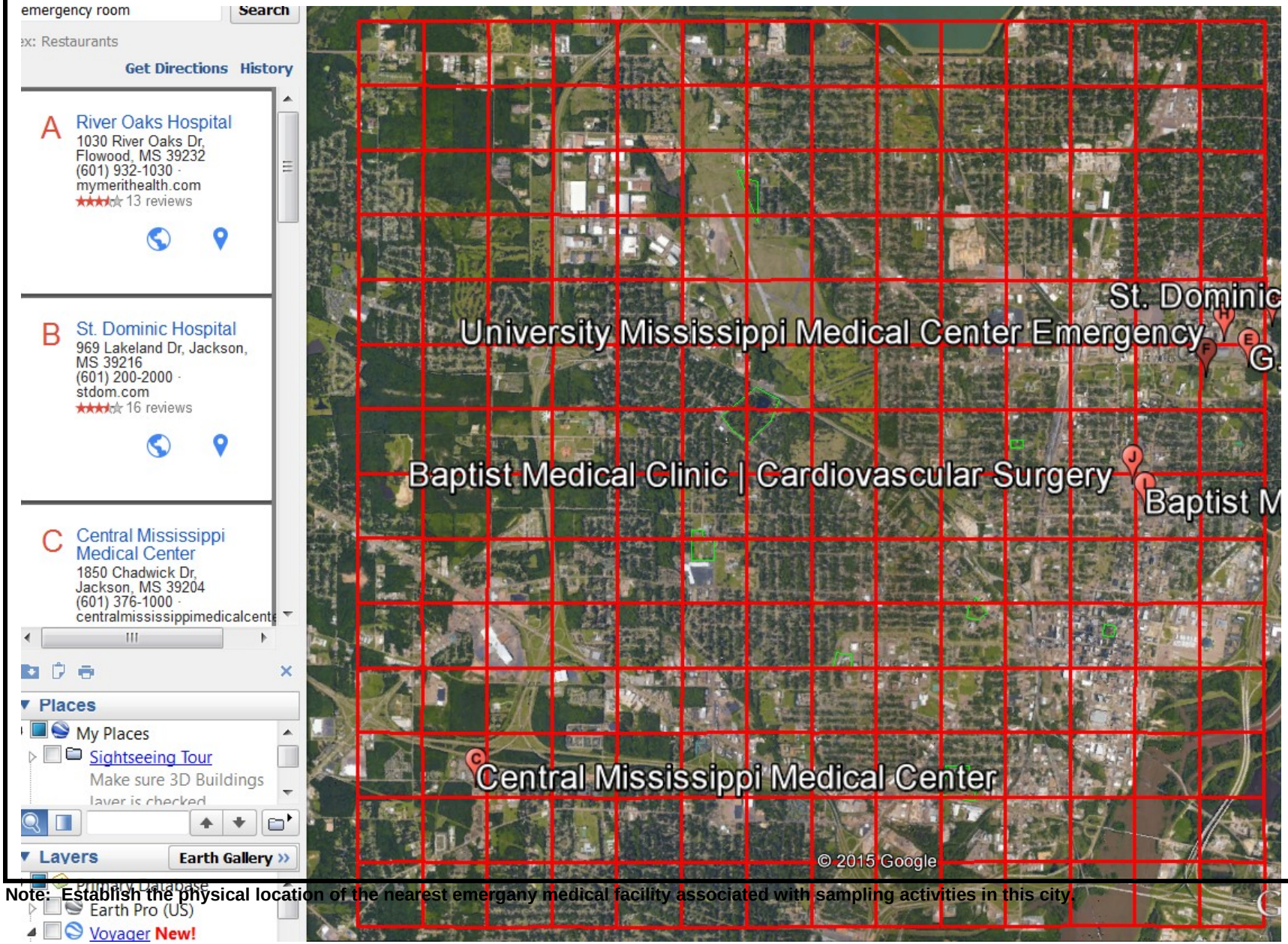


Note: Establish the physical location of the nearest emergency medical facility associated with sampling activities at this city.

Jackson, MS Site Map

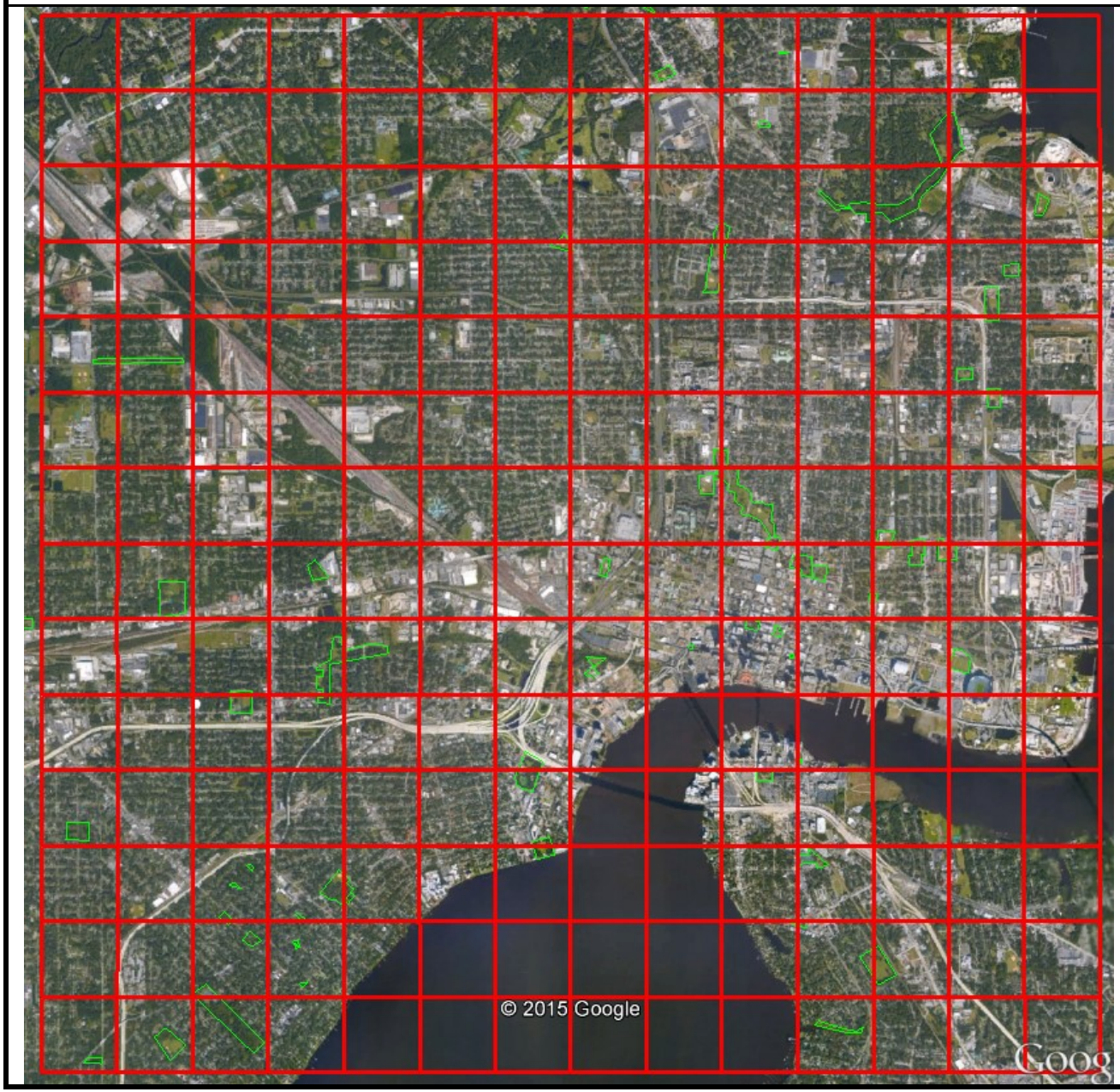


Jackson, MS Hospital Map

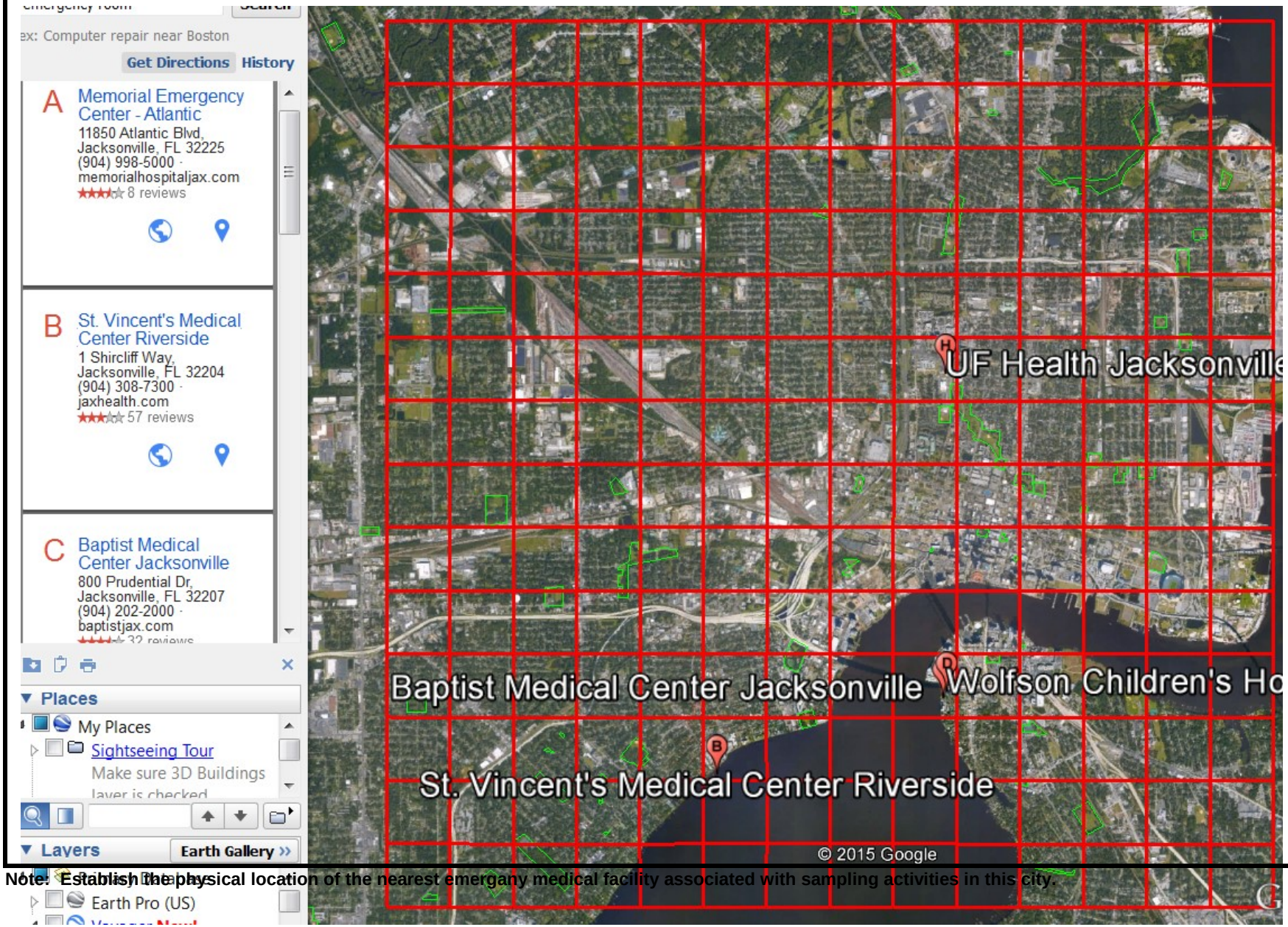


Note: Establish the physical location of the nearest emergany medical facility associated with sampling activities in this city.

Jacksonville,FL Site Map

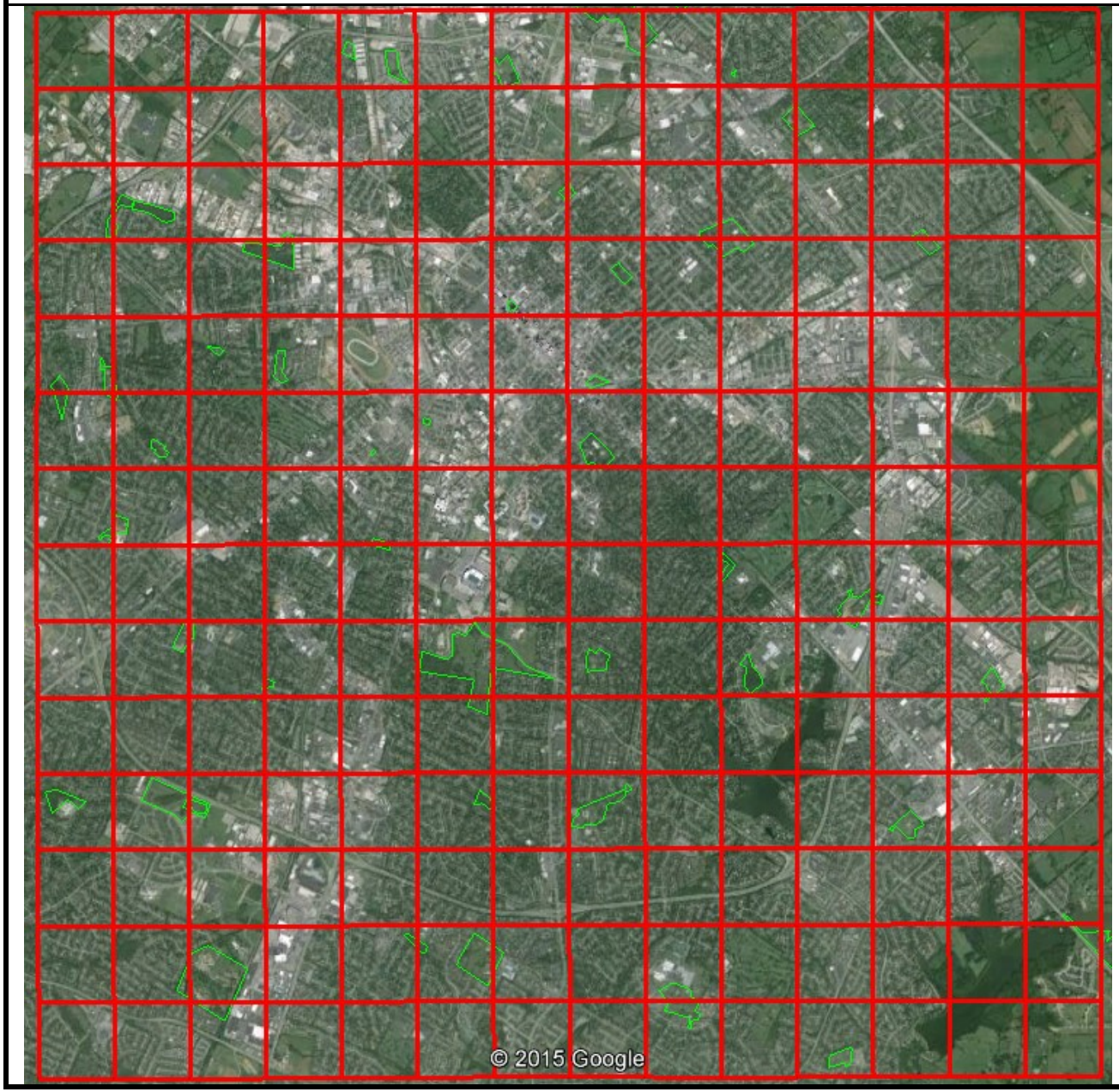


Jacksonville,FL Hospital Map

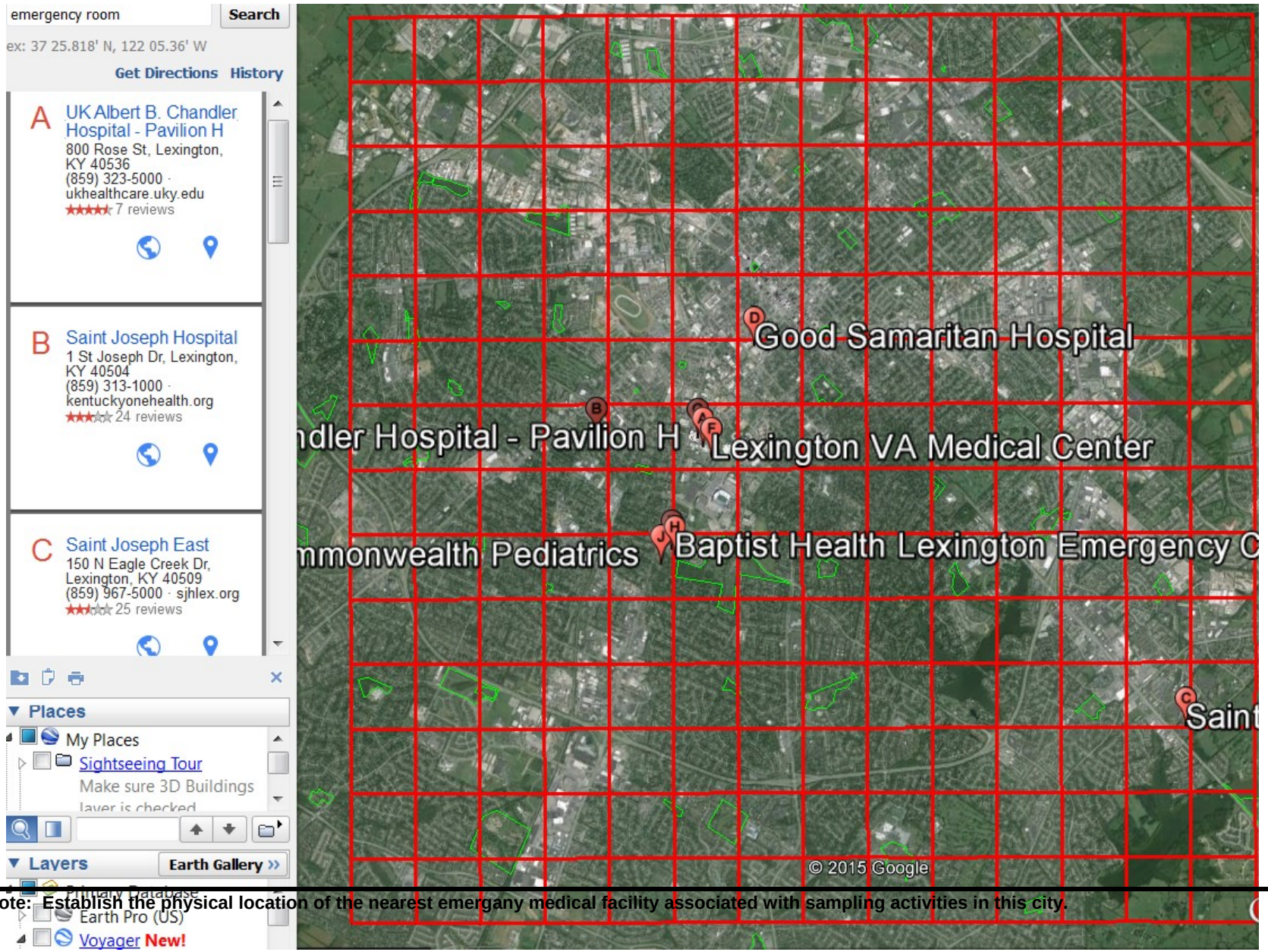


Note: Establish the physical location of the nearest emergency medical facility associated with sampling activities in this city.

