



November 2, 2012

United States Environmental Protection Agency
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303-8960

Attention: Ms. Meredith Anderson
Environmental Engineer

Re: **EPA Comments Dated 10/22/12**
Vapor Intrusion Characterization Work Plan (Revision 1.0)
Walter Coke
3500 35th Avenue North
Birmingham, Jefferson County, Alabama
USEPA ID No. ALD 000 828 848
Terracon Project No. E1127095

Dear Ms. Anderson:

On behalf of Walter Coke, Inc. (Walter Coke), Terracon Consultants, Inc. (Terracon) is pleased to submit the enclosed revisions to the Vapor Intrusion (VI) Characterization Work Plan (*Revision 1.0*) for the above-referenced site. These revisions have been prepared in response to Final Comments dated 10/25/12 for the Vapor Intrusion Characterization Work Plan (VIC WP) from the United States Environmental Protection Agency (USEPA) Region 4. The individual comments and responses are provided below:

General Comments

USEPA Comment No. 1

In reference to sub-slab vapor, indoor air, and ambient air sampling, the VIC WP makes several references to the ITRC Guidance. Please be aware that the EPA is in the process of issuing revised final Subsurface Vapor Intrusion (VI) Guidance by late 2012. In the interim, EPA has issued some technical documents and tools to support our updated approach on VI: 1) EPA's vapor intrusion website (www.epa.gov/oswer/vaporintrusion) and 2) Superfund Vapor Intrusion FAQs, February 2012 ([http://www.epa.gov/superfund/sites/npl/Vapor Intrusion FAQs Feb2012.pdf](http://www.epa.gov/superfund/sites/npl/Vapor%20Intrusion%20FAQs%20Feb2012.pdf)). Please review these references to ensure that the sampling approach and techniques proposed in this work plan are consistent with EPA's current approach.

Walter Coke Response No. 1

The EPA guidance has been added to the list of documents that were used to prepare the VIC Work Plan.

USEPA Comment No. 2

EPA's experience with VI investigations indicates that typically a data set for a single medium (groundwater, soil gas, sub-slab gas, or indoor air) is inadequate to accurately screen out sites. One round of sampling may not be sufficient to understand VI because of the uncertainty of VI dynamics, and therefore more than one round of sampling may be needed to make a determination. EPA guidance recommends a multiple lines of evidence approach to provide the best means of evaluating the vapor intrusion pathway, and to demonstrate that there is no unacceptable risk from vapor intrusion (i.e., the vapor intrusion pathway, therefore, does not require further investigation as long as site conditions remain the same). This approach can include: multiple rounds of sampling, sampling to assess seasonal variability, sampling of preferential pathways (if any), groundwater data, soil gas data, indoor air data, ambient air data, etc.

Walter Coke Response No. 2

Section 2.3 has been modified to incorporate the multiple lines of evidence approach and seasonal sampling approach that was discussed in the meeting between EPA, Walter Coke, and Terracon on October 16, 2012.

USEPA Comment No. 3

The Johnson & Ettinger vapor intrusion model was run on the volatile compound groundwater data in the Walter Coke Phase III RI report. The boring logs and well construction diagrams were consulted to generate a typical soil column consisting of two feet of silty clay and 8 feet of clay before bedrock was encountered. These model results are approximate but sufficient to demonstrate that only one area offsite would be expected to exceed 10⁻⁶ risk (near MW-50) and few places exceed 10⁻⁴ risk (all onsite) based upon the data from the Phase III RFI report. The VIC WP proposes sub-slab sampling only at one location. It is recommended that the study area be expanded to include sampling of more than one media, sampling at additional locations, and sampling during more than one season as part of this vapor intrusion study. A phased approach is often appropriate for these types of studies, with risk-based screening levels utilized at pertinent decision points in the study (see attached VI Screening Levels). Please update the text, Figure 5, and Appendix B to reflect an expanded approach.

Walter Coke Response No. 3

Section 2.3 has been modified to incorporate the multiple lines of evidence approach and seasonal sampling approach that was discussed in the meeting between EPA, Walter Coke, and Terracon on October 16, 2012. In addition, all of the figures have been modified and Figure 3 incorporates the new soil vapor sampling locations. Appendix B has been modified and Figure 4, a tax map illustrating the properties included in Appendix B, has been.

USEPA Comment No. 4

The scope of the soil gas investigation is currently limited to samples obtained from underneath the concrete slab at a select residence. While it is understood that additional residences or areas may be investigated pending the results of this investigation, there is no clear rationale for not collecting soil gas samples (not sub-slab) from areas around the residence, between the residence and the facility (or plume) boundary, and/or between the residence and the down gradient wells during this investigation. This additional information would be beneficial to ascertain the potential extent of any plume impacts, regardless of the results of the sub-slab soil gas sampling at the residence. Please revise the VIC WP as appropriate to include the collection of additional soil gas samples to assist in further defining or delineating the potential areas impacted by the groundwater plume.

Walter Coke Response No. 4

Section 2.3 has been modified to include additional sample locations and rationale to determine additional sampling, if necessary.

USEPA Comment No. 5

The VIC WP should include a human health conceptual site model that identifies potential sources, pathways, and off-site receptors.

Walter Coke Response No. 5

Section 2.2 Human Health Conceptual Site Model has been added to the VIC Work Plan. This section describes the potential sources, pathways and off-site receptors.

USEPA Comment No. 6

Section 2.3 discusses a Health and Safety Plan (HASP) for the sampling activities proposed in this work plan. The EPA-approved site-wide HASP should be referenced here as a permanent part of this work plan.

Walter Coke Response No. 6

The Health and Safety Plan is now Section 2.4, and the previously submitted site-wide HASP is referenced.

Other Comments**p. 4 – Section 1.0 Introduction****USEPA Comment No. 7**

Please correct the page numbering so that this page is page 1.

Walter Coke Response No. 7

The page numbering in the document has been corrected.

USEPA Comment No. 8

As mentioned above, the EPA is in the process of issuing updated agency guidance for vapor intrusion investigations. This guidance is expected to be final by late 2012. In the meantime, please add the following EPA website and document as a reference for this VIC Work Plan: www.epa.gov/oswer/vaporintrusion/ and Superfund Vapor Intrusion FAQs, February 2012.

Walter Coke Response No. 8

This guidance has been added to the references in Section 1.0.

USEPA Comment No. 9

Also, the terms “Facility” (meaning the entire Walter Coke property) and “FCP” (meaning Walter Coke Former Chemical Plant) should be used consistently throughout the document.

Walter Coke Response No. 9

The document has been modified so that “facility” and “FCP” are used in a consistent manner.

p. 5 – Section 1.2 Previous Assessment Activities**USEPA Comment No. 10**

For background purposes, please provide a figure indicating the approximate plume boundary and groundwater flow direction.