Lexington,KY Site Map

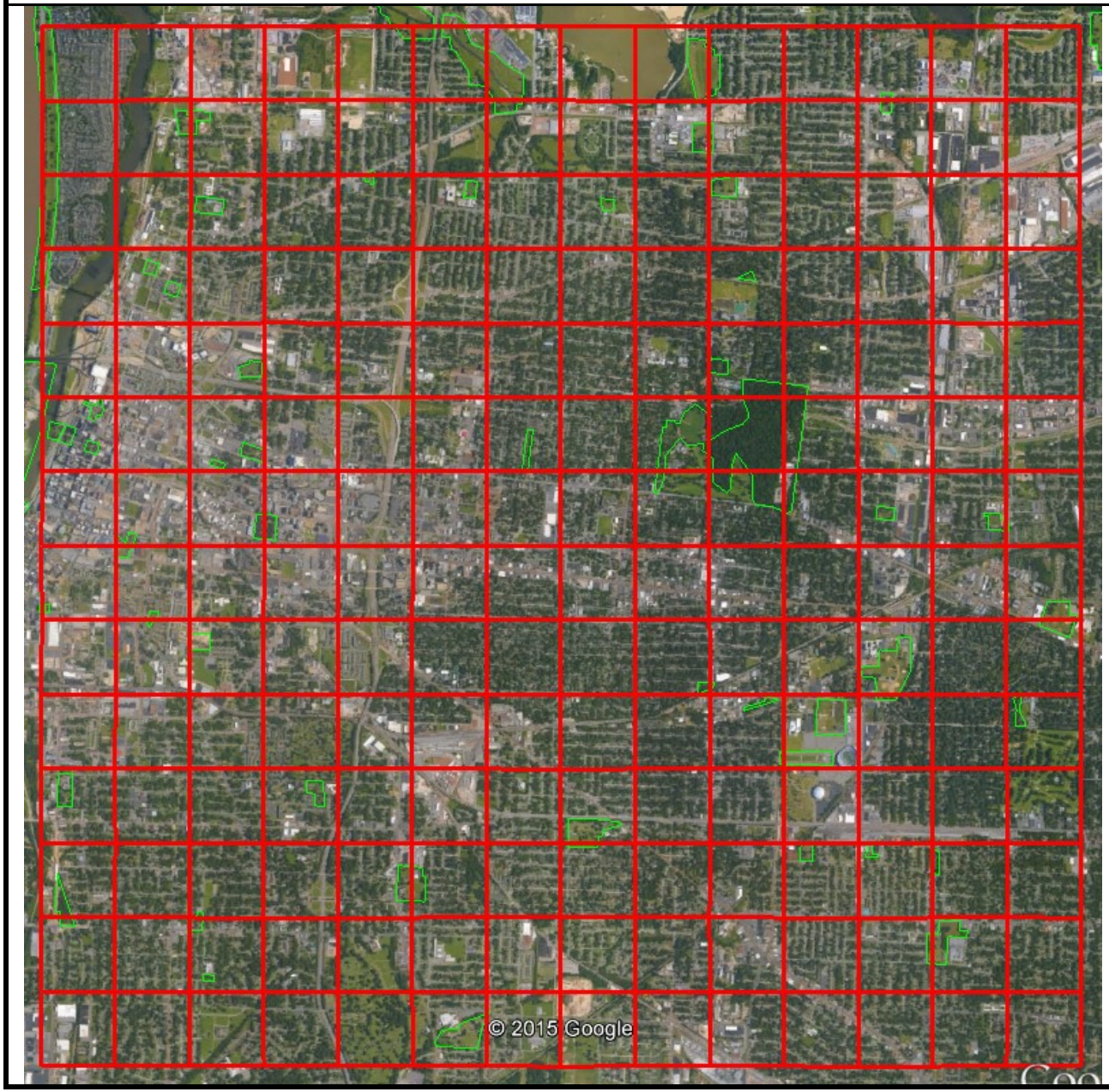


Lexington,KY Hospital Map

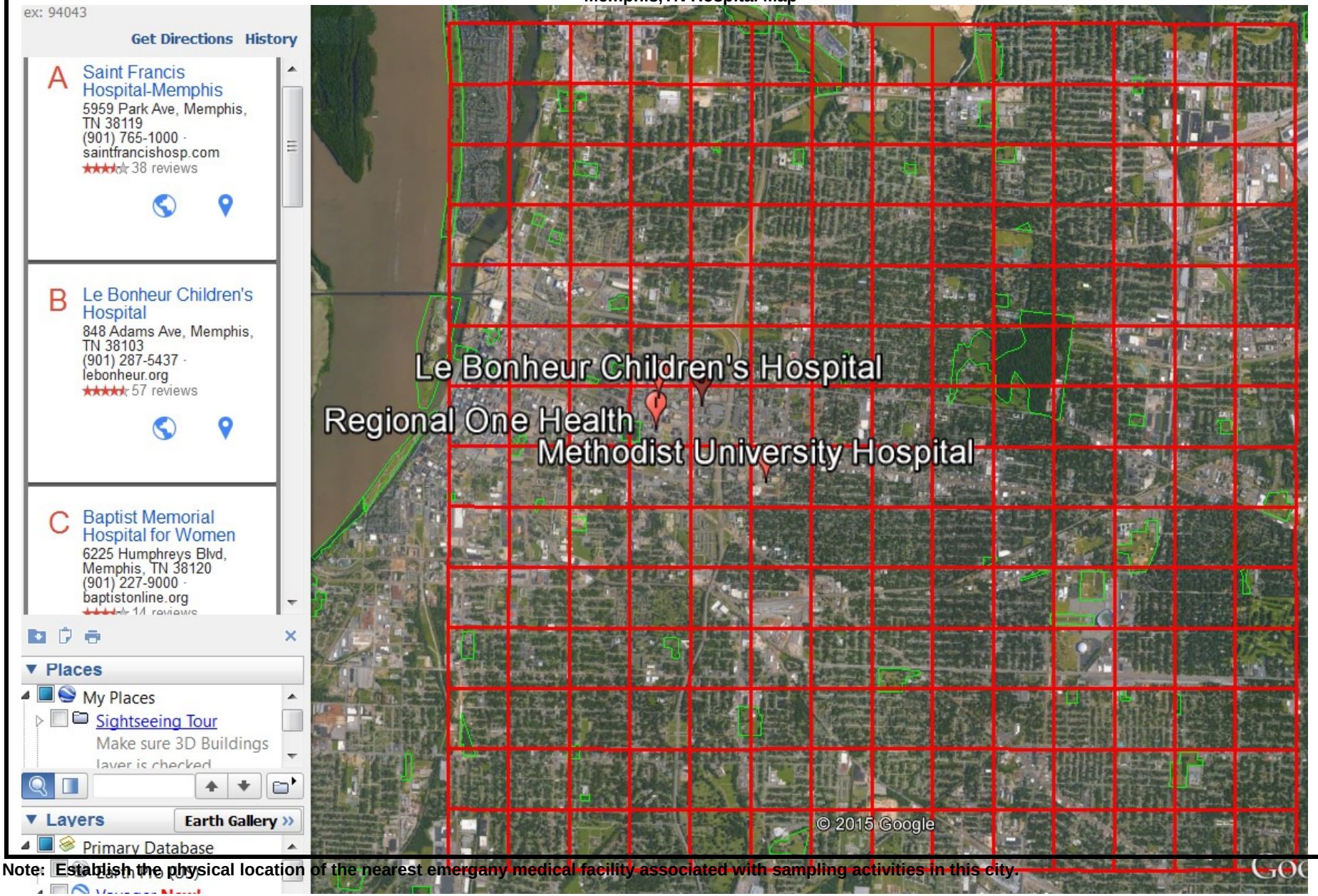


Note: Establish the physical location of the nearest emergany medical facility associated with sampling activities in this city.

Memphis,TN Site Map

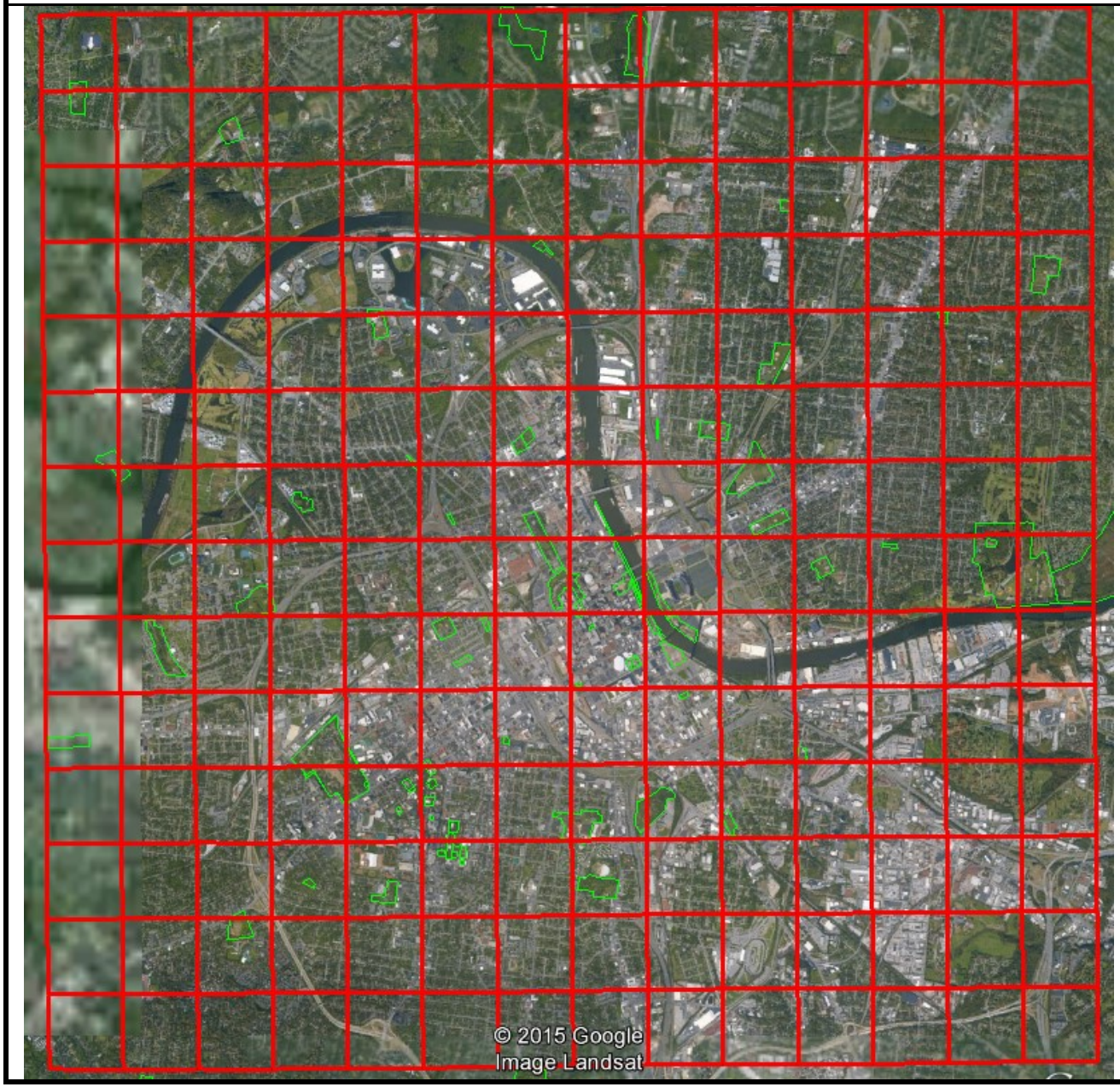


Memphis,TN Hospital Map

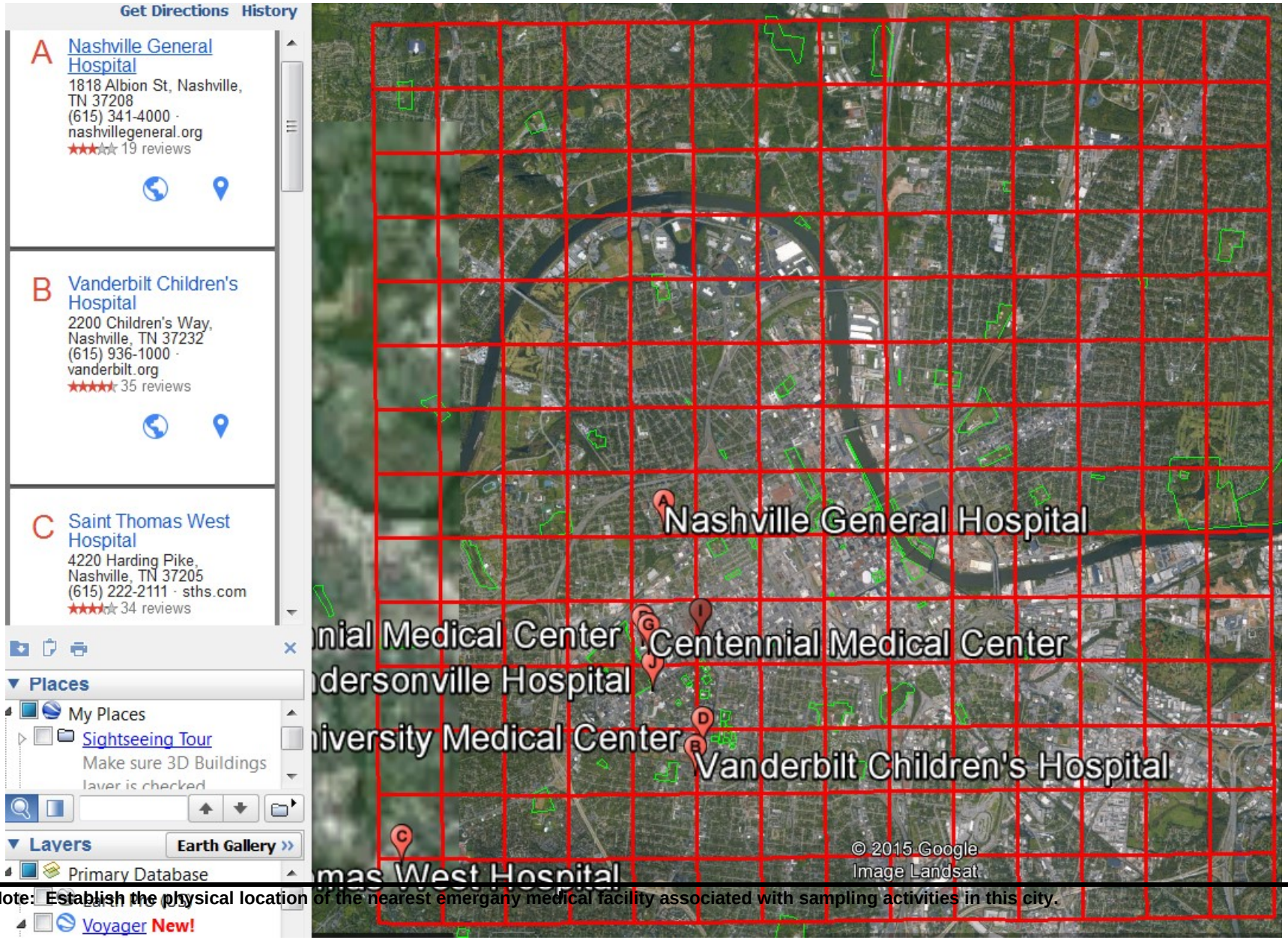


Note: Establish the physical location of the nearest emergany medical facility associated with sampling activities in this city.

Nashville,TN Site Map

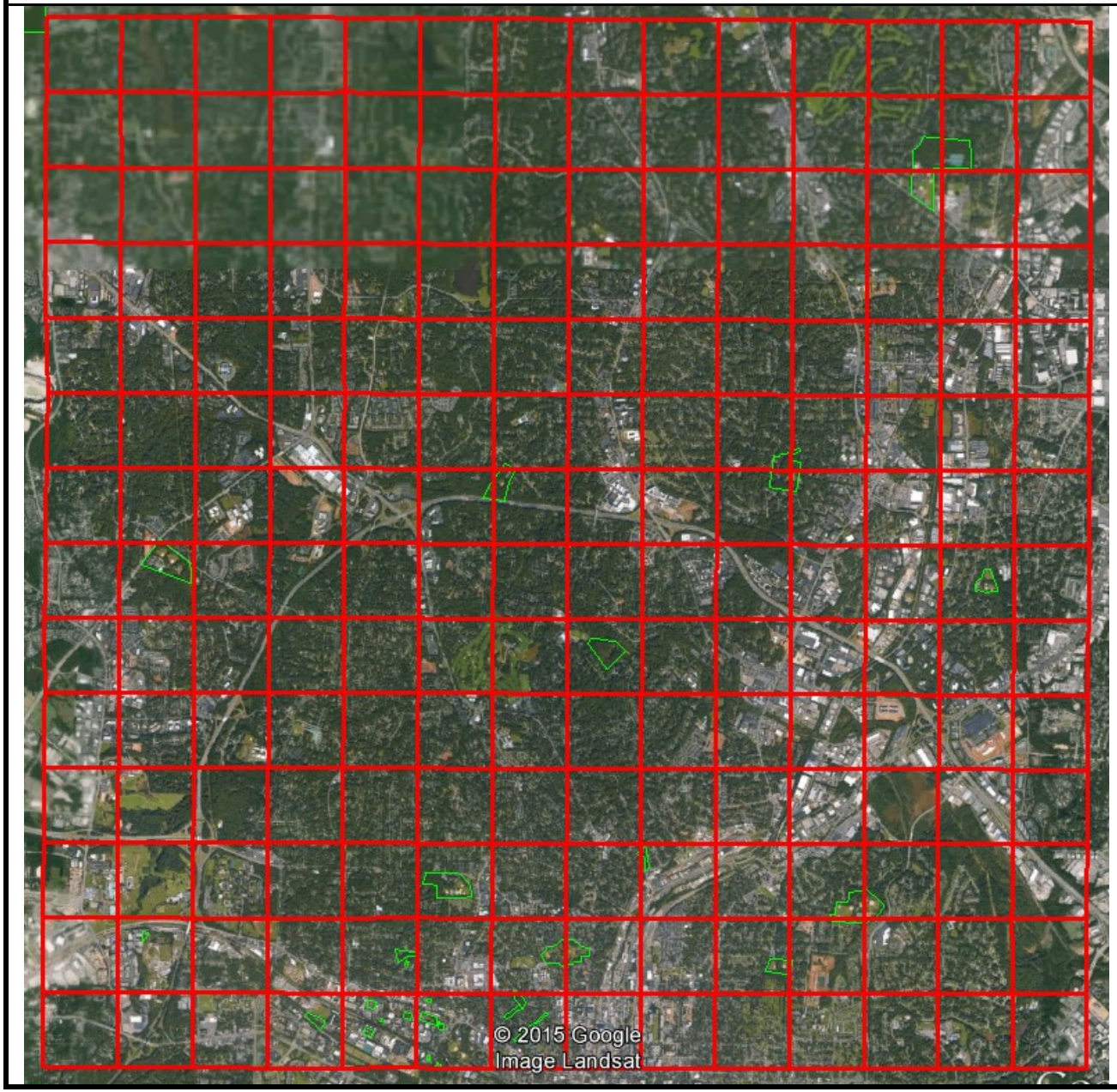


Nashville, TN Hospital Map

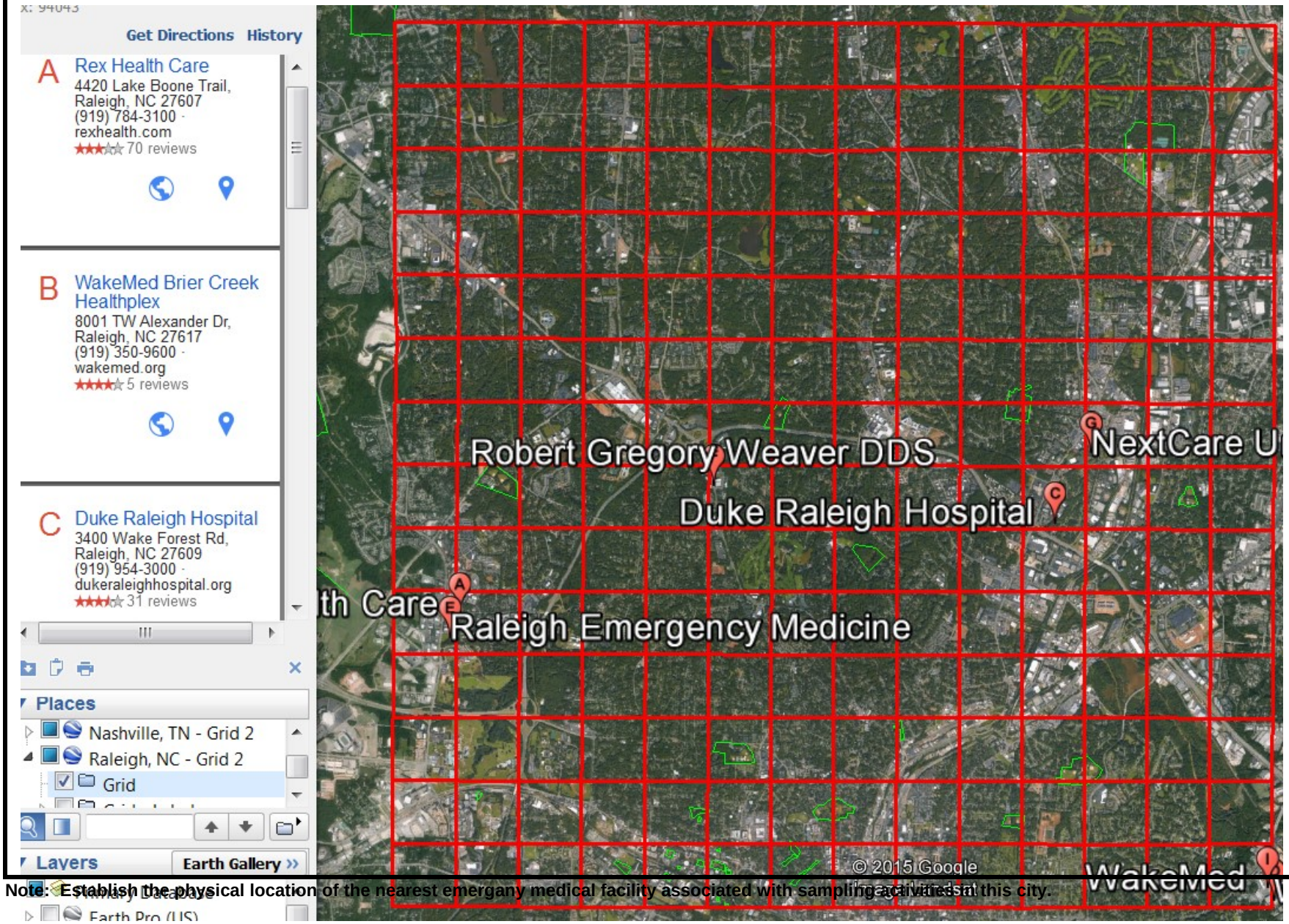


Note: Establish the physical location of the nearest emergency medical facility associated with sampling activities in this city.