Walter Coke Response No. 10

All of the figures in the VIC Work Plan have been modified. Figure 3 contains groundwater flow direction arrows and the approximate plume boundary.

p. 6 - Section 2.0 Scope of Services USEPA Comment No. 11

The introductory paragraph should address the potential for crawlspace sampling (if a “slab” does not exist at the residence to be sampled) and include a discussion of these sampling methodologies in Section 3.0 (see comment # below).

Walter Coke Response No. 11

This paragraph has been modified to include all potential sampling types that may be conducted under this VIC Work Plan.

p. 6 – Section 2.1 Proposed Study Area USEPA Comment No. 12

Please expand the study area to include the four additional homes on 41st Avenue North, between Shuttlesworth Drive and 35th Street North, as discussed above, and update Figure 5 and Appendix B accordingly.

Walter Coke Response No. 12

Section 2.1 Proposed Study Area has been modified. In addition, all of the figures have been modified and Figure 3 incorporates the new soil vapor sampling locations. Appendix B has been modified and Figure 4 has been added and is a tax map illustrating the properties included in Appendix B.

USEPA Comment No. 13

The VIC WP indicates that the “analysis will begin with the home within 100 feet of the of the approximate plume boundary”. Please note that EPA has ~~updated this~~ approach, and the 100-foot distance is not intended to serve as an absolute “bright line decision criterion” in all cases. In certain cases (for example, if the contaminant plume is not well defined), it may be prudent to evaluate potential VI pathways from a distance greater than 100 feet from the estimated edge of the contamination of concern for VI

Walter Coke Response No. 13

Section 2.3.2 Soil Vapor Sampling has been modified to incorporate the multiple lines of evidence. The reference to 100 feet has been removed.

USEPA Comment No. 14

The last sentence of this paragraph should be moved to Section 2.2.1.

Walter Coke Response No. 14

This sentence has been moved to the Section on Site Access which is now Section 2.3.1.

p. 6 – Section 2.2.1 Site Access**USEPA Comment No. 15**

It is unclear why two 2 certified letters will be sent to residents for site access, and the timing of these mailings is unclear. It is also unclear why there are 2 types of access agreements proposed. Please clarify the type and timing of site access letters that will be sent to residents. The EPA RCRA Community Engagement staff is available to assist with these revisions and is also available to assist with site access, if needed.

Walter Coke Response No. 15

Site Access is now Section 2.3.1. This section has been modified so that only one letter will be sent out. The timing of the letter is indicated and the timeframe for requesting help from EPA RCRA Community Engagement Staff is included.

p. 7 – Section 2.3 Health and Safety**USEPA Comment No. 16**

A “level D work uniform” is an OSHA protocol.

Walter Coke Response No. 16

RCRA has been replaced with OSHA in Section 2.4 Health and Safety.

p. 7 – Section 2.4 Site Access Protocol**USEPA Comment No. 17**

It should be noted that every effort will be made to schedule the sample port installation and sampling process at a time convenient to the home owner, and the property should be left in a manner identical to arrival.

Walter Coke Response No. 17

Section 2.5 Site Access Protocol has been revised to include this.

**p. 7 – Section 3.0 Methodologies
USEPA Comment No. 18**

Please identify the QAPP already approved by EPA.

Walter Coke Response No. 18

The reference to the QAPP has been removed from the VIC Work Plan.

**p. 8 – Table 3-1
USEPA Comment No. 19**

The applicable SOPs listed in Table 3-1 should be attached to the VIC WP, or a specific sub-document that contains these SOPs should be referenced and should accompany field personnel implementing the VIC WP activities. SOPs for vapor intrusion sampling (e.g., soil gas, sub-slab, and indoor air) should also be referenced.

Walter Coke Response No. 19

Appendix G has been added and includes the Terracon SOPs listed in Table 3-1. We have also referenced the EPA Region 4 Field Branches Quality Systems and Technical Procedures.

**p. 8 – Section 3.1 Sample Port Installation
USEPA Comment No. 20**

The methodology for selecting sub-slab/crawlspace sample locations should be discussed. EPA/ITRC guidance should be referenced for sampling port installation, not an unknown Superfund site document.

Walter Coke Response No. 20

The installation of the soil vapor ports references the EPA/ITRC guidance.

**p. 9 – Section 3.2 Sub-Slab Vapor Sampling/last paragraph
USEPA Comment No. 21**

Figure 5 should be referenced, not Fig 3. Please provide a more thorough discussion of sampling if a crawl space exists beneath the structure. Would crawl space air sampling (rather than soil gas sampling 10' from structure) be conducted instead of soil gas? What would the procedures for this type of sampling be?

Walter Coke Response No. 21

Section 3.3 Crawlspace/Indoor Air Sampling has been added which describes the vapor sampling. The correct Figure is now referenced in the appropriate sections.

**p. 10 – Section 3.3 Indoor Air Sampling
USEPA Comment No. 22**

The section is inconsistent in terms of the number of indoor air samples that will be collected – the 1st sentence states that an indoor air sample will be collected where sub-slab soil gas sample results are above screening levels; the 4th paragraph states that one indoor air sample will be collected for every ten sub-slab vapor samples. Please clarify the number of indoor air samples proposed.

Walter Coke Response No. 22

The number of indoor air samples has been clarified.

USEPA Comment No. 23

EPA recommends that a time-integrated sample be collected in the area directly above the foundation floor (if crawl space) and one from the first floor living or occupied area. In general, samples should be collected at the breathing zone level for the most sensitive receptor.

Walter Coke Response No. 23

A phased approach has been added to the work plan. This phased approach lists crawlspace sampling first. The crawlspace air sample results will be compared to the screening levels. If the results indicate screening levels are exceeded, then an indoor air sample will be collected.

USEPA Comment No. 24

An indoor building survey using the Occupied Dwelling Questionnaire is to be conducted prior to indoor air sampling. Please specify whether household products, identified on the Occupied

Dwelling Questionnaire, will be removed from the home prior to indoor air sampling. Do the residents remain in the home? How will indoor air sampling locations be determined?

Walter Coke Response No. 24

The second paragraph of Section 3.4 addresses these questions.

USEPA Comment No. 25

Please define the “SOW” referenced in the 4th paragraph.

Walter Coke Response No. 25

This paragraph has been removed.

p. 10 – Section 3.4 Ambient Air

USEPA Comment No. 26

Please discuss how ambient air sample locations will be determined. Ambient air sampling that coincides with sub-slab/crawl space or indoor air sampling is usually located closer than 2 blocks from the residence.

Walter Coke Response No. 26

Section 3.5 has been modified to address these comments.

USEPA Comment No. 27

EPA recommends beginning ambient air sampling at least 1 hour and preferably 2 hours before indoor air monitoring begins and continue sampling until at least 30 minutes before indoor monitoring is complete to measure ambient air concentrations.

Walter Coke Response No. 27

Section 3.5 has been modified to address these comments.

p. 11 – Section 4.0 Laboratory Analysis

USEPA Comment No. 28

Please provide the data from the results of all TO-15 analytes. The method detection limits (MDLs) for each constituent must be less than the screening levels for each constituent. Chlorobenzene has been omitted from this paragraph as an analyte (see Table 7-1).