Raleigh,NC Site Map



Raleigh,NC Hospital Map



Note: Establish the physical location of the nearest emergany medical facility associated with sampling activities at this city.

APPROVAL AND SIGN-OFF FORM

Project No: _____

I have read, understood, and agree with the information set forth in this Health and Safety Plan and will follow the direction of the Site Safety Coordinator (SSC) as well as procedures and guidelines established in the Tetra Tech, Inc., Health and Safety Manual. I understand the training and medical requirements for conducting field work and have met these requirements.

Tetra Tech has prepared this plan solely for the purpose of the health and safety protection of Tetra Tech employees. Subcontractors, visitors, and others at the site, while required to read and follow the provisions outlined in this plan at a minimum, should refer to their safety program for specific information related to their health and safety protection.

Name	Company / Agency / Organization	Signature	Date

I have read, understood, and agree with the information set forth in this HASP and will comply with and enforce this HASP, as well as procedures and guidelines established in the Tetra Tech, Inc., Health and Safety Manual.
A Post-Project Field Team Check-In SHALL be conducted and documented below to ensure that ALL incidents and near-misses were reported at project completion.

Name	Project-Specific Position	Signature	Date
	Project Manager		
	Field Team Leader		
	Site Safety Coordinator		
	Subcontractor SSC		
	Required Post-Project Field Team Check-In		

Tetra Tech has prepared this plan solely for the purpose of the health and safety protection of Tetra Tech employees. Subcontractors, visitors, and others at the site, while required to read, acknowledge and follow the provisions outlined in this plan at a minimum, should refer to their safety program for specific information related to health and safety.

Note: Use Additional sheets as necessary to ensure that all personnel sign and affirm this document.

Emergency Contacts

WorkCare - For issues requiring an Occupational Health Physician; assistance is available 24 hours per day, 7 days per week.

InfoTrac - For issues related to incidents involving the transportation of hazardous chemicals; this hotline provides accident assistance 24 hours per day, 7 days per week

U.S. Coast Guard National Response Center - For issues related to spill containment, cleanup, and damage assessment; this hotline will direct spill information to the appropriate state or region

Poison Control Center – For known or suspected poisoning.

Limitations:

The Level-Two HASP is not appropriate in some cases:

- Projects involving unexploded ordnance (UXO), radiation sources as the primary hazard, or known chemical/biological weapons site must employ the Level 3 HASP
- Projects of duration longer than 90 days may need a Level 3 HASP (consult your RSO)

Decontamination:

Decontamination Solutions for Chemical and Biological Warfare Agents[a]: PPE and equipment can be decontaminated using 0.5 percent bleach (1 gallon laundry bleach to 9 gallons water) for biological agents (15 minutes of contact time for anthrax spores; 3 minutes for others) followed by water rinse for chemical and biological agents. In the absence of bleach, dry powders such as soap detergents, earth, and flour can be used. The powders should be applied and then wiped off using wet tissue paper. Finally, water and water/soap solutions can be used to physically remove or dilute chemical and biological agents. Do not use bleach solution on bare skin; use soap and water instead. Protect decontamination workers from exposure to bleach.

Decontamination for Radiological and Other Chemicals: Primary decontamination should use Alconox and water unless otherwise specified in chemical specific information resources. The effectiveness of radiation decontamination should be checked using a radiation survey instrument. Decontamination procedures should be repeated until the radiation meter reads less than 100 counts per minute over a 100-square-centimeter area when the probe is held 1 centimeter from the surface and moving slower than 2.5 centimeters per second.

Decontamination Corridor: The decontamination setup can be adjusted to meet the needs of the situation. The decontamination procedures can be altered to meet the needs of the specific situation when compound- and site-specific information is available.

Decontamination Waste: All disposable equipment, clothing, and decontamination solutions will be double-bagged or containerized in an acceptable manner and disposed of with investigation-derived waste.

Decontamination Personnel: Decontamination personnel should dress in the same level of PPE or one level below the entry team PPE level.

All investigation-derived waste should be left on site with the permission of the property owner and the EPA on-scene coordinator. In some instances, another contractor will dispose of decontamination waste and investigation-derived waste. DO NOT place waste in regular trash. DO NOT dispose of waste until proper procedures are established.

Notes:

[a] Source: Jane's Information Group. 2002. *Jane's Chem-Bio Handbook*. Page 39.

TETRA TECH, INC.

DAILY TAILGATE SAFETY MEETING FORM

Date: _____ Time: _____ Project No.: _____

Client: _____ Site Location: _____

Site Activities Planned for Today: _____

Weather Conditions: _____

Safety Topics Discussed	
Protective clothing and equipment:	
Chemical and physical hazards:	
Emergency procedures:	
Equipment hazards:	
Other:	
Attendees	
Printed Name	**Signature**

Meeting Conducted by:

_____ _____

Name Signature

TETRA TECH EM INC.

HEALTH AND SAFETY PLAN AMENDMENT

Site Name: _____

Amendment Date: _____

Purpose or Reason for Amendment: _____

_____

_____

Required Additional Safe Work Practices or Activity Hazard Analyses: _____

_____

Required Changes in PPE: _____

_____

_____

Action Level Changes: _____

_____

_____

_____

_____

AMENDMENT APPROVAL

RSO or Designee	_____ Name	_____ Signature	_____ Date
Site Safety Coordinator	_____ Name	_____ Signature	_____ Date

Date presented during daily site safety meeting: _____

TETRA TECH, INC.

FIELD AUDIT CHECKLIST

Project Name: _____ Project No.: _____

Field Location: _____ Completed by: _____

Project Manager: _____ Site Safety Coordinator: _____

General Items		In Compliance?		
Health and Safety Plan Requirements		Yes	No	NA
1	Approved health and safety plan (HASP) on site or available			
2	Names of on-site personnel recorded in field logbook or daily log			
3	HASP compliance agreement form signed by all on-site personnel			
4	Material Safety Data Sheets on site or available			
5	Designated site safety coordinator physically present on jobsite			
6	Daily tailgate safety meetings conducted and documented on Form HST-2			
7	Documentation available proving compliance with HASP requirements for medical examinations, fit testing, and training (including subcontractors)			
8	HASP onsite matches scope of work being conducted			
9	Emergency evacuation plan in place and hospital located			
10	Exclusion, decontamination, and support zones delineated and enforced			
11	HASP attachments present onsite (VPP sheet, audit checklist, AHA, etc.)			
12	Illness and injury prevention program reports completed (California only)			
Emergency Planning				
13	Emergency telephone numbers posted			
14	Emergency route to hospital posted			
15	Local emergency providers notified of site activities			
16	Adequate safety equipment inventory available			
17	First aid provider and supplies available			
18	Eyewash solution available when corrosive chemicals are present			
Air Monitoring				
19	Monitoring equipment specified in HASP available and in working order			
20	Monitoring equipment calibrated and calibration records available			
21	Personnel know how to operate monitoring equipment and equipment manuals available on site			
22	Environmental and personnel monitoring performed as specified in HASP			

Safety Items		In Compliance?		
Personal Protection		Yes	No	NA
23	Splash suit, if required			
24	Chemical protective clothing, if required			
25	Safety glasses or goggles (always required)			
26	Gloves, if required			
27	Overboots, if required			
28	Hard hat (always required)			
29	High visibility vest, if required			
30	Hearing protection, if required			
31	Full-face respirator, if required			
Instrumentation				
32	Combustible gas meter and calibration notes			
33	Oxygen meter and calibration notes			
34	Organic vapor analyzer and calibration notes			
Supplies				
35	Decontamination equipment and supplies			
35	Fire extinguishers			
37	Spill cleanup supplies			
Corrective Action Taken During Audit:				

Note: NA = Not applicable

_____ _____

Auditor's Signature Site Safety Coordinator's Signature

_____

Date

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Turf Sampling

Task Description

This Activity Hazard Analysis (AHA) applies to the task listed above. It has been developed and approved by the Director of Health and Safety for Tetra Tech EMI. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required equipment (including safety equipment), inspections, and training. The hazard controls listed below are specific to this task.

Hazards		Actions
Task Steps	**Potential Hazards**	**Critical Safety Procedures and Controls**
Set up equipment at sampling location	SLIP/TRIP/FALL	Visually inspect the area for slippery spots or debris and correct if found
	BACK STRAIN/SPRAIN	Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy Use proper lifting techniques (lift with legs not back)
Dig to appropriate depth with appropriate tools	SLIP/TRIP/FALL	Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI Policy
	BACKSTRAIN/SPRAIN	Use proper digging techniques. Use care if resistance is encountered. Do not strain to advance the sampler. Consider a different sampling location if possible.
	HAND INJURY	Wear gloves when digging or hand sampling.
	TRAFFIC	Wear high-visibility vests at all times
	HIGH NOISE	Use appropriate hearing protective devices as needed.
	UNDERGROUND UTILITIES	Probe the area to be sampled with a non-conductive stick or plastic knife before advancing sampler. Use care if resistance is encountered.
Extract Soil	EMPLOYEE	Wear safety glasses and nitrile gloves
	EXPOSURE	Plastic sheeting can be used to kneel upon while collecting samples
Store sample containers in coolers and load	SLIP/TRIP/FALL	Ensure all debris has been removed from the path of travel
	BACK STRAIN/SPRAIN	Use proper lifting techniques, including obtaining help with heavy coolers
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Level D PPE (steel-toed boots, safety glasses, Class 2 safety vest, nitrile gloves) First Aid Kit Eyewash Turf Profiler sampler Appropriate sample containers and preservative	Inspect area prior to sampling Conduct utility locating and marking as required prior to Intrusive activities	Safe Lifting Procedures Personal Protective Equipment CPR/First Aid (one employee on-site must have current CPR/First Aid training) As required in accordance with policy and/or sampling and analysis plan

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

1 Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Trade name: ALCONOX**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture:** Cleaning material/ Detergent

· **1.3 Details of the supplier of the Safety Data Sheet**
· **Manufacturer/Supplier:**
Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040
· **Further information obtainable from:** Product Safety Department

· **1.4 Emergency telephone number:**
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

2 Hazards identification

· **2.1 Classification of the substance or mixture**
· **Classification according to Regulation (EC) No 1272/2008**


GHS05 corrosion
Eye Dam. 1; H318: Causes serious eye damage.


GHS07
Skin Irrit. 2; H315: Causes skin irritation.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**


Xi; Irritant
R38-41: Irritating to skin. Risk of serious damage to eyes.
· **Information concerning particular hazards for human and environment:**
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.
· **Classification system:**
The classification is according to the latest editions of the EU-lists, and extended by company and literature data.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **2.2 Label elements**
· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.

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· **Hazard pictograms**

GHS05

· **Signal word:** Danger

· **Hazard-determining components of labelling:**
sodium dodecylbenzene sulfonate
· **Hazard statements**
H315: Causes skin irritation.
H318: Causes serious eye damage.
· **Precautionary statements**
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264: Wash thoroughly after handling.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER or doctor/physician.
P321: Specific treatment (see on this label).
P362: Take off contaminated clothing and wash before reuse.
P332+P313: If skin irritation occurs: Get medical advice/attention.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.
· **Hazard description:**
· **WHMIS-symbols:**
D2B - Toxic material causing other toxic effects

· **NFPA ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS Long Term Health Hazard Substances**
None of the ingredients is listed.

· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

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3 Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**		
CAS: 68081-81-2	sodium dodecylbenzene sulfonate Xn R22; Xi R36 Acute Tox. 4, H302; Eye Irrit. 2, H319	10-25%
CAS: 497-19-8 EINECS: 207-838-8 Index number: 011-005-00-2	Sodium Carbonate Xi R36 Eye Irrit. 2, H319	2,5-10%
CAS: 7722-88-5 EINECS: 231-767-1	tetrasodium pyrophosphate substance with a Community workplace exposure limit	2,5-10%
CAS: 151-21-3 EINECS: 205-788-1	sodium dodecyl sulphate Xn R21/22; Xi R36/38 Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	2,5-10%

· **Additional information:** For the wording of the listed risk phrases refer to section 16.

4 First aid measures

· **4.1 Description of first aid measures**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents:**
CO_2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

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· **5.2 Special hazards arising from the substance or mixture:** No further relevant information available.
· **5.3 Advice for firefighters**
· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.
· **Additional information:** No further relevant information available.

6 Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Product forms slippery surface when combined with water.
· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Clean the affected area carefully; suitable cleaners are:
Warm water
· **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

· **7.1 Precautions for safe handling**
Prevent formation of dust.
Keep receptacles tightly sealed.
· **Information about fire - and explosion protection:** No special measures required.

· **7.2 Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Protect from humidity and water.
· **7.3 Specific end use(s):** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**	
7722-88-5 tetrasodium pyrophosphate	
REL (USA)	5 mg/m³
TLV (USA)	TLV withdrawn
EV (Canada)	5 mg/m³

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· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the skin.
Avoid contact with the eyes and skin.
· **Respiratory protection:**
Not required under normal conditions of use.
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.
· **Protection of hands:**


Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
· **Material of gloves**
Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber, NR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**


Safety glasses

· **Body protection:** Protective work clothing

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9 Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Powder
Colour:	White
· **Odour:**	Odourless
· **Odour threshold:**	Not determined.
· **pH-value (10 g/l) at 20 °C:**	9,5 (- NA for Powder form)
· **Change in condition**	
Melting point/Melting range:	Not Determined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not determined.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Self-igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density at 20 °C:**	1,1 g/cm³
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Soluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0,0 %
Solids content:	100 %
· **9.2 Other information**	No further relevant information available.

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10 Stability and reactivity

· **10.1 Reactivity**
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
· **10.3 Possibility of hazardous reactions**
Reacts with acids.
Reacts with strong alkali.
Reacts with strong oxidizing agents.
· **10.4 Conditions to avoid:** No further relevant information available.
· **10.5 Incompatible materials:** No further relevant information available.
· **10.6 Hazardous decomposition products:**
Carbon monoxide and carbon dioxide
Phosphorus compounds
Sulphur oxides (SOx)

11 Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **On the skin:** Irritant to skin and mucous membranes.
· **On the eye:** Strong irritant with the danger of severe eye injury.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

12 Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability:** No further relevant information available.
· **12.3 Bioaccumulative potential:** Not worth-mentioning accumulating in organisms
· **12.4 Mobility in soil:** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water.
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

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· **vPvB:** Not applicable.
· **12.6 Other adverse effects:** No further relevant information available.

13 Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

14 Transport information

· **14.1 UN-Number**	
· **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.2 UN proper shipping name**	
· **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.3 Transport hazard class(es)**	
· **DOT, ADR, IMDG, IATA, ICAO**	
· **Class**	Not Regulated
· **14.4 Packing group**	
· **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.5 Environmental hazards:**	
· **Marine pollutant:**	No
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **UN "Model Regulation":**	Not Regulated

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15 Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **United States (USA)**
· **SARA**

· **Section 355 (extremely hazardous substances):**
None of the ingredients is listed.
· **Section 313 (Specific toxic chemical listings):**
None of the ingredients is listed.
· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients is listed.
· **Chemicals known to cause developmental toxicity:**
None of the ingredients is listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients is listed.
· **IARC (International Agency for Research on Cancer)**
None of the ingredients is listed.
· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients is listed.
· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients is listed.
· **OSHA-Ca (Occupational Safety & Health Administration)**
None of the ingredients is listed.

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· **Canada**

· **Canadian Domestic Substances List (DSL)**	
All ingredients are listed.	
· **Canadian Ingredient Disclosure list (limit 0.1%)**	
None of the ingredients is listed.	
· **Canadian Ingredient Disclosure list (limit 1%)**	
497-19-8	Sodium Carbonate
7722-88-5	tetrasodium pyrophosphate
151-21-3	sodium dodecyl sulphate

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H302: Harmful if swallowed.
H312: Harmful in contact with skin.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
R21/22: Harmful in contact with skin and if swallowed.
R22: Harmful if swallowed.
R36: Irritating to eyes.
R36/38: Irritating to eyes and skin.

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Maritime Code for Dangerous Goods DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

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1 Identification of the Substance/mixture and of the Company/Undertaking

1.1 Product identifier
Trade name: LIQUINOX
Application of the substance / the preparation: Hand detergent
1.3 Details of the supplier of the Safety Data Sheet
Manufacturer/Supplier:
Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040
Further information obtainable from: Product Safety Department

1.4 Emergency telephone number:
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

2 Hazards Identification

2.1 Classification of the substance or mixture
Classification according to Regulation (EC) No 1272/2008

GHS07

Skin Irrit. 2: H315: Causes skin irritation.
Eye Irrit. 2: H319: Causes serious eye irritation.

Classification according to Directive 67/548/EEC or Directive 1999/45/EC

Xi; Irritant

R36/38: Irritating to eyes and skin.
Information concerning particular hazards for human and environment:
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.
Classification system:
The classification is according to the latest editions of the EU-lists, and extended by company and literature data

2.2 Label elements
Labelling according to Regulation (EC) No 1272/2008
The product is classified and labelled according to the CLP regulation.

Hazard pictograms

GHS07

Signal word: Warning

Hazard-determining components of labelling:
Benzenesulfonic Acid, Sodium Salts
Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

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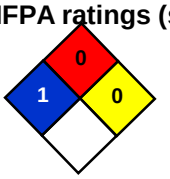
Precautionary statements:
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264 Wash thoroughly after handling.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P321 Specific treatment (see on this label).
P362 Take off contaminated clothing and wash before reuse.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P337+P313 If eye irritation persists: Get medical advice/attention.
P302+P352 IF ON SKIN: Wash with plenty of soap and water.