Walter Coke Response No. 28

Section 4.0 has been revised to address reporting limits of the VOC compounds using TO-15 in Table 7-1, and Chlorobenzene has been added to Table 7-1.

**p. 12 – Section 5.0 Quality Assurance/Quality Control
USEPA Comment No. 29**

A clear presentation of the number and types of all samples proposed for this study, including QA/QC samples, should be presented in this section. Chlorobenzene should be added to the list of VOCs in footnote 1 of Tables 5-1 and 5-2.

Walter Coke Response No. 29

Table 5-3 has been added to indicate the total number of samples to be collected during the first quarterly sampling event. Chlorobenzene has been added to the footnotes of Tables 5-1 and 5-2.

USEPA Comment No. 30

The 2nd Paragraph on this page should specify the analytical procedure that QA and confirmatory samples will be analyzed by (i.e., TO-15). Does “confirmatory” mean “duplicate”, in this case?

Walter Coke Response No. 30

The paragraph has been revised to indicate QA samples will be analyzed by EPA Method TO-15.

USEPA Comment No. 31

In situations where a limited number of samples are expected, the rationale for determining the frequency of various field quality control samples usually includes something like “at least one, or at a ratio of one for every ten...”, meaning that each type of field quality control sample will be collected even though the total number of actual samples is less than ten. Please revise Table 5-2 to propose the specific number of field quality control samples to be collected for this investigation based on the number of the various types of air samples proposed.

Walter Coke Response No. 31

Table 5-2 has been revised and Table 5-3 has been added in order to add clarity to the number of samples collected.

**p. 12 – Section 6 Data Validation and Management
USEPA Comment No. 32**

This section should also describe how and when analytical data will be reported/submitted to the EPA. The EPA requests data be submitted in the EPA Region 4 electronic data delivery (EDD) format. This format and submittal procedures can be found at: <http://www.epa.gov/region4/superfund/allresource/edd/edd.html>.

Walter Coke Response No. 32

The last paragraph in Section 6.0 has been added to address this comment.

**p. 13 – Section 7.0 Vapor Intrusion Characterization Report
USEPA Comment No. 33**

Is the preliminary report the same as a draft report? A draft VIC report should, at a minimum, include the following components: background of study (history, objectives, and methods); tabulated summary of all sample results; evaluation/interpretation of the data results; figure of site, FCP, study area, plume map etc.; data validation summary; uncertainties; preliminary recommendations; and raw data.

Walter Coke Response No. 33

Section 7.0 has been revised to address this comment. Only one report will be submitted; however, data will be submitted electronically on a quarterly basis once the data has been validated.

USEPA Comment No. 34

Why are two VIC Reports proposed?

Walter Coke Response No. 34

Only one report will be submitted; however, data will be submitted electronically on a quarterly basis once the data has been validated.

USEPA Comment No. 35

How will the need for confirmatory sampling be determined? This discussion should be presented in an earlier section of the work plan.

Walter Coke Response No. 35

Confirmatory sampling has been removed from this section. Section 2.0 provides the sampling sequence and the number of samples to be collected.

USEPA Comment No. 36

Please remove the reference to the Chamberlain Manufacturing Site.

Walter Coke Response No. 36

This has been removed.

p. 13 – Table 7-1**USEPA Comment No. 37**

The residential air screening values for perchloroethylene and trichloroethylene have been updated to 9.4 ug/m³ and 0.234 ug/m³, respectively (please refer to <http://www.epa.gov/ncea/iris>). Please revise the table accordingly.

Walter Coke Response No. 37

The residential air screening levels have been revised based on the screening levels provided to Walter Coke as part of these comments.

USEPA Comment No. 38

Are Analytical Detection Limits the same as MDLs? If so, what are the Reporting Limits (RLs) for each of these constituents? Please clearly identify the MDLs and the RLs for each of these constituents. Please provide a reference for the EPA approval of the ADLs for PCE and VC as the screening levels for this VI study.

Walter Coke Response No. 38

Both the MDLs and RDLs have been added to Table 7-1.

p. 14 – top paragraph**USEPA Comment No. 39**

Please clarify the last sentence concerning vapor intrusion mitigation, which has not been discussed previously in the work plan. Also, what is the Vapor Intrusion Interim Measures Plan referenced here?

Walter Coke Response No. 39

This paragraph has been removed from the plan.

p. 15 – Table 9-1 USEPA Comment No. 40

The EPA would like to work with Walter Coke to shorten the timeframes proposed in Table 9-1.

Walter Coke Response No. 40

The number of sampling events has increases, as reflected by the duration of the timeframe; however, the analytical data will be submitted electronically to EPA on a quarterly basis.

p. 15 – Table 9-2 USEPA Comment No. 41

The purpose of this table is unclear. Please clarify the discussion of supplemental sampling in previous sections of the VIC WP and verify that the timeframes proposed in Table 9-2 are consistent with the timeframes in Table 9-1.

Walter Coke Response No. 41

This table has been removed.

Appendix C USEPA Comment No. 42

The discussion within the letter to be provided to residents indicates that the sampling ports will be installed using a “wet drilling” technique. Several portions of the text of the VIC WP describe a different procedure which does not indicate or appear to involve a “wet” process. Since this type of procedure (wet or dry) can be very intrusive to residents, it is recommended that the letters be as descriptive and accurate as possible. Please review the procedures to be used to determine whether a wet procedure will indeed be used, or revise the letter accordingly. If the letters are correct and a wet procedure will be employed, revise the VIC WP to alter the discussion of the sub-slab sampling port accordingly. Also, if a crawl space sample will be collected rather than a sub-slab sample, the letter should clearly describe this process as well.

Walter Coke Response No. 42

The letter and the attachments have been modified to accurately address the sampling that will be occurring at the residence.

USEPA Comment No. 43

The discussion within the letter, located immediately after the “Additional Visit(s); Sample Collection” subsection appears to contain an incorrect statement. The first sentence appears correct and indicates that about two days after the sampling port is installed, the team would return for approximately 45 minutes to collect a sample from the port. The next (second) sentence then states that these samples are collected by small canisters that would be left at the residence for 24 hours. Based on the general protocol, the second sentence appears to be discussing the collection of indoor air samples, but this is not defined as such. Please revise (or delete) the second sentence under that subsection, as appropriate.

Walter Coke Response No. 43

The letter has been corrected to accurately address the sampling that will be occurring at the residence.

USEPA Comment No. 44

The “Access Agreement” provided as the last page of Appendix C appears to have an error in the new statement provided in the “Grantor” portion, where the statement “Grantee understands it has the right to decline to grant this authorization”. Based on the nature of the statement, it appears that the Access Agreement should be modified to state that the “Grantor understands it has the right to decline to grant this authorization” Revise the document accordingly.

Walter Coke Response No. 44

The referenced sentence is no longer in the Terracon Standard Access Agreement.