Hazard description:
WHMIS-symbols:
D2B - Toxic material causing other toxic effects

NFPA ratings (scale 0 - 4)



Health = 1
Fire = 0
Reactivity = 0

HMIS-ratings (scale 0 - 4)

HEALTH	1
FIRE	0
REACTIVITY	0

Health = 1
Fire = 0
Reactivity = 0

2.3 Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/Information on Ingredients

3.2 Mixtures
Description: Mixture of substances listed below with nonhazardous additions.

Dangerous components:

CAS: 68081-81-2	Benzenesulfonic Acid, Sodium Salts Xi R38-41 Eye Dam. 1, H318 Skin Irrit. 2, H315	10-25%
CAS: 1300-72-7 EINECS: 215-090-9	Sodium xylenesulphonate Xi R36/37/38 Skin Irrit. 2, H315; Eye Irrit. 2, H319; STOT SE 3, H335	2.5-10%
CAS: 84133-50-6	Alcohol Ethoxylate Xi R36/38 Skin Irrit. 2, H315	2.5-10%

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CAS: 68603-42-9 EINECS: 271-657-0	Coconut diethanolamide Xi R36/38	2.5-10%
CAS: 17572-97-3 EINECS: 241-543-5	Ethylenediaminetetraacetic acid, tripotassium salt Xi R36/37/38	2.5-10%

Additional information: For the wording of the listed risk phrases refer to section 16.

4 First Aid Measures

4.1 Description of first aid measures

General information:
Take affected persons out into the fresh air.

After inhalation:
Supply fresh air; consult doctor in case of complaints.

After skin contact:
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.

After eye contact:
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

After swallowing:
Do not induce vomiting; call for medical help immediately.
Rinse out mouth and then drink plenty of water.
A person vomiting while laying on their back should be turned onto their side.

4.2 Most important symptoms and effects, both acute and delayed:
No further relevant information available.

4.3 Indication of any immediate medical attention and special treatment needed:
No further relevant information available.

5 Firefighting Measures

5.1 Extinguishing media:

Suitable extinguishing agents:
CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

5.2 Special hazards arising from the substance or mixture:
No further relevant information available.

5.3 Advice for firefighters:

Protective equipment:
Wear self-contained respiratory protective device.
Wear fully protective suit.

6 Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures:
Ensure adequate ventilation
Particular danger of slipping on leaked/spilled product.

6.2 Environmental precautions:
Dilute with plenty of water.
Do not allow to enter sewers/ surface or ground water.

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6.3 Methods and material for containment and cleaning up:
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust). Clean the affected area carefully; suitable cleaners are:
Warm water

6.4 Reference to other sections:
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information

7 Handling and Storage

7.1 Precautions for safe handling:
No special measures required.

Information about fire - and explosion protection:
No special measures required.

7.2 Conditions for safe storage, including any incompatibilities:
Storage:
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Not required.
Further information about storage conditions: None

7.3 Specific end use(s): No further relevant information available.

8 Exposure Controls/Personal Protection

Additional information about design of technical facilities: No further data; see item 7.

8.1 Control parameters

Ingredients with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information: The lists valid during the making were used as basis.

8.2 Exposure controls:
Personal protective equipment:
General protective and hygienic measures:
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.

Respiratory protection:
Not required.

Protection of hands:

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion **and the** degradation

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Material of gloves:
Natural rubber, NR
Nitrile rubber, NBR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.

Penetration time of glove material:
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

Eye protection:

Safety glasses

Goggles recommended during refilling

9 Physical and Chemical Properties

9.1 Information on basic physical and chemical properties:

General Information:

Appearance:

Form:	Liquid
Colour:	Light yellow
Odour:	Odourless
Odour threshold:	Not determined.
pH-value at 20°C:	8.5
Change in condition:	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	100°C
Flash point:	Not applicable.
Flammability (solid, gaseous):	Not applicable.
Ignition temperature:	
Decomposition temperature:	Not determined.
Self-igniting:	Product is not selfigniting.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined.
Upper:	Not determined.
Vapour pressure at 20°C:	23 hPa
Density at 20°C:	1.08 g/cm³
Relative density:	Not determined.
Vapour density:	Not determined.
Evaporation rate:	Not determined.

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Trade name: LIQUINOX

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Solubility in / Miscibility with water:	Fully miscible.
Segregation coefficient (n-octanol/water):	Not determined.
Viscosity:	
Dynamic:	Not determined.
Kinematic:	Not determined.
9.2 Other information:	No further relevant information available

10 Stability and Reactivity

10.1 Reactivity:
10.2 Chemical stability:
Thermal decomposition / conditions to be avoided:
No decomposition if used according to specifications.
10.3 Possibility of hazardous reactions:
Reacts with strong oxidizing agents.
Reacts with strong acids.
10.4 Conditions to avoid:
No further relevant information available.
10.5 Incompatible materials:
No further relevant information available.
10.6 Hazardous decomposition products:
Carbon monoxide and carbon dioxide
Sulphur oxides (SOx)
Nitrogen oxides

11 Toxicological Information

11.1 Information on toxicological effects:
Acute toxicity:
Primary irritant effect:
On the skin: Irritant to skin and mucous membranes.
On the eye: Strong irritant with the danger of severe eye injury.
Sensitization: No sensitizing effects known.
Additional toxicological information:
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant

12 Ecological Information

12.1 Toxicity:
Aquatic toxicity: No further relevant information available.
12.2 Persistence and degradability: No further relevant information available.
12.3 Bioaccumulative potential: No further relevant information available.
12.4 Mobility in soil: No further relevant information available.
Additional ecological information:
General notes:
Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for water.
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
Must not reach sewage water or drainage ditch undiluted or unneutralized.

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12.5 Results of PBT and vPvB assessment:
PBT: Not applicable.
vPvB: Not applicable.
12.6 Other adverse effects: No further relevant information available.

13 Disposal Considerations

13.1 Waste treatment methods:
Recommendation:
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.
Uncleaned packaging:
Recommendation: Disposal must be made according to official regulations.
Recommended cleansing agents: Water, if necessary together with cleansing agents.

14 Transport Information

14.1 UN-Number:	
DOT, ADR, ADN, IMDG, IATA, ICAO:	Not Regulated
14.2 UN proper shipping name:	
DOT, ADR, ADN, IMDG, IATA, ICAO:	Not Regulated
14.3 Transport hazard class(es):	
DOT, ADR, ADN, IMDG, IATA, ICAO:	Not Regulated
14.4 Packing group:	
DOT, ADR, AND, IMDG, IATA, ICAO:	Not Regulated
14.5 Environmental hazards:	
Marine pollutant:	No
14.6 Special precautions for user:	Not applicable.
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:	Not applicable.
UN "Model Regulation":	Not Regulated

15 Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:
United States (USA):
SARA:

Section 355 (extremely hazardous substances):
None of the ingredients is listed.
Section 313 (Specific toxic chemical listings):
None of the ingredients is listed.
TSCA (Toxic Substances Control Act):
All ingredients are listed.

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Proposition 65 (California):

Chemicals known to cause cancer:
None of the ingredients is listed.
Chemicals known to cause reproductive toxicity for females:
None of the ingredients is listed.
Chemicals known to cause reproductive toxicity for males:
None of the ingredients is listed.
Chemicals known to cause developmental toxicity:
None of the ingredients is listed.

Carcinogenic Categories:

EPA (Environmental Protection Agency):
None of the ingredients is listed.
TLV (Threshold Limit Value established by ACGIH):
None of the ingredients is listed.
NIOSH-Ca (National Institute for Occupational Safety and Health):
None of the ingredients is listed.
OSHA-Ca (Occupational Safety & Health Administration):
None of the ingredients is listed.

Canadá:

Canadian Domestic Substances List (DSL):
All ingredients are listed.
Canadian Ingredient Disclosure list (limit 0.1%):
None of the ingredients is listed.
Canadian Ingredient Disclosure list (limit 1%):
None of the ingredients is listed.

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other Information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Relevant phrases:

H315 Causes skin irritation.
H318 Causes serious eye damage.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.
R36/37/38 Irritating to eyes, respiratory system and skin.
R36/38 Irritating to eyes and skin.
R38 Irritating to skin.
R41 Risk of serious damage to eyes.

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Abbreviations and Acronyms

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent

MSDS Number: **N3659** * * * * * *Effective Date:* ***11/02/01*** * * * * * *Supercedes:* ***10/15/99***

NITRIC ACID 1.0 N AND 2.0 N VOLUMETRIC SOLUTIONS

1. Product Identification

Synonyms: Azotic acid solution; nitric acid 6.3%; nitric acid 1.0 N volumetric solution; nitric acid 2.0 N volumetric solution; nitric acid 12.6%
CAS No.: 7697-37-2
Molecular Weight: 63.00
Chemical Formula: HNO3 in H2O
Product Codes:
J.T. Baker: 5639
Mallinckrodt: 3510

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	6 - 13%	Yes
Water	7732-18-5	> 87%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Yellow (Reactive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
May react explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc.
Fire Extinguishing Media:
If involved in a fire, use water spray.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The

toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORBï¿½ or TEAMï¿½ 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Nitric Acid:
OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA)
ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat and incompatibles.

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11. Toxicological Information

For Nitric Acid: Investigated as a mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031

Packing Group: II
Information reported for product/size: 20L

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 20L

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15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                    TSCA  EC   Japan  Australia
----------------------------------------------  ----  ---  -----  ---------
Nitric Acid (7697-37-2)                        Yes  Yes   Yes      Yes
Water (7732-18-5)                              Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                        --Canada--
Ingredient                                    Korea  DSL   NDSL  Phil.
----------------------------------------------  -----  ---   ----  -----
Nitric Acid (7697-37-2)                        Yes   Yes   No     Yes
Water (7732-18-5)                              Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                        -SARA 302-    ------SARA 313------
Ingredient                              RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Nitric Acid (7697-37-2)                 1000  1000    Yes        No
Water (7732-18-5)                       No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                -RCRA-    -TSCA-
Ingredient                              CERCLA     261.33     8(d)
----------------------------------------  ------     ------    ------
Nitric Acid (7697-37-2)                 1000       No         No
Water (7732-18-5)                       No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: Yes         (Mixture / Liquid)
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Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.

Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Store in a tightly closed container.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

This hearing conservation program has been established by Tetra Tech to protect employees from the harmful effects of noise exposure. This program is designed to comply with the Occupational Safety and Health Administration (OSHA) occupational noise exposure standard in Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.95, as well as federal, state, local, and contractual requirements.

The hearing conservation program elements describe how the criteria specified by the OSHA standard shall be implemented, reviewed and maintained. Program elements include responsibilities, action levels, monitoring, employee notification, audiometric testing, hearing protection, warning signs and information, and training. This hearing conservation program shall be made available upon request to employees and their representatives.

1.0 SCOPE

An action level for noise has been established by OSHA based on an 8-hour, time-weighted average (TWA) of 85 decibels measured on the A-weighted scale (dBA) in the slow response mode. When employees are exposed to sound that exceeds this action level, employers must implement a hearing conservation program. All employees exposed to sound levels exceeding the action level of 85 dBA fall under the scope of this Hearing Conversation Program.

2.0 RESPONSIBILITIES

Operating unit health and safety managers (HSMs) are responsible for application and oversight of the hearing conservation program within their respective organizations. Each HSM will maintain records of all noise exposure measurements for at least two (2) years, in accordance with Tetra Tech Recordkeeping and Reporting Requirements (Document Control Number (DCN) 1-4). The HSM is also responsible for identifying employees to be included in the audiometric testing program and for scheduling audiometric exams through the Tetra Tech corporate medical surveillance provider.

Project managers are responsible for ensuring compliance with hearing conservation controls and protection at their project sites. Site safety coordinators (SSCs) are responsible for identifying noise control areas or operations and implementing the program on a site-specific basis. The HSM will assist project managers and SSCs with assessing the need for and implementing hearing conservation programs at individual sites. Employees are responsible for wearing appropriate hearing protection devices and following hearing conservation procedures in noise control areas.

3.0 PROGRAM ELEMENTS

Permissible Exposure Limits

The following table identifies OSHA permissible exposure limits for noise exposures. Whenever possible, administrative or engineering controls will be used to reduce sound levels. If controls are not feasible or fail to reduce sound levels to below 85 dBA, hearing protection will be provided to employees to reduce sound exposures to below the 85 dBA limit. This Tetra Tech hearing conservation program ***mandates*** the use of hearing protection for 8-hour, TWA exposures of 85 dBA or greater.

TABLE 1 - PERMISSIBLE NOISE EXPOSURES*

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
½	110
¼ or less	115

* When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

Monitoring

In most instances, high noise levels at a project site are generated by heavy equipment, such as drill rigs and backhoes, or sources associated with the work site operations such as operating equipment and vehicles. Most common high-noise-level sources have been measured, and instances where hearing protection is required shall be indicated in the site-specific hazard assessment documents such as a health and safety plan (HASP), construction health and safety plan (C-HASP), job hazard analysis (JHA), job safety analysis (JSA), or permit. When noise

exposures at a work site are suspected to equal or exceed an 8-hour, TWA of 85 dBA resulting from noise sources not previously measured, the SSC will conduct an evaluation to characterize the noise sources and exposure levels.

A portable sound-level meter is recommended for surveying general work areas and for estimating noise exposure when the noise levels are relatively constant. Noise dosimeters are recommended for documenting full-shift noise exposures when noise sources fluctuate, are intermittent, or otherwise difficult to document with the sound-level meter. Monitoring for occupational noise exposure will be conducted for each representative task or job position that the SSC deems necessary. The HSM shall assist with sound level monitoring and reporting as necessary.

All noise measurements will be taken in the hearing zone of the affected employee. The hearing zone is an area within a radius not to exceed 12 inches from the ear closest or in most direct proximity to the noise source.

Monitoring equipment must be in factory calibration and will be checked in the field with an appropriate field calibration check standard according to the equipment manufacturer's recommendation before and after each set of measurements. Documentation of test field calibration checks will be kept with the field data collected.

In some cases, such as on short-term projects, the SSC may forgo actual noise level measurements and use a simple rule-of-thumb test to determine if noise levels are in excess of 85 dBA. The test requires the SSC to determine how loud he or she must speak to be heard at arm's length from another person. If the SSC must raise his or her voice to be heard, average noise levels likely exceed 85 dBA.

Employee Notification

The SSC is responsible for informing employees exposed at or above an 8-hour, TWA of 85 dBA of the results of the monitoring.

Audiometric testing

Audiometric testing shall be conducted for all Tetra Tech employees potentially exposed to sounds levels greater than 85 dBA TWA. The audiometric testing program consists of baseline audiograms, annual audiograms, and termination audiograms. Employees will be informed of the results of these tests at the time of their examination. Audiometric test results will be retained for Tetra Tech by the corporate medical advisor and will become a part of each employee's permanent

medical record. Exposure and audiometric records will be made available to employees upon request.

Hearing Protection

Tetra Tech will provide hearing protection to all personnel that may experience noise exposures at or greater than 85 dBA. Hearing protection must provide sufficient attenuation to limit employee noise exposure to an 8-hour, TWA of less than 85 dBA. Hearing protection will be replaced as necessary. The SSC will supervise the correct use of hearing protection at a work site. Personnel will receive instruction in proper fitting during initial and refresher hearing conservation training classes.

Warning Signs and Information

The SSC will post "Hearing Protection Required" signs in areas where noise levels have been measured and determined to exceed the 85-dBA, TWA action level. Signs may also be posted in areas where monitoring has not been conducted but noise levels are expected to exceed the 85-dBA, TWA level based on similarity to past activities or on the judgment of the SSC.

For short-duration projects or where personnel exposure in the high-noise area is limited and controlled, the SSC may provide verbal notice of the need for hearing protection in place of the signs described above.

4.0 Training

Hearing conservation training may be conducted as a stand-alone course or may be included in HAZWOPER, construction safety, or other health and safety training. Hearing Conservation training will include the following:

- Effects of noise on hearing;
- The purpose of hearing protectors;
- The advantages, disadvantages, and attenuation of various types of hearing protection;
- Instruction on selection, fitting, use, and care of hearing protectors; and
- The purpose of audiometric testing and an explanation of the test procedure.

Documentation of initial and refresher training will be through class attendance records and course agendas.

Revision Date	Document Authorizer	Revision Details
10/1/2008	Chris McClain	Update from 1998 format

To prevent injuries and adverse health effects, the following general safe work practices (SWP) are to be followed when conducting work involving known and unknown site hazards. These SWPs establish a pattern of general precautions and measures for reducing risks associated with field operations not conducted on hazardous waste sites. This list is not inclusive and may be amended as necessary.

- Be familiar with and knowledgeable of and adhere to all instructions in the construction health and safety plan (C-HASP), job safety analysis, job hazard analysis, work permit or other health and safety documentation.
- At a minimum, a safety meeting will be held at the start of each project to discuss the hazards of the site and site work. Additional meetings will be held, as necessary, to address new or continuing safety and health concerns.
- Be aware of the location of the nearest telephone and all emergency telephone numbers.
- Attend a briefing on the anticipated hazards, equipment requirements, SWPs, emergency procedures, and communication methods before going on site.
- Plan and delineate entrance, exit, and emergency escape routes.
- Rehearse unfamiliar operations prior to implementation.
- Use the "buddy system" whenever respiratory protection, fall protection, or other protective equipment is in use. Buddies should establish hand signals or other means of emergency communication in case radios break down or are unavailable.
- In order to assist each other in the event of an emergency, buddies should maintain visual contact with each other and with other on-site team members by remaining in close proximity.
- Do not bring nonessential vehicles and equipment onto the site.
- Immediately report all injuries, illnesses, and unsafe conditions, practices, and equipment to the site safety coordinator (SSC).
- Maintain a portion of the site field logbook as a project safety log. The project safety log will be used to record the names, entry and exit dates, and times on site of all Tetra Tech personnel, subcontractor personnel, and project site visitors; and other information related to safety matters.

- A portable eyewash station should be located in the support zone if corrosive materials are used or stored on the site.
- Smoking is not allowed on Tetra Tech projects sites, except in designated smoking areas.
- Do not bring matches and lighters in the exclusion zone or contamination reduction zone.
- Observe coworkers for signs of toxic exposure and heat or cold stress.
- Inform coworkers of nonvisual effects of illness if you experience them, such as headaches, dizziness, nausea, or blurred vision.
- Anyone known to be under the influence of drugs or intoxicating substances that impair the employee's ability to safely perform assigned duties shall not be allowed on the job while in that condition.
- Horseplay, scuffling, and other acts that tend to have an adverse influence on the safety or well-being of the employees is prohibited.
- Work shall be well planned to prevent injuries in the handling of materials and when working with equipment.
- No one shall knowingly be permitted or required to work while the employee's ability or alertness is so impaired by fatigue, illness, or other causes that might unnecessarily expose the employee or others to injury.
- Use proper lifting techniques. Heavy objects will be lifted using the large muscles of the leg instead of the smaller muscles of the back.
- Wear appropriate footwear and all other protective equipment required for work.
- Cleanse thoroughly after handling hazardous substances.
- Maintain all tools and equipment in good condition.
- First aid kits shall be located in a prominent location and stocked with basic first aid supplies.

Revision Date	Document Authorizer	Revision Details
10/1/2008	Chris McClain	NEW

1.0 INTRODUCTION

This safe work practice (SWP) addresses situations during which heat illness is likely to occur and provides procedures for preventing and treating heat-related injuries and illnesses. This SWP is applicable to all Tetra Tech employees performing outdoor activities at both domestic and international project locations. This SWP incorporates safety regulations of the States of California and Washington to protect outdoor workers from heat-related illness. An "outdoor place" is an open area such as an agricultural field, forest, park, equipment and storage yard, outdoor utility installation, tarmac, and road. An outdoor workplace also can include a construction site at which no building shell has been completed, and areas of a construction site outside of any building shells that may be present.

Many factors contribute to heat illness and UV exposure, including personal protective equipment (PPE), ambient temperature and humidity, workload, sun exposure, and the physical condition of the employee, as well as predisposing medical conditions. However, the primary factors of heat illness are elevated ambient temperatures in combination with fluid loss. Because heat illness is one of the more common health concerns during field activities, employees must be familiar with the signs, symptoms, and various treatment methods of each form of heat illness. Health effects from heat illness may range from transient heat fatigue or rashes to serious illness or death. Tracking the weather is imperative during outdoor field projects because heat-related illness and fatalities occur primarily during heat waves.

2.0 Definitions

The following are typical terms and definitions associated with heat illness prevention and monitoring activities:

Acclimatization – Gradual adaptation of the body to work under temperature conditions to which it is exposed. Acclimatization peaks in most people within 4 to 14 days of regular work taking up at least 2 hours per day in the heat.

Ambient Temperature – Temperature of the surroundings.

Electrolytic Sports Drink – A beverage containing sodium and potassium salts that replenish the body's water and electrolyte levels after dehydration caused by physical activity.

Environmental Risk Factors for Heat Illness – Working conditions under which heat illness could occur. Environmental risk factors include air temperature, relative humidity, radiant heat from the sun and other sources, conductive heat sources such as the ground, air movement (or lack of), workload severity and duration, and protective clothing and PPE worn by employees.

Heat Illness – A serious medical condition resulting from the body's inability to cope with a particular heat load. Symptoms include heat cramps, heat exhaustion, and heat stroke (see Table 1).

Heat Index – An index that combines air temperature and relative humidity to indicate the human-perceived equivalent temperature (i.e., how hot it feels outdoors).

Heavy Work – Digging/hand-auguring, heavy lifting, cutting trees, using heavy hand tools, and similar tasks.

Light Work – Walking, writing notes, handling samples, and similar tasks.

Medium Work – Bailing wells, moving light equipment, driving nails, and similar tasks.

Personal Risk Factors for Heat Illness – Factors such as an individual's age, degree of acclimatization, health, water consumption, alcohol consumption, caffeine consumption, and use of prescription medications that affect the body's water retention or other physiological responses to heat.

Preventive Recovery Period – Period of time needed to recover from the heat in order to prevent heat illness.

Relative Humidity – The amount of water vapor that exists in a gaseous mixture of air and water vapor.

Shade – Blockage of direct sunlight. Canopies, umbrellas, and other temporary structures or devices may be used to provide shade. One indicator that blockage is sufficient is absence of a shadow of an object within the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of shade, which is to allow the body to cool. For example, a car sitting in the sun does not provide acceptable shade to a person inside it unless the car is running with air conditioning.

Wet Bulb Globe Temperature (WBGT) - a measurement used to indicate heat stress. WBGT takes into account the effects of humidity

3.0 Employee Duties and Responsibilities

Written procedures help Project Managers (PM), Site Safety Coordinators (SSC), and field team members reduce the risk of heat-related illnesses, and ensure that emergency assistance is provided without delay to all Tetra Tech employees. The following are the duties and responsibilities of the Project Team for implementing and managing the Heat Illness Prevention and Monitoring SWP.

3.1 Project Management

The PM must understand and agree to the responsibility for implementing this SWP for worker safety. The PM will assure that all employees at the work site comply with this SWP.

- The PM must designate an appropriate field team member to serve as the SSC who will implement this SWP and who will perform and document necessary monitoring requirements for worker safety.
- The PM will ensure necessary resources required to implement this SWP and necessary monitoring resources for worker safety are acquired and present at the work site prior to initiation of project activities in hot environments.
- The PM will work with the Director of Health and Safety and identify at risk employees.
- The PM will ensure all field team members are trained in heat illness management prior to working outdoors.
- The PM and SSC will modify working hours to schedule work during the cooler hours of the day, when possible. When a modified or shorter work-shift is not possible, more water and rest breaks shall be provided.
- The PM and SSC will verify that the elements of this SWP are documented in the Health and Safety Plan, as necessary.

3.2 Site Safety Coordinator

- The SSC must understand and agree to the responsibility for implementing this SWP in the field, and implement the necessary monitoring requirements for worker safety during outdoor activities.
- The SSC must have appropriate Occupational Safety and Health Administration (OSHA)-related training and experience to understand and implement this SWP, and to ensure required monitoring for worker safety during outdoor activities.
- The SSC must ensure that resources needed to implement this SWP and required monitoring for worker safety are acquired and present at the work site prior to initiation of project activities in hot environments.
- The SSC must maintain all necessary resources required under the SWP during project activities in hot environments.
- The SSC must ensure implementation and appropriate documentation of required monitoring for worker safety during site activities.
- The SSC must be familiar with and continuously monitor all employees, and must remain alert for onset of heat-related symptoms.
- The SSC and co-workers are encouraged never to discount any signs or symptoms of heat-related illness shown by one or more project team members, and to immediately report these signs or symptoms.
- The SSC will carry a cell phone or other means of communication to ensure that emergency services can be contacted, and will verify that these resources are functional at the worksite prior to each shift.

3.3 Field Team

- The field team will be able to recognize the hazards of working in warm environments.

- Co-workers will use a "buddy system" to monitor each other closely for discomfort or symptoms of heat illness.

- Every morning, workers must attend a daily tailgate safety meeting to be reminded of site-specific emergency procedures.

- A copy of site specific heat illness procedures shall be available for employee review.

4.0 Description and Requirements

4.1 Effects of Hot Weather

As the environment heats up, the body tends to warm up as well. The body's internal thermostat maintains a constant temperature by pumping more blood to the skin, which is cooled by evaporation from increasing perspiration production. In this way, the body increases the rate of heat loss to balance the heat burden created by a hot environment. Such situations generally do not cause harm, as long as the body is allowed to adjust to cope with the increasing heat.

In a very hot environment, however, the rate of heat gain exceeds the rate of heat loss. In this situation, the body's coping mechanisms can be overwhelmed, resulting in heat illness and leading to a range of serious and possibly fatal conditions.

4.2 Preparation for Hot Weather Work

The following list describes the process for preparing to work in hot weather conditions:

- Identify work that can pose a risk of heat stress and Ultraviolet (UV) exposure.
- Identify at-risk employees.
- Identify possible controls:
  - Establish controls for hot weather situations
  - Determine mandatory work and rest regimens based on current conditions, workload, clothing requirements, temperature and humidity for Threshold Limit Value (TLV).
  - Identify required fluid and food replacement schedules.

- Provide a location to cool down during breaks.
- Establish requirements to address UV exposure.
- Monitor workers in extreme heat conditions.

• Establish emergency response procedures to be followed for heat-related emergency situations.

• Provide for first aid and establish the requirement that first aid be administered immediately to employees displaying symptoms of heat-related illness.

• Provide training to employees and verify training records about site legal and regulatory requirements and about the characteristics and effects of heat stress and the recognition and prevention of heat-related injuries (See Table 1).

5.0 Employee Training

Training is an important component of heat illness prevention. Employees are instructed to recognize and treat heat-related illnesses during 8-hour health and safety refresher and first aid training courses. The conditions, symptoms, and treatment for heat-related illnesses are listed below in Table 1.

TABLE 1
HEAT ILLNESS CONDITIONS

Condition	Causes	Signs and Symptoms	Treatment
Heat cramps	Fluid loss and electrolyte imbalance from dehydration	• Painful muscle cramps, especially in legs and abdomen • Faintness • Profuse perspiration	• Move affected worker to cool location • Provide sips of liquid such as Gatorade® • Stretch cramped muscles • Transport affected worker to hospital if condition worsens
Heat Exhaustion	Blood transport to skin to dissipate excessive body heat, resulting in blood pooling in the skin with inadequate return to the heart	• Weak pulse • Rapid and shallow breathing • General weakness • Pale, clammy skin • Profuse perspiration • Dizziness • Unconsciousness	• Move affected worker to cool area • Remove as much clothing as possible • Provide sips of cool liquid or Gatorade® (only if conscious) • Fan the person but do not overcool or chill • Treat for shock • Transport to hospital if condition worsens
Heat Stroke**	Life threatening condition from profound disturbance of body's heat-regulating mechanism	• Dry, hot, and flushed skin • Constricted pupils • Early loss of consciousness • Rapid pulse • Deep breathing at first, and then shallow breathing • Muscle twitching leading to convulsions • Body temperature reaching 105 or 106 degrees Fahrenheit (°F) or higher	• Immediately transport victim to medical facility • Move victim to cool area • Remove as much clothing as possible • Reduce body heat promptly by dousing with water or wrapping in wet cloth • Place ice packs under arms, around neck, at ankles, and wherever blood vessels are close to skin surface • Protect patient during convulsions
**** Any of these symptoms require immediate attention. If heat stroke is suspected, emergency medical personnel should be immediately contacted and on-site first aid provided.**			

Employee training procedures include, but are not limited to, the following:

- All employees (including and especially newly hired employees) will receive heat illness prevention training prior to working outdoors.
- SSCs will hold short tailgate meetings daily to review important heat illness and prevention information with all field team members.
- All workers will be assigned a "buddy" or experienced coworker to ensure that they understood the training and follow the company procedures.
- PMs and SSCs will be trained before assignment to supervise outdoor workers.

6.0 Heat Illness Prevention and Monitoring Requirements

6.1 Identification of Work Conditions

Hot weather is a condition that will be encountered during Tetra Tech operations. When work takes place outdoors during warm weather, working conditions shall be identified for both heat stress conditions and UV exposure.

6.2 Heat Index

The Heat Index (HI) can be used as a first indicator of thermal comfort. The HI can be obtained by directly measuring the dry bulb temperature and relative humidity. The dry bulb temperature and relative humidity forecast can be obtained by checking the local weather station information or measured by using a wet bulb thermometer. A direct reading of HI can be obtained by placing a heat stress monitor in full shade at the workplace.

The HI does not take into account acclimation, clothing or nature of work; therefore, if the HI is at 80°F (26.7°C) or above, further evaluation is required to adjust workload and clothing.

6.3 Heat Exposure Limits and Measurement

The TLV is a means of providing heat exposure limits and gauging potential heat impacts. To determine the TLV, the Wet Bulb Globe Temperature (WBGT) index is measured. The WBGT is calculated using a formula that takes into account air temperature, speed of air movement, radiant heat from hot objects, sunshine and body cooling due to sweat evaporation. WBGT direct reading meters, often called 'heat stress analyzers,' are also available. These meters give direct WBGT readings; no calculations are necessary.

A trained person shall take WBGT measurements. If a WBGT direct reading meter is not available, two different methods are used to calculate WBGT in the workplace: one for workplaces with direct sunlight, and the other for workplaces without direct sunlight. In addition, when conditions of the workplace fluctuate widely, time-weighted WBGT is often used. The WBGT calculation is used in determining heat stress exposure guidelines and heat stress and clothing guidelines. Table 2 presents approximate WBGT values.

APPROXIMATE WBGT VALUE (°F) TABLE

Dry Bulb Temperature		Relative Humidity																			
°C	°F	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
18.33	65	59	59	60	61	62	62	63	64	64	65	66	67	67	68	69	70	70	71	72	73
18.89	66	59	60	61	61	62	63	64	65	65	66	67	68	68	69	70	71	71	72	73	74
19.44	67	60	61	61	62	63	64	65	65	66	67	68	69	69	70	71	72	72	73	74	75
20.00	68	60	61	62	63	64	64	65	66	67	68	69	69	70	71	72	73	74	74	75	76
20.56	69	61	62	63	63	64	65	66	67	68	69	69	70	71	72	73	74	75	75	76	77
21.11	70	62	62	63	64	65	66	67	68	69	69	70	71	72	73	74	75	76	77	77	78
21.67	71	62	63	64	65	66	67	68	69	69	70	71	72	73	74	75	76	77	78	79	79
22.22	72	63	64	65	66	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
22.78	73	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
23.33	74	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
23.89	75	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
24.44	76	65	66	67	68	69	71	72	73	74	75	76	77	78	79	80	81	82	83	85	86
25.00	77	66	67	68	69	70	71	72	74	75	76	77	78	79	80	81	82	84	85	86	87
25.56	78	66	67	69	70	71	72	73	74	76	77	78	79	80	81	82	84	85	86	87	88
26.11	79	67	68	69	71	72	73	74	75	76	78	79	80	81	82	84	85	86	87	88	90
26.67	80	68	69	70	71	72	74	75	76	77	79	80	81	82	84	85	86	87	88	90	91
27.22	81	68	69	71	72	73	75	76	77	78	80	81	82	83	85	86	87	89	90	91	92
27.78	82	69	70	71	73	74	75	77	78	79	81	82	83	85	86	87	88	90	91	92	94
28.33	83	69	71	72	73	75	76	78	79	80	82	83	84	86	87	88	90	91	92	94	95
28.89	84	70	71	73	74	76	77	78	80	81	83	84	85	87	88	90	91	92	94	95	97
29.44	85	71	72	73	75	76	78	79	81	82	84	85	87	88	89	91	92	94	95	97	98
30.00	86	71	73	74	76	77	79	80	82	83	85	86	88	89	91	92	94	95	97	98	100
30.56	87	72	73	75	76	78	80	81	83	84	86	87	89	90	92	93	95	97	98	100	101
31.11	88	72	74	76	77	79	80	82	84	85	87	88	90	92	93	95	96	98	100	101	103
31.67	89	73	75	76	78	80	81	83	85	86	88	90	91	93	94	96	98	99	101	103	104
32.22	90	74	75	77	79	80	82	84	86	87	89	91	92	94	96	97	99	101	103	104	106
32.78	91	74	76	78	80	81	83	85	87	88	90	92	94	95	97	99	101	102	104	106	108
33.33	92	75	77	79	80	82	84	86	88	89	91	93	95	97	98	100	102	104	106	107	109
33.89	93	76	77	79	81	83	85	87	89	90	92	94	96	98	100	102	103	105	107	109	111
34.44	94	76	78	80	82	84	86	88	90	92	93	95	97	99	101	103	105	107	109	111	113
35.00	95	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	108	110	112	114
35.56	96	77	79	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116
36.11	97	78	80	82	84	86	89	91	93	95	97	99	101	103	105	108	110	112	114	116	118
36.67	98	79	81	83	85	87	90	92	94	96	98	100	103	105	107	109	111	113	116	118	120
37.22	99	79	82	84	86	88	91	93	95	97	99	102	104	106	108	111	113	115	117	120	122
37.78	100	80	82	85	87	89	91	94	96	98	101	103	105	108	110	112	115	117	119	121	124
38.33	101	81	83	85	88	90	92	95	97	100	102	104	107	109	111	114	116	119	121	123	126
38.89	102	81	84	86	89	91	93	96	98	101	103	106	108	111	113	116	118	120	123	125	128
39.44	103	82	84	87	89	92	94	97	100	102	105	107	110	112	115	117	120	122	125	127	130
40.00	104	83	85	88	90	93	96	98	101	103	106	108	111	114	116	119	121	124	127	129	132
40.56	105	83	86	89	91	94	97	99	102	105	107	110	113	115	118	121	123	126	129	131	134
41.11	106	84	87	89	92	95	98	100	103	106	109	111	114	117	120	122	125	128	131	133	136
41.67	107	84	87	90	93	96	99	101	104	107	110	113	116	119	121	124	127	130	133	136	138
42.22	108	85	88	91	94	97	100	103	106	108	111	114	117	120	123	126	129	132	135	138	141
42.78	109	86	89	92	95	98	101	104	107	110	113	116	119	122	125	128	131	134	137	140	143
43.33	110	86	90	93	96	99	102	105	108	111	114	117	120	124	127	130	133	136	139	142	145
43.89	111	87	90	93	97	100	103	106	109	113	116	119	122	125	128	132	135	138	141	144	148
44.44	112	88	91	94	98	101	104	107	111	114	117	121	124	127	130	134	137	140	143	147	150
45.00	113	88	92	95	99	102	105	109	112	115	119	122	126	129	132	136	139	142	146	149	153
45.56	114	89	93	96	99	103	106	110	113	117	120	124	127	131	134	138	141	145	148	152	155
46.11	115	90	93	97	100	104	108	111	115	118	122	125	129	133	136	140	143	147	150	154	158
46.67	116	90	94	98	101	105	109	112	116	120	123	127	131	134	138	142	146	149	153	157	160
47.22	117	91	95	99	102	106	110	114	118	121	125	129	133	136	140	144	148	152	155	159	163
47.78	118	92	96	100	103	107	111	115	119	123	127	131	134	138	142	146	150	154	158	162	166
48.33	119	92	96	100	104	108	112	116	120	124	128	132	136	140	144	148	152	156	160	164	168
48.89	120	93	97	101	105	110	114	118	122	126	130	134	138	142	147	151	155	159	163	167	171

Notes: Calculated values assume outdoor work in full sun, with a light (<5 mph) wind.
WBGT of green-shaded cells is less than dry-bulb temperature.

6.4 Heat Stress Exposure Guidelines

Heat stress exposure guidelines recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) are shown in Table 3: ACGIH Screening Criteria for Heat Stress Exposure. This table is used to determine the allocation of work in a work/rest cycle, which is dependent on the type of work and WBGT values.

Table 3: ACGIH Screening Criteria for Heat Stress Exposure

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUE															
Clothing Type	**Summer Lightweight**			**Cotton Coveralls**			**Winter Work**			**Permeable Water Barrier (Tyvek)**			**Fully-Encapsulating Suit (Level 4)**		
Work Load	**Light**	**Moderate**	**Heavy**	**Light**	**Moderate**	**Heavy**	**Light**	**Moderate**	**Heavy**	**Light**	**Moderate**	**Heavy**	**Light**	**Moderate**	**Heavy**
Work/Rest Schedule / WBGT	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
Continuous Work	86	80	77	82	76	73	79	73	70	75	69	66	68	62	59
75% Work, 25% Rest / Hr	87	82	79	83	79	75	80	75	71	76	72	68	69	64	61
50% Work, 50% Rest / Hr	89	85	82	85	81	79	81	78	75	78	74	71	71	67	64
25% Work, 75% Rest / Hr	90	88	86	86	84	82	83	81	79	79	77	75	72	70	68

Notes: Temperature is approximate WBGT from accompanying tables, based on outdoor work, temperature, and relative humidity measurement during work activities. Light Work includes walking, writing notes, handling samples, and similar activities (metabolic rate up to 200 kilocalories [kcal]/hour). Medium Work includes bailing wells, moving light equipment, driving nails, and similar tasks (metabolic rate of 200-350 kcal/hour). Heavy Work is digging, heavy lifting, cutting trees, using heavy hand tools, and similar tasks (metabolic rate above 350 kcal/hour).

Table 3 is based on five-day work weeks and eight-hour work days with conventional breaks. Conventional breaks include a 15-minute break in a four-hour period and a half-hour lunch in an eight-hour period. The ACGIH exposure limits are intended to protect most workers from heat-related illnesses. The limits are higher than that if they had been developed to prevent discomfort. A safety factor should be used to protect sensitive individuals or increase comfort. Examples to clarify work load intensity:

- Rest: sitting (quietly or with moderate arm movements).
- Light work: sitting or standing to control machines, performing light hand or arm work (e.g., using a table saw), occasional walking, driving.
- Moderate work: walking about with moderate lifting and pushing or pulling, walking at a moderate pace, scrubbing in a standing position.
- Heavy work: digging, carrying, pushing/pulling heavy loads, walking at a fast pace, pick and shovel work, carpenter sawing by hand.
- Very heavy: very intense activity at a fast to maximum pace (e.g., shoveling wet sand).

For example, in order to minimize heat stress exposure, an employee who is acclimated and is performing heavy work such as shoveling dirt in a temperature of 78°F (25.6°C), would fall into a work/rest regimen of 100% work.

TLVs assume that workers who are exposed to these conditions are adequately hydrated, are not taking medication, are wearing lightweight clothing and are in generally good health.
When the WBGT is at a temperature that exceeds the TLV, 'Stop Work' should be enforced.

6.5 Heat Stress and Clothing Guidelines

The exposure limit should be adjusted for workers wearing heavy clothing. ACGIH recommendations for these conditions are listed in Table 4: Correction of TLV for Clothing.