Appendix E, Typical Field Forms

USEPA Comment No. 45

Appendix E includes copies of some typical field forms which will/may be used during implementation of the VIC WP activities. For the purposes of this Appendix (i.e., Typical Field Forms) the inclusion of forms that are not specific to the site, the laboratory to be used, etc. is acceptable. However, as the VIC WP is finalized and/or the field activities are implemented, a full series of site/job-specific field forms should be available for use. Specifically, when listing the site, the form should be accurate, and any forms with contact information (i.e., addresses and/or

telephone numbers) should be accurate and complete prior to work initiation. Revise the VIC WP and/or the field forms as appropriate.

Walter Coke Response No. 45

The field forms have been modified to be specific to the site where applicable; however, many of the forms will be filled out during the field activities. The forms will be properly completed during field activities and a sufficient number of forms will be provided to the field staff.

Appendix F, Laboratory Standard Operating Procedures USEPA Comment No. 46

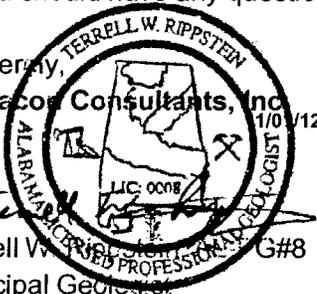
Appendix F provides the full text of Compendium Method TO-15 in an Appendix titled Laboratory Standard Operating Procedures. While it is understood and agreed that this is the most appropriate method for analysis of the Walter Coke samples, the inclusion of the actual Compendium Method within the Laboratory SOP Appendix should be further clarified noting that the method has been adopted by the Laboratory as their applicable SOP. This clarification should be conducted both within the text where the Compendium Method is referred to, as well as on the Appendix cover page. Otherwise, the specific Laboratory SOP(s) to be followed should be included in Appendix F instead.

Walter Coke Response No. 46

The wording has been changed to indicate that the laboratory has adopted the Method as their SOP for TO-15. It has also been changed on the cover page of the Appendix.

CLOSING

If you should have any questions, please do not hesitate to contact us at (205) 942-1289.

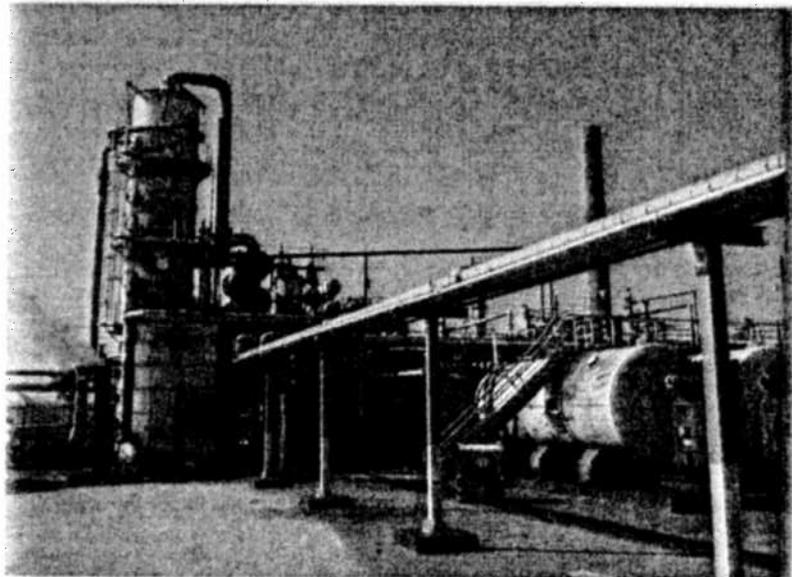
Sincerely,
Terracon Consultants, Inc.
1/01/12

Terrell W. Ripstein
Principal Geologist

Cc: Mr. Don Wiggins – Walter Coke
Mr. Dan Gucza – Walter Energy
ADEM

Vapor Intrusion Characterization Work Plan (Revision 1.0)

Walter Coke
Former Chemical Plant
3500 35th Avenue North
Birmingham, Alabama
US EPA ID No. ALD 000 828 848

November 2, 2012
Terracon Project No. 95127118



Prepared for:
Walter Coke
Birmingham, Alabama

Prepared by:
Terracon Consultants, Inc.
Birmingham, Alabama

Offices Nationwide Established in 1965
Employee-Owned terracon.com

Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities



November 2, 2012

Walter Coke
3500 35th Avenue North
Birmingham, Alabama 35207

Attention: Mr. Don Wiggins

Re: **Vapor Intrusion Characterization Work Plan**
Walter Coke
Former Chemical Plan
3500 35th Avenue North
Birmingham, Alabama 35207
US EPA ID No. ALD 000 828 848
Terracon Project No. 95127118

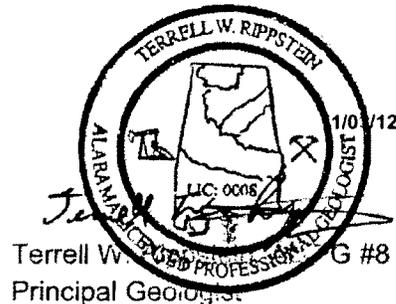
Dear Mr. Wiggins:

Terracon Consultants, Inc. (Terracon) is pleased to submit this Vapor Intrusion Characterization Work Plan (VIC Work Plan) for activities in conjunction with the site referenced above. The VIC Work Plan presents a summary of proposed activities related to the installation of sub-slab vapor sampling points and the collection of sub-slab vapor, indoor air, and ambient air samples for chemical analysis.

Should you have any questions or require additional information, please do not hesitate to contact our office.

Sincerely,
Terracon Consultants, Inc.

John B. Sallman
Senior Principal



Terrell W. Ripstein
Principal Geologist



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ACRONYMS & ABBREVIATIONS



CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
City	City of Birmingham
COC	Chain of Custody
EPA	Environmental Protection Agency
Facility	Walter Coke, Inc. Former Chemical Plant facility
FCP	Former Chemical Plant
HASP	Health and Safety Plan
NELAC	National Environmental Laboratory Accreditation Conference
PCE	Tetrachloroethene (or Perchloroethene)
PID	Photoionization Detector
ppm	parts per million
QA	Quality Assurance
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
SOP	Standard Operating Procedure
SOW	Statement of Work
TCE	Trichloroethene
TestAmerica	TestAmerica, Inc.
TSOP	Terracon Standard Operating Procedure
UAO	Unilateral Administrative Order
USEPA	United States Environmental Protection Agency
VIC	Vapor Intrusion Characterization
VOC	Volatile Organic Compound

**VAPOR INTRUSION CHARACTERIZATION WORK PLAN
WALTER COKE
FORMER CHEMICAL PLANT
3500 35th AVENUE NORTH
BIRMINGHAM, ALABAMA**

**Project No. 95127118
November 2, 2012**

1.0 INTRODUCTION

Terracon has developed this Vapor Intrusion Characterization (VIC) Work Plan to evaluate the potential existence of a vapor pathway in off-site areas related to the presence of certain chemicals in shallow groundwater contamination from the Walter Coke Former Chemical Plant (FCP) Facility.

The VIC Work Plan has been developed in accordance with USEPA guidance including but not limited to:

- EPA's Vapor Intrusion website, www.epa.gov/oswer/vaporintrusion.
- Superfund Vapor Intrusion FAQs, February 2012, [www.epa.gov/superfund/sites/npl/Vapor Intrusion FAQs Feb2012.pdf](http://www.epa.gov/superfund/sites/npl/Vapor%20Intrusion%20FAQs%20Feb2012.pdf).
- CalEPA (California Environmental Protection Agency). 2004. *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. Interim Final. Department of Toxic Substances Control. Sacramento, CA. (Revised February 7, 2005) ("California Guidance")
- ITRC (The Interstate Technology & Regulatory Council). 2007. *Vapor Intrusion Pathway: A Practical Guideline*. Vapor Intrusion Team. Washington, DC. ("ITRC Guidance")
- U.S. EPA. 2002. *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*. Office of Solid Waste and Emergency Response, Washington, DC.
- U.S. EPA. 2008: *US. EPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors*. Draft. Office of Solid Waste, Washington, DC.
- U.S. EPA "Development of a Sub-Slab Gas Sampling Protocol to Support Assessment of Vapor Intrusion." (http://www.epa.gov/ahaazvuc/research/waste/research_40.pdf.)

Vapor Intrusion Characterization Work Plan

Walter Coke Former Chemical Plant ■ Birmingham, Alabama

November 2, 2012 ■ Terracon Project No. 95127118



1.1 Site Conditions

The Walter Coke FCP facility is a portion of an irregularly shaped parcel located at 3500 35th Avenue North in Birmingham, Alabama. A Site Map of the Walter Coke facility is included as Figure 1 in Appendix A which includes the location of the FCP – SMA 4. A Topographic Map is included as Figure 2 in Appendix A. A Site Diagram showing the FCP, with groundwater flow direction arrows, approximate groundwater plume boundaries, and the proposed locations of the Vapor Monitoring Points is included as Figure 3.

The overall site was first developed as a pig iron manufacturing plant in 1881. In 1920, two coke oven batteries were constructed on the site for production of coke fuel (produced from coal). An additional three coke furnaces were constructed in the 1950s. The overall plant processed coal to produce coke, and the FCP was constructed to support the coke manufacturing activities. The FCP has since ceased operations, and the associated buildings have been razed.

The FCP is adjoined by other portions of the Walter Coke plant to the north, south and west, and single family residential housing to the east.

1.2 Previous Assessment Activities

Walter Coke conducted a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) beginning in 1990 in accordance with a consent order and amendment thereto entered with EPA under the RCRA Hazardous and Solid Waste Amendments (HSWA) to evaluate past waste management practices at its Birmingham, Alabama, facility. During the RFI, a groundwater plume was identified in the FCP located at the northeastern edge of the actively operating portion of the facility (Figure 3). Chemicals identified in groundwater beneath the FCP at concentrations above their respective maximum contaminant levels (MCLs) include benzene, toluene, chlorobenzene, perchloroethene (PCE), trichloroethene (TCE), trans-1,2-dichloroethene (t-DCE), 1,1-dichloroethene (1,1-DCE) and vinyl chloride (VC).

An Interim Measures Work Plan (IMWP), prepared and submitted to the U.S. Environmental Protection Agency (EPA) in February 2002, included a detailed description of the conceptual geologic and hydrogeologic model for the site, which would affect groundwater flow from the FCP, along with an evaluation of several remedial options to reduce the chemical mass beneath the FCP and to prevent offsite migration of affected groundwater. An addendum to the 2002 IMWP was submitted to EPA in February 2011 to address EPA comments on the original submittal. On April 16, 2012, EPA approved the IMWP, specifically approving Sections 2 and 5 of the original 2002 submittal and the 2011 Addendum, pending modification per EPA comments.

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The Final Groundwater IMWP focuses on the installation of groundwater containment system to mitigate groundwater migration from the former plant toward the southeast past the facility boundary.

1.3 Project Objectives

The objective of the VIC Work Plan is to develop procedures to define the nature and extent of soil vapor impact, if any, in residential areas adjoining the FCP to the east. Results of the vapor sampling will be used to evaluate whether there is a need for vapor intrusion interim measures and potential corrective actions.

2.0 SCOPE OF SERVICES

The VIC Work Plan for the area east of the FCP is designed to evaluate the potential vapor intrusion pathway. Activities will include the installation of vapor monitoring points, the collection of vapor samples, ambient air sampling, and crawl space vapor sampling. In addition, indoor air samples may be collected if the vapor samples collected in the crawl space exceed the screening levels (See Section 7.0).

2.1 Proposed Study Area

The proposed study area for the VIC Work Plan is the area immediately east of the FCP. Initially, the study area will comprise the property associated with the residence located at 4081 FL Shuttlesworth Drive and the adjacent property to the south of the residence at 4081 FL Shuttlesworth Drive (4077 FL Shuttlesworth Drive) which is owned by Walter Coke (Figure 4, Appendix A). If the soil vapor sampling conducted at the downgradient (east) property boundaries indicates VOC concentrations exceeding the screening levels, then sampling may be conducted at the four additional residences: 3509, 3513, and 3517 41st Avenue North and 4044 35th Street North indicated on Figure 3 and further reflected on Figure 4, Appendix A.

2.2 Human Health Conceptual Site Model

The soil vapor sampling proposed for the area east of the FCP is being conducted due to the presence of a VOC plume that extends to monitoring well MW-50 (Figure 3). The VOC plume shown on Figure 3 is the potential source for VOC vapors in the subsurface. The potential pathway for the VOC vapors in the subsurface is by diffusion through the pore space between the soil particles. The potential off-site receptors would be:

- Outdoor inhalation of vapors above the VOC plume.
- Crawlspace and/or basements above the VOC plume.
- Residences or buildings built on slabs above the VOC plume.

2.3 Proposed Sampling Activities

2.3.1 Site Access

The name and address for the residences within the limits of the study area will be obtained from a City of Birmingham directory, or similar databases as may be available. Except for persons who Walter Coke has been informed are represented by counsel within 15-days of receipt of EPA's approval of the VI Work Plan or 30-days of determination of the need to sample at a residence, the identified resident will be sent a certified letter explaining the vapor sampling program, details concerning the procedures to be followed, schedule of proposed activities, and availability of results. If Walter Coke does not receive a response from the resident or property owner within 30-days of receipt of the access agreement, Walter Coke may request assistance from the EPA RCRA Community Engagement Staff to assist in procuring site access.

A standard Terracon Access Agreement will be included with the letter. To the extent that Walter Coke determines the resident is represented by Counsel, Walter Coke will arrange for the access package to be provided to such Counsel. The form of the letter is set forth in Appendix C.