Table 4: Correction of TLV for Clothing

Clothing Type	WBGT Correction (in °F [°C])
Work Clothes (long-sleeved shirts and pants)	0 (0)
Cloth coveralls (woven material)	+3 (0)
Spunbonded Meltdown Spunbonded polypropylene coveralls	+6 (+0.5)
Polyolefin coveralls	+8 (+1)
Double-layer woven clothing	+9 (+3)
Limited-use vapor-barrier coveralls	+18 (+11)

For example, an acclimated worker wearing double-layer woven clothing doing moderate work in 30°C would have a corrected exposure level of 30 + 3 = 33°C (91.4°F). This would lower the allowable exposure to 0-25% work from 25-50% work.

For Fire Retardant Clothing (FRC), there is no WBGT correction. FRC can be obtained in various weight materials. The lightest weight FRC should be worn during work in warm environments. No second layer of clothing should be worn except for cotton undergarments.

These values are not to be used for completely encapsulating suits. The assumption is that coveralls are worn with only modest clothing underneath, not a second layer of clothing.

6.6 Identifying At-risk Employees

A screening program for identifying at risk employees shall include identification of health conditions that are aggravated by extreme environmental temperatures. How a person functions under conditions of heat stress will be unique that person and will depend on:

- Age.
- Weight.
- Metabolism.
- Alcohol or drug use.
- Pre-existing medical conditions.

- Level of physical fitness.
- Use of medications.
- Individual sensitivity to heat.
- Possibility of hypertension.

Note: Employees with any 'at-risk' conditions shall have more stringent work/rest regimens or controls

6.7 Health and Safety Controls

Controls shall be based on a risk assessment approach. Conditions and available controls will vary from site to site. Therefore, the HASP shall define and document the site specific control plan. Controls shall be appropriate for the risks that are associated with heat hazards.

6.7.1 Acclimation

The human body can adapt to heat exposure to some extent. This physiological adaptation is called acclimation. Acclimation is a response by the body that results in increased heat tolerance.

People differ in their ability to acclimate to heat. Usually, acclimation is obtained in four to five days. However, it is lost in approximately the same amount of time. After a period of acclimation, the same activity will produce fewer cardiovascular demands. The worker will perspire more efficiently, leading to better evaporative cooling, and thus will more easily be able to maintain normal body temperatures.

All site workers who could be exposed to hot weather conditions shall be acclimated or go through an acclimation process, as necessary. Where workers are already acclimated, no acclimation process is necessary. A previously acclimated person is someone who has already been in similar working and heat conditions.

6.7.2 Fluid and Nutrient Replacement

Cool (50°-60°F [10°-15°C]) water or other cool liquid, except alcoholic beverages, should be made available to workers.

Provision of Water (Not Temperature Dependent)

Water is the principal preventive measure to minimize the risk of heat-related illnesses. Tetra Tech employees shall have access to potable drinking water (or electrolytic sports drink). Where the supply of water is not plumbed or otherwise continuously supplied, water shall be provided in sufficient quantity at the beginning of the work shift to provide **1 quart per employee per hour for drinking for the entire shift**. Frequent drinking of water shall be encouraged by the SSC. Water provision requirements include the following:

- At least 2 quarts of water per employee will be available at the start of the shift.
- The SSC will monitor water containers every 30 minutes, and employees are encouraged to report low levels or dirty water to the SSC when observed.
- The SSC will provide reminders to the field team members to drink frequently, and more water breaks will be provided as needed.
- During the daily tailgate safety meeting each morning, the SSC will remind the field team about the importance of frequent water consumption throughout the shift.
- Water containers will be placed as close to the workers as safety conditions allow.
- When drinking water levels within a container drop below 50%, the water shall be replenished immediately.
- If a common water source is used, disposable/single-use drinking cups will be provided to employees each day.
- Communication devices such as radios, cell phones, or air horns may be used to remind field team members to take water breaks.

Although some commercial replacement drinks contain salt, this is not necessary for acclimated people, because most people have enough salt in their normal diets. Commercial replacement drinks contain high amounts of sugar and may contribute to an individual's inability to cope with the warm environment. If used, commercial replacement drinks should not be used at full strength and should be diluted with water on at least a one-to-one ratio.

Energy drinks shall not be used while working in warm environments.

Poor nutrition, over eating and under eating are factors contributing to heat stress. During hot conditions, employees should eat small, regular meals.

6.7.3 Additional Control Measures

Outdoor workers are exposed to not only potential heat illness, but also UV radiation. Long-term exposure to UV radiation poses additional risks and can lead to a variety of skin disorders, including skin cancer and cataracts of the eyes.

Protection from UV exposure, sunscreen and appropriate eye protection should be considered in addition to the additional controls listed below:

Access to Shade (Not Temperature-Dependent)

Access to rest and shade or other cooling measures are important preventative steps to minimize the risk of heat-related illnesses and exposure to UV radiation. Tetra Tech employees suffering working in extreme temperatures for any period of time shall be provided access to an area with shade that is either open to the air or provided with ventilation or cooling. Such access to shade shall be permitted at all times. Procedures for the provision of shade include the following:

- SSC will set up an adequate number of shaded areas as needed. Examples of shaded areas include vehicles with air conditioning, umbrellas, canopies, or other portable devices. Shading should be placed in close proximity to the work activity (no more than 50-100 yards away, or at the closest location safety conditions allow).

- Employees should have access to an office, construction trailer, or other places with air conditioning.

- Every morning a short tailgate meeting will occur to remind workers about the importance of rest breaks and the location of shade.

- Other cooling measures may be used **if (and only if)** these can be deemed effective as shade.

- As safety conditions allow, SSCs shall provide areas for employee breaks that are:
  - Readily accessible
  - In the shade, open to air, and ventilated
  - Near sufficient supplies of drinking water

7.0 Heat Illness Monitoring

A medical monitoring program shall be planned with the assistance of a medical or industrial hygiene professional. The monitoring program shall be specify the leading indicators to be used (e.g. heat rate, body temperature, blood pressure, respiration rate, and other) and frequency of measurement.

Heat illness monitoring will be conducted by the SSC or his/her designee when work conditions warrant implementation of a work/rest schedule based on temperature conditions and PPE requirements associated with project activities. Monitoring will be conducted as follows:

- Heart Rate: Count the radial (wrist) pulse during a 30-second period as early as possible in the rest period; if heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third without changing the rest period.
  - If the heart rate still exceeds 110 beats per minute at the next period, shorten the following work cycle by one-third.

- Body Temperature: If body temperature exceeds 99.6 degrees Fahrenheit (°F) (37.6 degrees Celsius [°C]), shorten the next work cycle by one-third without changing the rest period. If body temperature still exceeds 99.6 °F at the beginning of the next rest period, shorten the following work cycle by one-third. Do not permit a worker to wear impermeable PPE when his or her body temperature exceeds 100.6 °F (38.1 °C). Use any of the following thermometers:

- Oral Thermometer – Use a clinical thermometer (3 minutes under the tongue) to measure the oral temperature at the end of the work period.
- Tympanic (ear) Thermometer
- Temporal (swipe) Thermometer

The SSC will document throughout the entire work shift results of heat illness monitoring for each team member participating in work activities.

8.0 EXTREME CONDITIONS

Extra Measures During Heat Waves

Extreme environmental conditions during a heat wave can cause an employee's physical and mental conditions to change rapidly into a serious medical condition. Workers previously fully acclimatized are at risk for heat illness during a heat wave because during a heat wave, the body does not have enough time to adjust to a sudden, abnormally high temperature or other extreme conditions. The onset of heat illness may be confused with other problems and may not always be obvious before it becomes life-threatening. Therefore, the following extra measures may be required to prevent and/or respond to heat illness.

- **Alertness to the Weather** – Make sure to monitor the weather and the specific locations where work activities are occurring. Continue to stay updated throughout the work shift on the changing air temperatures and other environmental factors. Use current weather information to make the appropriate adjustments in work activities throughout the workday.
- **Extra Vigilance** – Apply real-time communication and the "Buddy System" to account for the whereabouts of employees at more frequent intervals throughout the work shift and at the end of the work shift.
- **Additional Water Consumption** – Encourage employees to drink small quantities of water more frequently, and have effective replenishment measures in place for provision of extra drinking water to ensure available supplies.

- **Additional Cooling Measures** – Other alternative cooling measures may be necessary in addition to shade (e.g., allowing employees to spend time in air conditioned places or having them spray themselves with water).

- **Additional and/or Longer Rest Breaks** – Allowing employees to take more frequent and longer breaks may be necessary.

- **Change of Work Scheduling and Assignments –** One or more of the following additional measures may be necessary:

  — Start the work shift earlier in the day or later in the evening.

  — Cut work shifts short or stop work altogether.

  — Bring in more personnel to accommodate longer, more frequent breaks as necessary to meet production requirements.

  — Reduce the severity of work by scheduling slower paced, less physically demanding work during the hot parts of the day, and the heaviest work activities during the cooler parts of the day (early morning or evening).

9.0 Establish Emergency Response

Specific procedures to be followed for heat related emergency response shall be established and documented in the HASP.

10.0 Variation to the Heat Illness Prevention and Monitoring Program

Before deviation from the requirements of this document, a designated manager shall authorize the variation. The exception process does not need to be followed for variations that impose more stringent requirements that those outlined in this document.

11.0 Disclaimer

This safe work practice (SWP) is the property of Tetra Tech, Inc. (Tetra Tech). Any reuse of the SWP without Tetra Tech's permission is at the sole risk of the user. The user will hold harmless Tetra Tech for any damages that result from unauthorized reuse of this SWP. Authorized users are responsible for obtaining proper training and qualification from their employer before performing operations described in this SWP.

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This safe work practices (SWP) describes situations where cold stress is likely to occur and discusses procedures for the prevention and treatment of cold-related injuries and illnesses. Cold conditions may present health risks to employees during field activities. The two primary factors that influence the risk potential for cold stress are temperature and wind velocity. Wetness can also contribute to cold stress. Other factors that increase susceptibility to cold stress include age (very young or old), smoking, alcohol consumption, fatigue, and wet clothing. Hypothermia can occur at temperatures above freezing if the individual has on wet or damp clothing or is immersed in cold water. The combined effect of temperature and wind can be evaluated using a wind chill index as shown in Table 1.

Bare flesh and body extremities that have high surface area-to-volume ratios such as fingers, toes, and ears are most susceptible to wind chill or extremely low ambient temperatures. Because cold stress can create the potential for serious injury or death, employees must be familiar with the signs and symptoms and various treatments for each form of cold stress. Table 2 provides information on frostbite and hypothermia, the two most common forms of cold-related injuries.

1.0 Training

Training is an essential component of cold stress prevention. Employees are taught to identify and treat cold-related injuries during various mandatory training events such as, but not limited to, the 8-hour HAZWOPER refresher, site-specific training, tailgate meetings, and first aid training courses.

2.0 Cold stress assessment

If a worker is or may be exposed to cold stress conditions, employees should conduct a cold stress assessment to determine the potential for hazardous exposure of workers. The first step in a cold stress assessment is to determine the areas, occupations, or tasks that place workers at risk of hypothermia or cold-related injuries. Consider factors such as the following:

- Areas with an equivalent chill temperature (ECT) below 19.4°F (see below)
- Fine dexterity tasks that require work with bare hands
- Contact with metal surfaces or use of evaporative liquids (gasoline, alcohol, or cleaning liquids)
- Working on or near bodies of water

- Areas about which employees have expressed concern

Once the areas or tasks that should be monitored are determined, the risk of developing hypothermia or a cold-related injury should then be evaluated. A cold stress assessment shall include determining the air temperature (below 45ºF) and wind speed (to determine the "equivalent wind chill temperature"). This information is available by obtaining weather, temperature, and wind information from a local weather source, or if there is a monitoring station close to the area in which the work is to be conducted. The site safety officer (SSO) shall check temperature, wind speed, and the conditions of the worker every hour to determine appropriate controls.

Wind chill is a concern when the equivalent chill temperature is less than 19.4°F (See Table 1). The conditions when this occurs are:

- The air is calm and the temperature falls below 19.4°F
- The wind speed is 5 mph or greater and the air temperature is 23°F
- The wind speed is 10 mph or greater and the air temperature is 32°F
- The wind speed is 20 mph or greater and the air temperature is 41°F

As part of the risk assessment, the potential for worker exposure to artificially generated air velocities should also be considered, for example when working in walk-in refrigerators and freezers, when riding all-terrain vehicles or snowmobiles, or when exposed to helicopter rotor downwash.

A general assessment of contact cooling for exposed skin, particularly the hands, should consider the following when workers are in contact with metal:

- Below 59°F - Prolonged contact may impair dexterity.
- Below 44°F - Prolonged contact may induce numbness.
- Below 32°F - Prolonged contact may induce frostnip or frostbite.
- Below 19.4°F - Brief contact with may induce frostnip or frostbite.

For materials other than metal, such as plastics and wood, the temperatures will be lower than those noted above since they are less conductive than metal. Contact with metal or other like-conductive materials should be avoided if possible. Any contact with liquids at subzero temperature is also of concern and should be avoided if possible.

Workers should be provided with gloves or other method of warming the hands when the air temperature is below:

- 61°F for sedentary work
- 39°F for light work
- 19.4°F for moderate work

3.0 Cold Exposure Control Plan

If a worker is or may be exposed to cold stress conditions, the employer shall assign a buddy system and develop and implement a cold exposure control plan on site. Some specific components of the cold exposure control plan, as they relate to education and training of workers are described below.

3.1 Control Plan Education and training

This element should contain initial and ongoing training and education that will be provided to all workers who work in areas where there is a reasonable likelihood of exposure to conditions that could cause cold stress.

The training and education material provided to workers who have not previously worked in a cold stress environment should include the following information:

- Recognition of the signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur
- Recognition of impending frostbite
- Proper re-warming procedures and appropriate first aid treatment
- Proper use of clothing
- Proper eating and drinking practices
- Safe work practices appropriate to the work that is to be performed

As previously noted, those workers exposed to cold-stress environments, Tetra Tech provides refresher training and education to ensure that workers remain knowledgeable about the above-mentioned items.

3.2 Engineering controls

Tetra Tech reduces the exposure hazard of workers to thermal conditions that could cause cold stress or injury using a hierarchy of control methods: engineering controls, followed by administrative controls and, as a last resort, personal protective equipment.

Here are some examples of engineering controls Tetra Tech uses to reduce cold exposure:

- Isolate the worker from the environment, where possible.
- Use local heating for the body and especially bare hands. This may include the use of warm air jets, radiant heaters, or contact warming plates.
- Provide barricades or other structures to block air or reduce air velocities at the work location.
- Provide a designated shelter to warm up during breaks.
    - At extreme temperatures employees will be directed to the warm shelters at regular intervals, or anytime cold stress signs or symptoms develop.
    - The shelter will be the designated area to change into dry clothing
- Provide heated metal tools and equipment handles or cover them with thermal insulating materials.
- Use machine controls and tools designed so that workers do not have to remove mittens or gloves to use them.

3.3 Administrative controls

If the above action is not practicable, Tetra Tech will reduce the exposure hazard by providing effective administrative controls to reduce the exposure hazard of workers to thermal conditions that could cause cold stress or injury.

Several administrative controls Tetra Tech commonly uses to reduce worker exposure to cold stress are described below:

- Work/warm-up schedules
    - A work/warm-up schedule (see Table 3) refers to the period a worker spends working in a cold environment and the time spent in a warm area.
    - Worker acclimatization should be a major factor in determining work/rest schedules for extreme cold (ECT of 10°F or less)

- Scheduling and organization of work – Tetra Tech will schedule tasks so as to minimize the length of time of exposure and to maximize the temperatures to which workers may be exposed. For example:
    - Schedule tasks for the warmest part of the day or when the wind is the most calm.
    - Minimize standing or sitting still for long periods in cold conditions (ECT of 10ºF or less).
    - Identify employees with conditions and risk factors which could contribute to cold stress
        - Require more frequent work/warm up schedule, mandatory insulated clothing, and establish a "buddy system".
        - These individuals shall be excluded from work in temperatures of 30ºF or below.
    - Schedule routine maintenance and repair work for warmer seasons of the year.
    - Postpone non-urgent tasks when equivalent chill temperatures are in the "great danger" portion of the "Cooling Power of Wind" ACGIH table (Table 1).
    - Take the equivalent chill temperature (Table 1) into account when planning or scheduling work activities.
    - Warm shelters are made available when work is performed continuously in cold weather with an ECT at or below 20° F
- Fluid replacement and diet
    - An ample supply of warm drinks and/or soup should be available, and workers encouraged to drink them in order to replace fluids lost through breathing and perspiration.
    - Workers should restrict their intake of coffee because of diuretic and circulatory effects.
    - A diet high in fats and carbohydrates will help to maintain body temperature.
- Appropriate measures such as warm vehicles/shelters, clothing and blankets will be available for cold related injuries.
- Heavy work shall not be assigned as to cause heavy sweating that will result in wet clothing.
-

Employees should be thoroughly cognizant of the signs and symptoms of frostbite and hypothermia (see Table 3) in themselves as well as in coworkers. All instances of cold stress should be reported to the site safety coordinator. If a worker exposed to cold shows signs or reports symptoms of cold stress or injury, the worker must be removed from further exposure

and treated by an appropriate first aid attendant, if available, or a physician. Work schedules may be adjusted and warm-up regimes imposed as needed to deal with temperature and wind conditions. Continuous skin exposure is not permitted when air speed and temperature results in an Equivalent Chill Temperature (ECT) of 25°F (32°C)

3.4 Personal Protective Equipment

If the above actions are not practicable, Tetra Tech will reduce the exposure hazard by providing effective PPE to reduce the exposure hazard of workers to thermal conditions that could cause cold stress or injury.

Several examples of PPE Tetra Tech commonly uses to reduce worker exposure to cold stress are described below:

- Protecting of exposed skin surfaces with appropriate clothing (such as face masks, handwear, and footwear) that insulates, stays dry, and blocks wind;
- Using adequate insulating clothing to maintain a body core temperature of above 98.6° F (36 °C);
- Providing extra insulating clothing on site in case of extreme temperature drops within a single shift;
- If an employee's clothing becomes wet while working below 40°F, he or she will automatically be given a change of clothing and checked for cold stress symptoms.
- Additional cold weather clothing will be identified for individuals with predisposed conditions that contribute to cold stress situations;

TABLE 1
COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMPERATURE

The ACGIH criteria, in the Fahrenheit scale, are listed in the following table as it appears in "Cold Stress" portion of the 2011 Threshold Limit Values and Biological Exposure Indices (or most current). The table shows the cooling power of wind on exposed flesh. If there is a wind, use the wind speed in the first column and the actual temperature across the top to find what the equivalent temperature would be under calm conditions.

Estimated wind speed (in mph)	**Actual temperature reading** (degrees Fahrenheit)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent chill temperature (degrees Fahrenheit)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
Wind speeds greater than 40 mph have little additional effect	**LITTLE DANGER** In < 1 hour with dry skin. Maximum danger of false sense of security.				**INCREASING DANGER** Danger from freezing of exposed flesh within one minute.				**GREAT DANGER** Flesh may freeze within 30 seconds.			
	Trench foot and Immersion foot may occur at any point on this chart.											

Note: Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36 C (96.8 F) per cold stress TLV.

TABLE 2
TWO OF THE MOST COMMON COLD STRESS CONDITIONS

Condition	Causes	Signs and Symptoms	Treatment
Frostbite	Freezing of body tissue, usually the nose, ears, chin, cheeks, fingers, or toes	• Pain in affected area that later goes away • Area feels cold and numb • Incipient frostbite (frostnip) - skin is blanched or whitened and feels hard on the surface • Moderate frostbite - large blisters • Deep frostbite - tissues are cold, pale, and hard	• Move affected worker to a warm area • Immerse affected body part in warm (100 to 105 °F) water—not hot! • Handle affected area gently; do not rub • After warming, bandage loosely and seek immediate medical treatment
Hypothermia	Exposure to freezing or rapidly dropping temperatures	• Shivering, dizziness, numbness, weakness, impaired judgment, and impaired vision • Apathy, listlessness, or sleepiness • Loss of consciousness • Decreased pulse and breathing rates • Death	• Immediately move affected person to warm area • Remove all wet clothing and redress with loose, dry clothes • Provide warm, sweet drinks or soup (only if conscious) • Seek immediate medical treatment

TABLE 3
WORK/WARM-UP SCHEDULE FOR A 4-HOUR SHIFT

A WORK/WARM-UP SCHEDULE IS AN EXAMPLE OF AN ADMINISTRATIVE CONTROL. THE ACGIH STANDARD CONTAINS A WORK/WARM-UP SCHEDULE FOR A 4-HOUR SHIFT FOR WORKERS WHO ARE PROPERLY CLOTHED.