2.3.2 Sampling

Four permanent soil vapor monitoring points will be installed. The locations of the proposed soil vapor monitoring points are shown on Figure 3. Two of the soil vapor monitoring points will be installed within 10 feet of the crawl space of the residence located at 4081 FL Shuttlesworth Drive, between the residence and the groundwater plume. The other two vapor monitoring points will be located on the downgradient (eastern) edge of the 4081 FL Shuttlesworth property and the property adjacent to the south (owned by Walter Coke) between the groundwater plume and the four residences located east of the plume. Soil vapor samples will be collected on a quarterly basis for a period of one year from the four vapor points. In addition, ambient air and crawlspace sampling of the residence located at 4081 FL Shuttlesworth Drive will be conducted quarterly for a period of one year. The validated laboratory results for soil vapor sampling will be compared to the screening levels presented in Table 7-1 (see Section 7.0).

If the soil vapor results are less than the screening levels for a period of one year, no additional sampling points or crawlspace sample locations will be added to the vapor sampling events, and no further sampling will be conducted after the fourth sampling event.

If validated laboratory results for the crawlspace sample exceeds the screening levels during any of the quarterly sampling events, then indoor air sampling at the 4081 FL Shuttlesworth Drive residence will be conducted. If the indoor air sampling indicates concentrations below the screening levels, no additional activities will be conducted. If validated laboratory results for any

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indoor air sampling indicates concentrations above the screening levels, EPA will be contacted and further steps will be recommended.

If validated laboratory results for any of the vapor samples from the two downgradient vapor sampling locations exceed the screening levels during any of the quarterly sampling events, then crawlspace vapor sampling will be conducted in the four residences downgradient of the soil vapor sampling points. The addresses for these residences are included in Appendix B, a copy of the Birmingham tax map illustrating the location of these residences is included as Figure 4, and they are indicated in Figure 3. For each residence, if validated laboratory results for any of the four quarterly crawlspace samples exceeds the screening levels, then indoor air sampling will be conducted at the residence where the screening levels are exceeded. If the indoor air sampling indicates concentrations below the screening levels, no additional activities will be conducted. If validated laboratory results for any of the indoor air sampling indicates concentrations above the screening levels, EPA will be contacted and further steps will be recommended for that residence.

2.4 Health and Safety

Terracon has prepared and submitted a Health and Safety Plan (HASP) for the sampling activities. At this time, we anticipate that all personnel in the work area will require an OSHA Level D work uniform consisting of hard hats, safety glasses, protective gloves, and steel-toed boots.

2.5 Site Access Protocol

Terracon staff will notify the Residences at least 48 hours in advance of the start of assessment activities. Every effort will be made to schedule the sampling port installation and/or crawlspace air sampling at a time convenient to the home owner, and the property will be left in a manner compliant with the terms of the access agreement. Walter Coke staff will be contacted if issues regarding access to assessment locations are encountered during assessment activities.

3.0 METHODOLOGIES

Project activities will be completed in accordance with the USEPA guidance (<http://www.epa.gov/region4/sesd/fbgstp/index.html>) and relevant Terracon Standard Operating Procedures (TSOPs). The following TSOPs will be used during the assessment.

Table 3-1 Terracon Standard Operating Procedures

REFERENCE NO.	TITLE OF PROCEDURE
E.10	Project Mobilization

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REFERENCE NO.	TITLE OF PROCEDURE
E.20	Standard Safe Operating Procedures for Hazardous Waste Operations
E.30	Chain of Custody Documentation
E.50	Sampling – Environmental Representativeness
E.554	Field Screening – Air / Photoionization Detector
E.2100	Soil Vapor Sampling
E.2210	General
E.2220	Disposal of Spent Supplies
E.2230	Handling and Storage of Drill Cuttings (Non-Hazardous)
E.2240	Site Security Procedures
E.2405	Cleaning - General
E.2410	Cleaning - Manual Washing

Copies of the TSOPs are included in Appendix G.

3.1 Soil Vapor Monitoring Point Installation

The soil vapor monitoring point installation will be conducted based on the EPA and/or ITRC guidance. A 1-inch diameter three- to four- foot deep boring will be drilled using direct push drilling technology, a 1.5-inch long soil gas probe will be embedded in approximately 6-inches to 1-foot of sand. A section of 1/8-inch diameter teflon tubing will be extended from the probe to above ground surface and have a ball valve at the top. The sand will be overlain by a one foot thick bentonite seal, and then neat cement will used to fill the annulus to within one-half foot of the ground surface. A traffic rated well box will be installed to protect the vapor sampling port.

3.2 Soil Vapor Sampling

The soil vapor monitoring point will be allowed to equilibrate for approximately 48 hours prior to sampling. Prior to sampling, the volume of air within the polyethylene tubing will be calculated and purged prior to collection of a soil vapor sample. The soil vapor sample will be collected by attaching the top end of the tubing to a six-liter Summa canister equipped with a 200 cubic centimeter per minute flow control and vacuum gauge with an in-line paper filter/moisture trap. The vacuum in the Summa canister before and after sampling will be recorded on the information form. The valve of the Summa canister will be opened and the soil vapor gas allowed to flow into the Summa canister for a period of 30-minutes. The vacuum gauge will be monitored to check progress of the canister filling. The Summa canister valve will be then closed and submitted for laboratory analysis. Sample collection will be completed prior to the full dissipation of vacuum on the summa canisters.

After the soil gas sample has been collected, a photoionization detector will be connected to the tubing to measure the organic vapor concentration. A Soil Vapor/Indoor Air Sampling Information Form indicating project information, equipment identifiers, sample location, sample

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time, etc. will be completed for each soil gas sample. A chain-of-custody (COC) will be also filled out indicating the sample identification, sampling time, equipment identifiers, and soil organic vapor reading. The canisters will then be transported to the laboratory.

Copies of field forms including a Soil Vapor/Indoor Air Sampling Information Form and a standard COC are included as Appendix E.

3.3 Crawlspace Sampling

Crawlspace sampling will be conducted from the residence at 4081 FL Shuttlesworth Drive during the four quarterly events, and at up to four additional residences if laboratory results for the soil gas samples collected from the two downgradient soil vapor monitoring points exceed the screening levels. Crawlspace sampling at each residence, if necessary, will be conducted in a similar manner.

Crawlspace air samples will be collected using a 6-liter, certified-clean, Summa canister with a 24-hour flow controller supplied by the laboratory. The vacuum pressure of the canisters will be recorded before sampling and at the end of sampling. Crawlspace samples will be collected from as close to the center of the crawlspace as possible.

Terracon field personnel will connect the flow controller to the Summa canister by removing the brass cap on the canister and tightening the stainless steel Swagelok fitting on the flow controller to the threads on the canister. This requires the use of a wrench to firmly tighten the fitting. Field personnel will not use Teflon tape, sealant, or over tighten the fitting.

Once a sampling location has been selected, a Terracon air sampling form (project information, equipment identifiers, sample location, and start time) will be filled out and attached to the canister. A Soil Vapor Air Sampling Information Form indicating project information, equipment identifiers, sample location, sample time, initial and final vacuum readings, etc. will be completed for each crawlspace air sample. A COC will be completed indicating the start and end times for the sample.

To open the canister, the valve will be rotated counter-clockwise at least one full turn or otherwise opened. After the 24-hours have passed, Terracon personnel will return to the residence, close the valve on the canister and record the time and vacuum remaining in the Summa canister on the Terracon sampling forms and on the COC. The canisters and flow controllers will then be transported to the laboratory.

3.4 Indoor Air Sampling

If deemed necessary based on laboratory results from crawlspace sampling as discussed above, indoor air samples will be collected using a 6-liter, certified-clean, Summa canister with a 24-hour flow controller supplied by the laboratory. The vacuum pressure of the canisters will be

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recorded before sampling and at the end of sampling. Indoor air samples will be collected from as close to the center of the residence as possible.

If indoor air sampling is conducted, Terracon will request that resident occupants close doors and windows and operate the heating, ventilating, and air conditioning (HVAC) system for the period beginning a minimum of 24-hours prior to the start of sample collection to the end of sample collection. The residents will not be asked to vacate their residence during the sampling. An indoor air sample (if required) will be collected from the breathing zone area (approximately between 4.5 feet to 5.0 feet off the ground), and placed approximately in the center of the house. Potential volatile materials stored in the house will be evaluated by interviewing the resident and completing the Occupied Dwelling Questionnaire (Appendix D) at least 48-hours prior to the start of sample collection. We will ask that any potential items which might adversely affect the indoor air sampling be removed at least 24 hours prior to initiation of sampling.

Terracon field personnel will connect the flow controller to the Summa canister by removing the brass cap on the canister and tightening the stainless steel Swagelok fitting on the flow controller to the threads on the canister. This requires the use of a wrench to firmly tighten the fitting. Field personnel will not use Teflon tape, sealant, or over tighten the fitting.

Once a sampling location has been selected, a Terracon air sampling form (project information, equipment identifiers, sample location, and start time) will be filled out and attached to the canister. A Vapor Sampling Information Form indicating project information, equipment identifiers, sample location, sample time, initial and final vacuum readings, etc. will be completed for each indoor air sample. A COC will be completed indicating the start time for the sample.

To open the canister, the valve will be rotated counter-clockwise at least one full turn or otherwise opened. After the 24-hours have passed, Terracon personnel will return to the Residence, close the valve on the canister and record the time and vacuum remaining in the Summa canister on the Terracon sampling forms and on the COC. The canisters and flow controllers will then be transported to the laboratory.

3.5 Ambient Air

Ambient (outdoor) air samples will be collected using a 6-liter, certified-clean, Summa canister with a 24-hour flow controller supplied by the laboratory. Ambient air sampling will begin approximately 1 hour before the crawlspace/indoor air sampling and will continue for 30 minutes after the crawlspace/indoor air sampling. The sample location will be selected based on a forecast of the prevailing wind direction for the 24-hour sampling period. The ambient air sample will be collected from the breathing zone area (approximately between 4.5 feet to 5.0 feet off the ground). One ambient air sample can be representative of ambient air for indoor air samples being collected at the same time (start times within approximately 4 hours of each

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other), provided that the indoor air samples are taken from within two blocks of each other. Ambient air samples will not be collected near buildings.

4.0 LABORATORY ANALYSIS

Any soil vapor, crawlspace air, indoor air, and ambient air samples will be collected using six-liter Summa canisters. The Summa canisters will be submitted for analysis of volatile organic compounds (VOCs) using Modified EPA Method TO-15. The method detection limit (MDL) will be less than the screening levels for each constituent.

Laboratory procedures will be performed by ESC Lab Sciences (ESC), Mt. Juliet, Tennessee. ESC is NELAC accredited for the laboratory methods referenced above. The laboratory QAM is on file with the USEPA. ESC has adopted the SOPs for the specified method (Appendix F).

5.0 QUALITY ASSURANCE/QUALITY CONTROL

This section sets forth the requirements and provisions for sample quality assurance and quality control in the field and during transport to the laboratory. The transfer of sample custody will be limited between Terracon personnel, laboratory courier and fixed base laboratory personnel. The primary objective of custody requirements for this project is simply to track that samples are handled by authorized personnel and document that handling occurred within the parameters of this Work Plan. In general, the outline for sample handling and custody will be as follows:

- The Terracon project manager will brief sampling personnel on custody procedures.
- Samples will be in the custody of the field team at the site or in secure location until they are transferred to the fixed base laboratory.
- Samples will be removed from the project site on a daily basis and transported to the laboratory.
- The fixed base laboratory will implement tracking and custody documentation.
- Post-analysis samples will be disposed of properly.
- Chain of Custody (COC) documentation will be maintained by Terracon after reporting.

COC protocol will be followed during all phases of the sample collection, storage, shipment, and analysis procedures. Maintaining the COC in the field will be the responsibility of the Terracon project professional. The Terracon project professional will perform and/or direct the collection, handling, field analysis, and/or shipment of samples collected from the site through the sampling personnel assigned.

Samples collected in the field will be labeled and then stored in a secure location from the time of collection through transfer to the fixed base laboratory. Soil gas and air samples will be

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collected using laboratory prepared and certified clean Summa canisters. Soil gas and air samples will be kept at ambient temperature.

Table 5-1 Laboratory Sample Requirements.

Analysis and Method	Media	Container	Preservative	Holding Time
VOCs ¹ by EPA Method TO-15	Air	6-Liter Summa Canister Individual Certified Clean	None	14 days ²

¹ - VOCs to include benzene, chlorobenzene, ethylbenzene, PCE, TCE, VC, t-DCE, c-DCE, 1,1-DCE, toluene, and xylenes

² - Stability studies indicate TO-15 samples can be held up to 30 days.

A COC record will accompany each set of samples during collection and shipment. Each COC record will be filled out and signed in permanent ink by a Terracon field team member. The COC records will include the following information: project name and number, sample designation, date and time of collection, samplers name, number of sample containers, type of matrix, preservatives, analysis to be performed, signature of laboratory person(s) receiving samples, and inclusive dates/times of possession. Original COC documents placed in laboratory shipping containers will be bagged in Ziploc[®] plastic bags for protection against moisture and damage. A carbon copy or photocopy will be made of the COC record before sealing and placing it in the shipping container to shipment to the fixed base laboratory.

Various blank and duplicate samples will be used to monitor the quality assurance and control of the field sampling activities. These samples will be analyzed for VOCs by EPA Method TO-15. Table 5-2 lists the type of sample and frequency with which they will be collected.

Table 5-2 Field Quality Control Sample Schedule

QC Sample Type	Media	Analysis	Container	Frequency
Duplicate Samples	Air	VOCs ¹	6-Liter Summa Canister Individual Certified Clean	At least 1 per 20 crawlspace-indoor-ambient air samples

¹ - VOCs to include benzene, chlorobenzene, ethylbenzene, PCE, TCE, VC, t-DCE, c-DCE, 1,1-DCE, toluene, and xylenes

Table 5-3 provides a sample summary for the first quarterly sampling event.