Table 3 TLVs Work/Warm-up Schedule for Outside Workers based on a Four-Hour Shift*

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°F (approx)	°C (approx)	Max. work Period	No. of Breaks**	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-15° to -19°	-26° to -28°	(Norm breaks) 1		(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4
-20° to -24°	-29° to -31°	(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4	30 min.	5
-25° to -29°	-32° to -34°	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-30° to -34°	-35° to -37°	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-35° to -39°	-38° to -39°	40 min.	4	30 min.	5	Non-emergency work should cease					
-40° to -44°	-40° to -42°	30 min.	5	Non-emergency work should cease							
-45° & below	-43° & below	Non-emergency work should cease									

Notes:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at -35°C (-30°F) with no noticeable wind (step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a 4-hour period (step 5).

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: (1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1,750 W/m2; (2) all non-emergency work should have ceased at or below a wind chill of 2,250 W/m2. In general, the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.

4. TLVs apply only for workers in dry clothing.

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Biological hazards, or "biohazards," include plants, animals or their products, and parasitic or infectious agents that may present potential risks to worker health. This safe work practice (SWP) discusses procedures for working with biohazards, preventive guidelines, and first-aid procedures for the most common hazards field staff are likely to encounter. This SWP does not address biohazards such as those associated with medical waste. Procedures for working with this type of biohazard should be addressed in the site-specific health and safety plan (HASP), construction health and safety plan (C-HASP), job safety analyses (JSAs), activity hazard analyses (AHAs), or other health and safety project planning documents on a case-by-case basis.

During preparation for site work, the document preparer should consider which plants, animals, and other biological agents may be encountered; assess their potential risk to project personnel; and attach this SWP to the document if necessary. Office health and safety representatives should become familiar with biological hazards indigenous to the geographical area in which most of their office personnel work and assist in evaluating the risks to personnel on projects staffed from their offices. SWPs for insects, snakes, animals, plants, waterborne pathogens (giardia), and hantavirus are provided below.

1.0 INSECTS

SWPs for reducing the chance of insect bites or stings and for treating bites or stings are listed below.

- Workers should keep as much skin area covered as possible by wearing long-sleeved shirts, long pants, and a hat. Pant legs should be tucked into socks or boots and shirts into pants. In addition, workers should wear light colored clothing.
- A proven insect repellent should be used on bare skin and clothing.
- When possible, tall grasses and brush that could harbor ticks should be avoided.
- Several times during the day and at the end of the work day, each worker should perform a check for evidence of imbedded ticks or previous bites. Particular attention should be paid to the scalp, neck, ankles, back of the legs, and waist.

- When opening well covers, vaults, or other closed items, workers should watch for hornet or wasp nests and black widow or brown recluse spiders. Workers should never reach into spaces with unprotected arms.
- Workers should watch carefully for bees around open soft drinks or food.
- If a worker is stung by a bee, the stinger should be carefully removed, if present. The wound should be washed and a cold pack applied. Allergic reaction should be watched for and is evidenced by extreme swelling, redness, pain, or difficulty breathing.
- If a worker is stung or bit by a spider or scorpion, medical attention should be obtained immediately.

2.0 SNAKES

SWPs for encounters with snakes and for treating snakebites are listed below.

- Workers should avoid walking in areas known to harbor snakes. Workers should be cautious when picking up or moving items that have been on the ground.
- Workers should wear boots made of heavy material that protect the ankles and pants. Heavy work gloves should be worn for picking up items.
- If one snake is encountered, others may be present. Workers should leave the area by retracing their steps.
- If a worker is bitten, the wound should be washed and the injured area immobilized and kept lower than the heart, if possible. Ice or a tourniquet should not be applied to a snake bite. The wound should not be cut. If medical care is more than 30 minutes away from a work site, a snakebite kit should be available on site and workers should know how to use it.

3.0 ANIMALS

SWPs for encounters with animals and for treating associated wounds are listed below.

- If workers encounter a wild animal, the animal should be observed for unusual behavior such as a nocturnal animal out during the day, drooling, an appearance of partial paralysis, irritability, meanness, or a strangely quiet demeanor.

- Workers should never touch the body of a dead animal because certain diseases could be carried by fleas still on the body.

- Workers should avoid animal droppings (including bird droppings). Pathogens, some of which can become airborne, may still be present in the droppings.

- If a worker is bitten, he or she should get away from the animal to avoid further bites. Workers should not try to stop, hold, or catch the animal.

- If the wound is minor, it should be washed with soap and water. Any bleeding should then be controlled, and an antibiotic ointment and dressing should be applied. All animal bite wounds should be watched for signs of infection.

- If the wound is bleeding seriously, the bleeding should be controlled but the wound should not be cleaned. Medical assistance should be summoned immediately.

- If a rabid animal is suspected, immediate medical attention should be summoned. If possible, workers should try to remember what the rabid animal looked like and the area in which it was last seen. The animal should be reported by calling the local emergency number.

4.0 PLANTS

SWPs for plants are as follows:

- Workers should be aware of the types and appearances of poisonous plants in the work site area. Poison ivy, oak, and sumac are the most frequently encountered plants that can cause reaction from casual contact. If a worker is extremely sensitive to these plants, he or she should avoid the area entirely because airborne drift could be sufficient to cause a reaction. Other plants, such as fireweed, can cause painful, short-term irritation and should be avoided as well. Workers should avoid touching face and eye areas after contact with any suspicious plant.

- Workers should wear proper clothing if working in or near overgrown areas. Disposable outerwear should be used, if necessary, and workers should not touch the material with bare hands during removal if the outerwear may have contacted poisonous plants.

- If contact with a poisonous plant has occurred, the affected area should be immediately washed thoroughly with soap and water. If a rash or weeping sore has already begun to develop, a paste of baking soda and water should be applied to the area several times a day to reduce discomfort. Lotions such as Calamine or Caladryl should be applied to help soothe the area. If the condition gets worse and affects large areas of the body or the face, a doctor should be consulted.

- Bushy and wooded areas should be thoroughly checked for thorn-bearing trees, brush, and bramble. In some cases, impalement can cause severe pain or infection.

5.0 WATERBORNE PATHOGENS-GIARDIA

Giardia is a waterborne pathogen consisting of a protoplasmic parasite of the mammalian digestive tract. Giardia is present worldwide, with the highest occurrence in areas with poor sanitation. In the United States, most reported cases are in mountainous regions where drinking water is obtained from streams and is unfiltered or untreated.

Giardia is contracted by ingesting water contaminated with giardia cysts in the dormant state. Giardia parasites can only thrive in the digestive tracts of mammals. Dormant giardia organisms enter water through the feces of infected animals or humans. Giardia symptoms include severe diarrhea and upset stomach. Some people are asymptomatic but can transmit the disease to others. Medical treatment of giardia can be difficult and unpleasant; therefore, prevention is critical. Precautions for preventing exposure to giardia are listed below.

- Workers should assume that all fresh water streams are infected with the giardia organism and not drink any untreated water.

- Team members collecting sediment and water samples from streams should wash their hands thoroughly with soap and water after collecting the samples.

- Giardia parasites are relatively easy to destroy or filter. Water should be treated for drinking or cooking with iodine or another recommended giardia treatment before use.

6.0 HANTAVIRUS

Hantavirus pulmonary syndrome (HPS) is a potentially fatal infection caused by a rodent-borne hantavirus. HPS begins with a brief illness most commonly characterized by fever, muscle pain, headache, coughing, and nausea or vomiting. Other early symptoms include chills, diarrhea, shortness of breath, abdominal pain, and dizziness. In the first identified cases of HPS, this stage of the infection lasted 2 to 5 days before victims were hospitalized. Typically, by the time of hospitalization, victims were found to have tachycardia (a heart rate of greater than 100 beats per minute) and tachypnea (a breathing rate of greater than 20 breaths per minute). Fever was also common. In most cases, death occurred within 2 to 16 days of the onset of symptoms, and victims exhibited pulmonary edema and severe hypotension.

Currently, experts believe that HPS is spread by the deer mouse (*Peromyscus maniculatus*). Though the deer mouse has been found to be the primary host of hantavirus, several other rodent species have also tested positive for the virus. Pinon mice (*Peromyscus truei*), brush mice (*Peromyscus boylii*), and western chipmunks (*Tamia spp.*) are also likely to carry the virus. Also, cases of HPS have been reported in areas of the United States where these particular rodents are not indigenous.

Infected rodents shed the virus in their urine, feces, and saliva. Humans can be exposed to the virus through (1) inhalation of suspended rodent excreta or dust particles containing rodent excreta, (2) introduction of rodent excreta into the eyes or broken skin, and (3) ingestion of food or water contaminated by rodent excreta. HPS has a reported mortality rate of 55 percent. Transmission of hantavirus from infected individuals to healthy persons has not been documented.

Prevention of HPS infection is essential because no known antidote and no specific treatment exists for treating HPS. Therefore, employees should practice risk reduction and control measures. Guidelines for workers in locations that may have rodent infestations or habitats are listed below.

- The best approach for HPS control and prevention is through environmental hygiene practices that deter rodents from colonizing the work environment.

- Information about the symptoms of HPS and detailed guidance on preventive measures should be provided to all employees assigned to field activities.

- Medical attention should be sought immediately for workers who develop a febrile or respiratory illness within 45 days of the last potential exposure to rodents. Attending physicians should be advised of each worker's potential for occupational exposure to hantavirus. Physicians should contact local health authorities promptly if hantavirus-associated illness is suspected. A blood sample should be obtained from the affected worker and forwarded with the baseline serum sample through the state health department to the Centers for Disease Control and Prevention for hantavirus antibody testing.

- Respiratory protective equipment should be worn when handling rodents, when removing rodents from traps, and when working in areas with evidence of rodent droppings or hair. Respiratory protective equipment should include, at a minimum, a half-face air-purifying respirator (APR) or powered APR equipped with a high-efficiency particulate air (HEPA) filter (P100). Full-face regulators may be needed under some circumstances. Respiratory protective equipment should be used in accordance with Occupational Safety and Health Administration regulations.

- Dermal protection should be worn when handling rodents or traps containing rodents, or if contact with contaminated surfaces could occur. Dermal protection should include rubber or plastic gloves that should be washed and disinfected before removal.

- A trap contaminated with rodent urine or feces or in which a rodent was captured should be disinfected with a commercial disinfectant or a 0.4 percent bleach solution. A dead rodent should be disposed of by placing the carcass in a plastic bag containing enough general-purpose household disinfectant to thoroughly wet the carcass. The bag should be sealed and disposed of by burning or by burying it in a 2- to 3-foot-deep hole. Local and state health departments can also provide appropriate disposal methods.

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1.0 PURPOSE

Numerous types of injuries can result from unsafe or improper handling and storing of materials. Workers should be able to recognize the methods for eliminating—or at least minimizing—the occurrence of such incidents. Employers and employees should examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment and take corrective action.

This Health and Safety Safe Work Practice (SWP) describes the potential hazards of handling materials and provides information on training, education, and applying general safety principles that will help reduce workplace accidents involving moving, handling, and storing of materials.

2.0 POTENTIAL HAZARDS FOR WORKERS

Workers frequently cite the weight and bulkiness of objects that they lift as major contributing factors to their injuries. Bending, twisting, and turning were the more commonly cited movements that caused back injuries. Other hazards include falling objects, improperly stacked materials, and the potential for injury from the use of various types of equipment.

Potential injuries that can occur when manually moving materials include:

- Strains and sprains from lifting loads improperly or from carrying loads that are too large or too heavy.
- Fractures and bruises caused by being struck by materials or by being caught in pinch points.
- Cuts and bruises caused by falling materials that have been improperly stored or by incorrectly cutting ties or other securing devices.

In addition, mechanical handling equipment operation can present hazards. Refer to the Tetra Tech Health and Safety Safe Work Practices (SWP) 05-45; Forklift Safety and SWP 05-37 Critical Lift Safe Practices for information on the training components and safe work practices for operating forklifts and working around cranes.

3.0 PRECAUTIONS WHEN MOVING, STACKING AND WORKING WITH STORED MATERIALS

This section describes the precautions workers should take when manually or mechanically moving materials, when stacking materials, and when working with stored materials. In addition, a number of material handling tools are posted online in the toolkit section including 1) Body Strain Risk Worksheet, 2) Back Checklist – Lifting and Material Handling Guide, and 3) Strain Prevention Behavior Checklist. For critical lifts requiring rigging refer to the Tt SWP 05-37; Critical Lifts.

3.1 Moving Materials Manually

Proper lifting technique is critical to back safety, but proper planning may be even more important. Before you lift that box, tool, or piece of equipment, take a moment to consider your action:

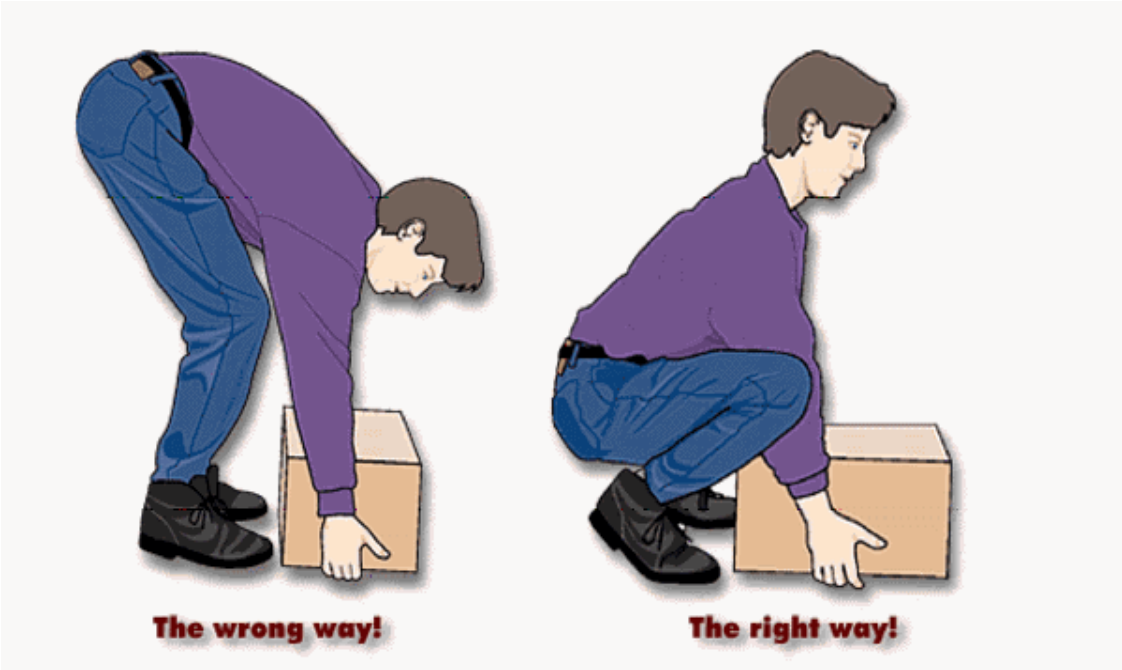
- Do you need to lift the item manually?
- How heavy is it?
- Where are you moving the item?
- Where does it have to go?
- What route do you have to follow?

Workers should always wear appropriate personal protective equipment (e.g., gloves, eye protection, steel-toed safety shoes or boots) and use proper lifting techniques when manually moving materials.

3.1.1 Proper Lifting Technique

- Wear shoes with non-slip soles.
- Clear a space around the object.
- Check your route. Make sure that the floors are not slippery and that there are no obstacles to maneuver around.
- Stand close to the object. Keep your feet apart, staggered if possible.
- Keeping your back upright, lower your body by bending your knees.
- Grip the object firmly.
- Tighten your abdominal muscles.
- Lift with a straight back, pushing with your legs for strength. Keep your head up and look straight ahead.
- Do not hold your breath.
- If you must turn - turn with your feet and your ENTIRE body. Never jerk or twist!
- Hold the object close to your body.
- Make sure you can see over the object.
- Lift and lower the load slowly and smoothly.
- Do not rely on a belt.

- If unsure about technique or weight of the object, ask for help
- If at anytime during lifting there are signs of discomfort or a problem, set down the load and get help.



3.1.2 Workers should seek help to lift items in the following circumstances:

- When a load is too heavy.
- When a load is so bulky that they cannot properly grasp or lift it.
- When they cannot see around or over a load.
- When they cannot safely handle a load.

3.1.3 Follow these procedures to prevent injury from oversize loads:

- Always practice safe lifting techniques
- Position yourself as close to the load as possible when moving an item from a hard-to-reach place. Slide it out to get it closer, and be sure that you have adequate room for your hands and arms.
- Provide sufficient headroom under overhead installations, lights, pipes, and sprinkler systems.

- Be aware of adjacent obstructions, on either side or above the load. Think about where the item will be placed once you've lifted it. Will it be overhead? Under an overhang? In a narrow spot?
- Allow as much room as possible to set the load down. You can always shift it slightly later.
- Check your path from place to place. Remove tripping hazards.
- Make sure that the lighting is sufficient to see where you are going. Stabilize uneven or loose ground, or choose an alternate route. The shortest way isn't always the fastest, or the safest.
- When loading or unloading equipment or materials from a pickup truck, always do so from the back end with the tailgate down. Do not lift anything over the sides of the bed and never stand on the tires to gain access.
- When possible, attach handles or holders to loads and use blocking materials to manage loads safely. When placing blocks under a raised load, be sure that the load is not released before you can remove your hands from under the load. Blocking materials and timbers should be large and strong enough to support the load safely. Do not use materials with rounded corners, cracks, splintered pieces, or dry rot.
    - Handle only stable or safely arranged loads.
    - When using mechanical help, remember to push, not pull – you'll have more control and greater leverage.
    - Fasten the load to the equipment so sudden stops or vibrations don't jar it off.

3.2 Moving Materials Mechanically

Use mechanical help – a dolly, hand truck, or forklift – wherever possible. However, keep in mind that using mechanical equipment to move and store materials may increase the potential for employee injuries due to hazards associated with the equipment being used. Follow these general safety rules.

- Let the weight, size, and shape of the material being moved dictate the type of equipment used. All materials-handling equipment has rated capacities indicating the maximum weight the equipment can safely carry and the conditions under which it can handle the weight. The department or project manager must ensure that the capacity is displayed on each piece of equipment and that it is not exceeded.
- Do not place extra weight on the rear of a counterbalanced forklift to allow an overload.

- Center the load on the platform as close to the support as possible to minimize the potential for tipping over or the load to fall.
- Adjust the load to the lowest position when traveling.
- Follow the equipment manufacturer's operational requirements.

3.3 Stacking Materials

Stacking materials can be dangerous if workers do not follow safety guidelines. Falling materials and collapsing loads can crush or pin workers, causing injury or death. To help prevent injuries, follow these general safety rules:

- Consider the need for availability of the material.
- Paint walls or posts with stripes for quick reference of the maximum stacking heights.
- Ensure that stacks are stable and self-supporting.
- Stack bags and bundles in interlocking rows to keep them secure.
- Step back the layers and cross-key bags at least every 10 layers. To remove bags from the stack, start from the top row first.
- Band or secure boxed materials with crossties or shrink plastic fiber.
- Do not store pipes and bars in racks that face main aisles, where it may create a hazard to passersby when supplies are removed.

3.4 Avoiding Storage Hazards

Workers must be aware of the height and weight of stored materials, their accessibility, and the condition of the containers where the materials are being stored. To prevent creating hazards when storing materials, the following guidelines should be used:

- Keep storage areas free from materials that could cause tripping, fires, explosions, or that may harbor rats or other pests.
- Place stored materials inside buildings that are under construction and at least 6 feet from hoist ways, or inside floor openings and at least 10 feet away from exterior walls.
- Separate materials that are not compatible (refer to SWP 05-13; Flammable Hazards and Ignition Sources).

4.0 OTHER IMPORTANT SAFETY MEASURES

Injuries from handling and storing materials may be reduced by adopting sound ergonomics practices, taking general fire safety precautions, keeping aisles and passageways clear and using ladders safely. Managers are expected to periodically evaluate current work station configurations

and employees' work techniques to assess the potential for and prevention of injuries. Injuries caused by improper lifting will be inviestigated in accordance with Tetra Tech DCN 02-02 Incident Reporting and Investigation Program. Investigatvive findings will be incorporated into work procedures to avoid future injuries. The following general guidelines are provided to aid managers and workers in these areas.

4.1 Ergonomics

Ergonomics (the study of work) is based on the principle that the job should be adapted to fit the person rather than forcing the person to fit the job. Workplace conditions should be restructured or changed to make the job easier and reduce stressors that cause musculoskeletal disorders. Ergonomic principles may require reducing the size or weight of the objects lifted, installing a mechanical lifting aid, or changing the height of a pallet or shelf. Although no lifting approach completely eliminates back injuries, a substantial number of injuries can be prevented by implementing sound ergonomic practices and by training employees in appropriate lifting techniques.

Not all back injuries are a result of sudden trauma; most are of a cumulative type, where a repeated minor injury has flared up, continued use of a heavy tool in the same position has caused pain, or a great deal of time is spent in the same position.

4.2 Fire Safety

Flammable and combustible materials must be stored according to their fire characteristics. Flammable liquids, for example, must be separated from other material by a firewall. Other combustibles must be stored in an area where smoking and using an open flame or spark-producing device is prohibited. Dissimilar materials that are dangerous when they come into contact with each other must be stored apart.

4.3 Aisles and Passageways

Allow sufficient clearance of aisles at loading docks, through doorways, at turning points, and in other parts of the workplace when mechanically moving materials. Providing sufficient clearance will prevent workers from being pinned between the equipment and fixtures, such as walls, racks, posts, or other machines. Sufficient clearance will also prevent the load from striking an obstruction and falling on an employee.

Ensure that passageways remain clear of obstructions and tripping hazards. Do not store materials in excess of supplies needed for immediate operations in aisles or passageways.

5.0 TRAINING AND EDUCATION

OSHA recommends that employers establish a formal training program to teach workers to recognize and avoid materials handling hazards. Training of Tt personnel on this topic will be implemented through the issuance of this SWP and periodic discussion of the topic during monthly health and safety meetings, as well as during pre-project and tailgate safety meetings. The training should reduce workplace hazards by emphasizing the following factors:

- Avoidance of unnecessary physical stress and strain.
- Awareness of what a worker can comfortably handle without undue strain.
- Proper use of equipment.
- Recognition of potential hazards and how to prevent or correct them.
- Prevention of back injuries

Prevention of back injuries should receive special emphasis because of the high incidence of back injuries. Training on proper lifting techniques should cover the following topics:

- Health risks of improper lifting vs. the benefits of proper lifting.
- Body strengths and weaknesses and determining one's own lifting capacity.
- Physical factors that might contribute to an accident.
- Safe postures and timing for smooth, easy lifting.
- Warning signals from your body to watch for when lifting.

Revision Date	Document Authorizer Name	Revision Details
11/27/2013	Chris McClain	Update from 1998 format

By far, the most common cause of skin cancer is overexposure to the sun. Ninety percent of all skin cancers occur on parts of the body that not usually covered by clothing. People who sunburn easily, and those with fair skin and red or blond hair are more prone to develop skin cancer. The amount of time spent in the sun also affects a person's risk of skin cancer. Premature aging of the skin also occurs with prolonged sun exposure. Tetra Tech encourages personnel to avoid prolonged exposure to the sun, and recommends the following:

- Sunburn can occur during any time of the year. To avoid sunburn, wear hats with wide brims.
- Use sunscreen with a Sun Protective Factor (SPF) rating of 15 or higher.
- To prevent skin cancer:
  - Cover up with a wide brimmed hat and a bandanna for your neck. Wear long-sleeved shirts and pants which the sun cannot penetrate.
  - Use sunscreens to help prevent skin cancer as well as premature aging of your skin. Use a Sun Protective Factor (SPF) rating of 15 or higher.
  - Apply sunscreen at least an hour before going into the sun and again after swimming or perspiring a lot.
  - Do not use indoor sun lamps, tanning salons/parlors, or tanning pills.
- You can still get burned on a cloudy day. Try to stay out of the direct sun at midday, because sun rays are their strongest between 10 a.m. and 3 p.m. Beware of high altitudes - where there is less atmosphere to filter out the ultraviolet rays. Skiers should remember that snow reflects the sun's rays, too.
- Know your skin. Whatever your skin type, do a monthly self-examination of your skin to note any moles, blemishes or birthmarks. Check them once a month and if you notice any changes in size, shape or color, or if a sore does not heal, see your physician without delay.

Revision Date	Document Authorizer	Revision Details
10/1/2008	Chris McClain	NEW

1.0 INTRODUCTION

Hand tools are used routinely in many Tetra Tech Operations. In order to prevent accidents associated with their use, our employees must be aware of the dangers associated with the different types of tools and the safety precautions necessary to prevent accidents. The following safe work practices must be followed when using hand tools.

2.0 GENERAL SAFETY RULES

All tools, regardless of ownership, shall be of an approved type and maintained in good and safe condition. Tools not meeting the requirements detailed in this safe work practice are prohibited. Tools are subject to inspection at any time. The supervisor has the authority and responsibility to condemn unserviceable tools, regardless of ownership.

- Defective tools shall be tagged to prevent their use and shall be removed from the job site.
- Employees shall always use the proper tool for the job performed.
- Hammers with metal handles, screwdrivers, knives with metal continuing through the handle and metallic measuring tapes shall not be used on or near energized electrical circuits or equipment.
- Tools shall not be thrown from place to place or from person to person; tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
- Tools shall never be placed unsecured on elevated places.
- Employees using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dust, fumes, mists vapors, or gases shall be provided with the designated PPE necessary to project them from the hazard. The designated PPE should be determined on a case by case basis.

3.0 HAND TOOLS

- All impact tools such as chisels, punches, drift pins, etc., that become mushroomed or cracked shall be dressed, repaired, or replaced before further use.
- Chisels, drills, punches, ground rods, and pipes shall be held with suitable holders or tongs (not with the hands) while being struck by another employee.
- Shims shall not be used to make a wrench fit.
- Wrenches with sprung or damaged jaws shall not be used.
- Pipe shall not be used to extend a wrench handle for added leverage unless the wrench was designed for such use.
- Tools shall be used only for the purposes for which they have been approved.
- Tools with sharp edges shall be stored and handled so that they will not cause injury or damage. They shall not be carried in pockets.

- Wooden handles that are loose, cracked, or splintered shall be replaced. The handle shall not be taped or lashed with wire.
- All cutting tools such as saws, wood chisels, drawknives, or axes shall be kept in suitable guards or in special compartments.
- Tools shall not be left lying around where they may cause a person to trip or stumble.
- When working on or above open grating, a canvas or other suitable covering shall be used to cover the grating to prevent tools or parts from dropping to a lower level where others are present or the danger area shall be barricaded or guarded.
- The insulation on hand tools shall not be depended upon to protect users from shock.

4.0 PORTABLE ELECTRIC TOOLS

- The non-current carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless the tool is an approved double-insulated type and the tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24-volt DC system.
- All powered tools shall be examined prior to use to ensure general serviceability and the presence of all applicable safety devices. The electric cord and electric components shall be given an especially thorough examination.
- Powered tools shall be used only within their capability and shall be operated in accordance with the instructions of the manufacturer.
- All tools shall be kept in good repair and shall be disconnected from the power source while repairs are being made.
- Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts.
- All power tools and cord sets shall be protected by ground fault circuit interrupters (GFCI).
- When using any power source, ensure that GFCI is functional. Otherwise, external GFCI must be used.

5.0 PNEUMATIC TOOLS

- Compressed air and compressed air tools shall be used with caution.
- Pneumatic tools shall never be pointed at another person.
- Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
- Compressed air shall not be used for cleaning purposes except when reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.

- Compressed air shall not be used to blow dust or dirt from clothing.
- The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
- The use of hoses for hoisting or lowering tools shall not be permitted.
- All hoses exceeding ½ inch inside diameter shall have a safety device at the source of supply or branch fine to reduce pressure in case of hose failure or disengagement of a connection.
- Before making adjustments or changing air tools, unless equipped with quick change connectors, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection.
- Eye, foot and hearing protection devices shall be worn during pneumatic tool use.
- Pneumatic tools shall be operated only by competent persons who have been trained in their use.
- A pneumatic tool used where it may contact exposed live electrical parts shall have a nonconductive hose and an accumulator to collect moisture.
- Employees shall not use any part of their bodies to locate or attempt to stop an air leak.

6.0 POWDER ACTUATED TOOLS

A powder actuated tool must always be treated the same as a loaded firearm. ALWAYS ASSUME THE TOOL IS LOADED. These tools come in both low and high velocity models, and both should have built-in safeguards; however, extreme caution must be used when working with this tool. Powder actuated tools can be used only by employees who have been trained in their operation. The user must have a current operator's card.

The following checklist, which may not be complete for all scenarios, is required at a minimum before each use of a powder actuated tool. (Project Managers are responsible for identifying other site specific requirements.)

- Check the safety for proper operation and make sure the bore is clear.
- Select the proper cartridge for the job to be done; never use a higher charge than is necessary.
- Make sure that the drive part of the tool will not penetrate the mounting surface and fly out the other side. The work area must be backed up by a plank or beam.
- Do not use this tool on hard steel, cast iron, rock, or other extremely hard materials.
- Make sure no one else is in the immediate area; concrete chips, metal spalls or rebounding studs could injure bystanders. Insure protective shield is in place to confine flying fragments or particles when the tool is fired.
- Make sure the tool is at the correct angle to the work surface, and maintain pressure against the surface.
- Always wear proper eye and hearing protection.

- Do not use in an explosive or flammable atmosphere.
- Never point the tool at anyone.
- Do not load until ready for use and never leave a loaded tool unattended.
- If the tool develops a defect during use, it should be tagged and removed from service until it is properly repaired.

7.0 GUARDS

Hazardous moving parts - belts, gears, shafts, pulleys or other reciprocating, rotating or moving parts of equipment must be guarded if such parts are exposed. Guards must be provided as necessary to protect the operator and others from point of operation hazards, in-running nip point hazards, rotating parts, flying chips, and sparks etc. All guards shall meet the requirements set forth by ANSI.

SAFETY GUARDS SHALL NEVER BE REMOVED OR TAMPERED WITH

Revision Date	Document Authorizer Name	Revision Details
1/31/2013	Chris McClain	Update

This safe work practice (SWP) presents guidance regarding encounters with dangerous or aggressive animals, and is based on reasonably anticipated animal hazards Tetra Tech, Inc. (Tetra Tech), field staff may encounter in their work.

THIS SWP APPLIES TO ALL TETRA TECH EMPLOYEES WHO MAY PERFORM WORK THAT COULD RESULT IN ENCOUNTERS WITH DANGEROUS OR AGGRESSIVE ANIMALS.

1.0 RESPONSIBILITIES

In preparation for project-related activities, the Project Manager (PM) is responsible for the following:

- Identify the types of dangerous or aggressive animals that could be encountered, based on the location and schedule of the planned work
- Ensure that potential risks to personnel are properly assessed, and
- Ensure that Tetra Tech personnel are provided with appropriate tools to control the anticipated hazards.

When applicable, this SWP must be attached to the health and safety plan. Project managers will ensure that appropriate measures have been taken regarding awareness of the potential threats from dangerous or aggressive animals and that preventative actions are implemented as feasible. This responsibility may be delegated to the site safety coordinator for a specific project.

2.0 PROCEDURES

Procedures for employee prevention and reaction to dangerous or aggressive animals are discussed below. While few preventative actions are likely to work in every situation, the procedures present the most reasonable means of minimizing or controlling confrontations with dangerous or aggressive animals.

1.2 KNOW BEFORE YOU GO

When feasible, workers should identify and contact residents or property owners in advance of visiting private residences to inform them of the schedule for work in the area. Such notifications should include

a request to restrain animals during this time for the protection of the animal and of the employee. During such notifications, workers should remember to inquire about any other known or potential hazards in the area (such as bee hives, wasp nests, and stray animals).

Dangerous or aggressive animals may be encountered anywhere — indoors or outdoors; as well as in urban or rural and remote areas. One of the most important steps in prevention is to understand the employee's work environment and predicting the types of animals that may be encountered. Any animal can become aggressive. Aggressive behavior could result if the animal feels threatened, is ill, is protecting its young, or many other factors. The subsections below discuss examples of animals that could typically be found in domestic and rural areas. Animal behaviors can be unpredictable, and therefore the information below should not be used as an absolute resource but instead as a general guide for awareness. After the employee's work environment has been identified, additional research may be necessary to realize what particular animals may exist in those areas and to obtain tips on how to prevent and respond to encounters.

Some examples of animals that could be encountered in domestic areas and tips on preventing negative encounters are listed below:

Dogs — One of the most common animals encountered in domestic areas and during project activities is the canine. "Dog mace", or pepper spray for canines may be an appropriate for areas with known sightings of aggressive dogs. Always exercise caution when approaching any dog, because all dogs have the potential to bite. Initial observations can be misleading. Telltale signs such as growling ears drawn back, or tails tucked between the hind legs may be absent, yet this does not guarantee that a dog will not act aggressively. For example, some dogs express nervousness by wagging their tail, which typically signifies a non-aggressive posture. If a dog displays unusual or awkward behavior, the worker should leave the area to avoid a negative encounter. Employees should request that residents and property owners restrain the animal while activities are under way. If a dog attempts to strike, the employee should try to block the dog using a backpack, stick, or other object for the dog to bite instead of the body. The employee should then immediately flee the area.

General safety tips for aggressive dog encounters:

- Employees should not approach any unfamiliar dog.
- Do not run from a dog or scream.
- Remain motionless ("be still like a tree") when approached by an unfamiliar dog.
- If the dog continues to be aggressive slowly back away from the dog until you can reach safe area.
- If knocked over by a dog, roll into a ball and be still.
- Do not attempt to pet or play with any dog that you are unfamiliar with, even if the owner is present and tells you that you can do so.
- Immediately report stray dogs or dogs displaying unusual behavior to your team leader and site safety officer.
- Avoid direct eye contact with a dog.
- Do not disturb a dog that is sleeping, eating, or caring for puppies.
- If bitten, clean the wound and seek medical direction from Work Care. Report the incident to your Supervisor, the Project Manager, and in TOTAL. (See section 2.3 for reporting procedures).

Cats — Like any other animal, a cat's behavior can be unpredictable. Employees should request that residents and property owners restrain the animal while work is under way. If a cat displays unusual or awkward behavior, the worker should leave the area to avoid a negative encounter.

Other Animals That Could be Encountered in Residential Areas — In addition to dogs and cats, domestic animals that may be encountered at a residence could include animals such as other mammals, reptiles, or insects (such as spiders or bee hives). When work is conducted in residential areas, the

employees should maintain awareness and speak with residents concerning the presence of the any pets, requesting that they be restrained while activities are in progress.

Farm Animals — Employees should inquire with property owner about the types of animals in the areas where activities will be conducted and requesting that the animals be restrained from "free range" while work is being conducted. Many different farm animals can be aggressive and cause injury, including horses, cattle, swine, goats, and others.

Snakes — Snakes may be encountered in domestic or rural areas in both interior and exterior spaces. It is important to be aware of the poisonous snakes that may be present in the geographical area. Employees should maintain awareness of where they are stepping, sitting, and storing equipment and supplies.

Guidelines for encounters with snakes and for treating snakebites are listed below.

- Workers should avoid walking in areas known to harbor snakes.
- Be aware of snakes that may be swimming in the water to reach higher ground and of those that may be hiding under debris or other objects.
- If you see a snake, back away from it slowly and do not touch it.
- Workers should be cautious when picking up or moving items that have been on the ground.
- Workers should wear boots made of heavy material that protect the ankles and snake chaps. Heavy work gloves should be worn for picking up items.
- If one snake is encountered, others may be present. Workers should leave the area by retracing their steps.

Responding to a Snake Bite:

- If a worker is bitten, try to see and remember the color and shape of the snake, which can help with treatment of the snake bite.
- Lie or sit the person down with the bite below the level of the heart. This position can slow down the spread of venom if the snake is poisonous.

- Tell him or her to stay calm and still.
- Cover the bite with a clean, dry dressing.
- Seek medical attention as soon as possible.
- Dial 911 or call local Emergency Medical Services.
- Apply first aid if you cannot get the person to the hospital right away.

For more information, see "How to Prevent or Respond to a Snake Bite" (www.bt.cdc.gov/disasters/snakebite.asp).

Rodents — Rats and mice may be encountered in interior or exterior areas. Employees should inquire with residents or commercial property owners regarding any knowledge of their presence and maintain awareness of rodents on interior and exterior areas. Employees should be alert for signs such as droppings, small holes (that may be used for entry and egress by a rodent), and gnawed areas that may indicate the presence of rodents. Rodents are known vectors for Hanta Virus and many other serious illnesses (See Biohazard Safety SWP 5-17). It may be difficult to spot these animals in dark areas. Employees should be equipped with a flashlight when they enter dark rooms. Any bites or contact with droppings or nesting materials should be reported to your project manager and Safety Manager immediately.

Raccoons —- Raccoons can be found in domestic or rural areas and particularly in or near trash storage areas, but are primarily nocturnal. Raccoons present during the day may indicate illness, such as rabies. They are able to open lids on trash cans and dumpsters when locks or additional controls are not in place. It may be difficult to spot these animals in dark areas. Employees should be aware of and avoid the areas where the potential to encounter raccoons is high. Employees should be equipped with a flashlight when entering dark areas.

- If a raccoon approaches too closely, make yourself appear larger: stand up, shout, and wave your arms. If he continues to approach, throw or spray water, or even stones if needed.

- A raccoon that is very aggressive – or too tame, or seems to be disoriented or staggers may be sick or injured. Do not approach the animal yourself; instead contact your team leader and site safety officer (also, you may contact a local wildlife department or a wildlife management professional.

Other Animals — Some examples of animals that may be encountered in rural or forested areas that could result in a negative encounter include bear, coyote, wolf, wild boar, muskrat, and beaver. Awareness is the key to prevention of encounters with animals in the wild. The employee is in the animal's home and it could react aggressively if it feels threatened. Find out what types of animals could be encountered in the rural area where the work is to be conducted and review the information with the project team before work begins. You may need to make contact with Local/State/Federal wildlife officials (Fish and Game, Forest Service, etc.) in regard to appropriate procedures. If a wild animal is encountered or observed, the employee should calmly leave the area, tracking the path they use to enter it.

2.2 BUDDY SYSTEM

Whenever possible, workers should conduct activities using the buddy system. Operating under the buddy system doubles visual awareness for prevention of a negative encounter with a dangerous or aggressive animal. Should a worker need to conduct activities as a lone worker, procedures detailed within SWP 5-32, Lone Worker Safe Practices, should be reviewed and followed.

2.3 PROCEDURES FOR ENCOUNTERS WITH DANGEROUS OR AGGRESSIVE ANIMALS

If an encounter with a dangerous or aggressive animal occurs, the worker should immediately assess the situation for appropriate action and follow the SWP guidelines. If the worker is bitten, he or she should immediately leave the area to avoid multiple bites. If the animal is or may be poisonous (venomous, rabid, etc.) or the wound is bleeding seriously, the employee should immediately seek medical attention (Call 911, then contact your project manager/safety manager). If possible, the employee should be aware of any unusual behavior that may indicate the animal is ill (rabid). Any wound should be cleaned, dressed, and reported to the project manager and safety manager within an hour. Work Care should be

notified as soon as possible for non-life threatening injuries at (800-455-6155) or (888-449-7787). SWP 5-17, Biohazard Safety, provides additional guidance on the biological hazards of animals and should be reviewed as an additional resource.

Revision Date	Document Authorizer		Revision Details
	Name	Approval Date	