Table 5-3 Sample Summary 1st Quarter

QC Sample Type	Number of Samples	Media/ Analysis	Container	Rationale
Soil Vapor Sample	4	Air/VOCs	1-Summa Canister for each sample	Determine soil vapor concentration
Crawlspace Sample	1	Air/VOCs	1-Summa Canister	Determine vapor

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QC Sample Type	Number of Samples	Media/ Analysis	Container	Rationale
				concentration in crawlspace air
Ambient Air Sample	1	Air/VOCs	1-Summa Canister	Determines ambient air concentrations
Duplicate Sample (Crawlspace)	1	Air/VOCs	1-Summa Canister	Assess collection technique on sample precision

Duplicate samples shall be designated using the analytical sample identification followed by “-D”, “-Dup” or other similar common designation. Duplicate sample nomenclature will be clearly identified on analytical data tables as a note.

6.0 DATA VALIDATION AND MANAGEMENT

Data validation activities will focus on verifying the completeness and accuracy of field methods used, sample handling, and fixed base laboratory results. The Terracon Project Manager will be responsible to conduct a full-package review of the field process and data produced for the site and reports from the fixed base laboratory. The ESC QA Officers will conduct validation and reporting consistent with the parameters of the Quality Assurance Manual (QAM). Data quality QA packages for analytical services will be delivered to the Terracon Project Manager and will be entered into the project record. The Terracon Project Manager is responsible for reviewing and confirming that field and laboratory data meets the data quality objectives for the project.

Raw data from the laboratory will be provided to Terracon electronically. The electronic data will be used to directly populate tables. In addition, field data may be entered onto tables or into forms for use in reporting. Terracon personnel not directly involved in the data input, perform a data check on all manually entered data to ensure data is not transposed or incorrectly typed.

Terracon maintains electronic files on the local office server. This information is backed up daily from Terracon’s Corporate Data Center. Once the final report is generated, all electronic files except the final report are deleted. At initial project closing, hard copy files are purged of all documents not provided to the client or other third party. Final reports, site photos, internal memos, permits, and laboratory data are retained. Project closing is 30 days after the last project activity has ceased. A second purge is conducted at three years after project closing. All documents are removed from the file except final reports and documents provided to the client or third parties. These documents are retained at the local office indefinitely.

As described in Section 7.0, Terracon will submit the data to the USEPA in the USEPA Region 4 electronic data delivery (EDD) format (<http://www.epa.gov/region4/superfund/allresource/edd/edd.html>).

7.0 VAPOR INTRUSION CHARACTERIZATION REPORT

A Vapor Intrusion Characterization (VIC) Report will be submitted to EPA upon completion of the one year of vapor sampling. The VIC Report will include: background of study (history, objectives, and methods); tabulated summary of all sample results; evaluation/interpretation of the data results; figure of site, FCP, study area, plume map etc.; data validation summary; uncertainties; preliminary recommendations; and raw data.

In addition to the final report, Walter Coke will submit the quarterly sampling data to USEPA in the USEPA Region 4 electronic data delivery (EDD) format (<http://www.epa.gov/region4/superfund/allresource/edd/edd.html>) on a quarterly basis once the data has been validated.

The VIC Report shall define the nature and extent of soil vapor contamination greater than the levels set forth in Table 7-1 below.

Table 7-1 Interim Measures Screening Levels

Contaminant	EPA Screening Level ($\mu\text{g}/\text{m}^3$) ¹	Method Detection Limit ($\mu\text{g}/\text{m}^3$) ²	Reporting Detection Limit ($\mu\text{g}/\text{m}^3$)
Perchloroethene	9.4 c ³	0.0508	0.2
Trichloroethene	0.234 c	0.0591	0.2
Vinyl Chloride	0.16 c ⁵	0.0309	0.2
Trans-1,2-Dichloroethene	63 n ⁴	0.0438	0.2
Cis-1,2-Dichloroethene ⁶	63 n	0.0477	0.2
1,1-Dichloroethene	210 n	0.0385	0.2
Benzene	0.31 c	0.057	0.2
Ethylbenzene	0.97 c	0.0789	0.2
Toluene	5,200 n	0.0705	0.2
Xylenes	100 n	0.152	0.4
Chlorobenzene	52 n	0.0752	0.2

¹ – Residential Indoor Screening Levels obtained from Regional Screening Table (USEPA April 2012).

² – Sub-slab vapor screening level = (Residential Indoor Screening Levels)/ α .

³ – c – based on 10^{-6} carcinogenic health effects.

⁴ – n – based on non-carcinogenic health effects.

⁵ – Trans-1,2-Dichloroethene is used as a surrogate compound for cis-1,2-Dichloroethene.

8.0 POST-SAMPLING ACTIVITIES

8.1 Sample Port Removal

Soil vapor monitoring points will be left in place until Terracon is directed by USEPA to remove them; however, collection of additional samples from installed sampling ports after the one-year of quarterly sampling is not intended or proposed at this time.

Upon notification by USEPA, Terracon will return to the Residence to remove soil vapor monitoring points. The protective casing will be removed and the sampling port will be hand augered or drilled. The hole will then be filled to within 0.5 feet of the ground surface using neat Portland cement. The remaining portion will be filled with material similar to the surrounding area (i.e., soil and grass, asphalt, etc.).

8.2 Data Transmittal to Residents

Correspondence that provides sampling results to residents and homeowners will only be transmitted by the USEPA, unless prior written approval is provided by the USEPA to Terracon and Walter Coke to perform the transmittal or unless Walter Coke otherwise is legally obligated to provide such results directly, including without limitation, to counsel for residents or homeowners.

Walter Coke and Terracon will copy the USEPA on any written communications with any residents regarding the work outlined in this plan. USEPA will copy Walter Coke and Terracon on any written communications with any residents relating to the work outlined in this plan.

9.0 SCHEDULE

Based upon currently available information, the proposed schedule is as follows:

Table 9-1 Schedule

Activity	Days to Complete After USEPA Approval of VIC Work Plan
Submit Letter to Each Residence to be Sampled	15
Deadline for Receipt of Responses from Residents	45
	Days to Complete After Receipt of Access Agreement
Schedule Soil Vapor Port Installation	30
Complete first quarter of soil vapor and crawlspace sampling	60
Complete fourth quarter of soil vapor and crawlspace sampling	330

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	Days to Complete After Receipt of Access Agreement
Submit VIC Report	390 ¹

¹ – Please note that analytical data will be submitted to EPA quarterly after validation of data.

Appendix A

Figures

BTF Process Area and Sewers - SMA 1
 SWMU #13 - Equalization Basin
 SWMU #14 - pH Neutralization Basin
 SWMU #15 - Primary Clarifier
 SWMU #16 - Aeration Basin
 SWMU #17 - Secondary Clarifier
 SWMU #18 - Thickener
 SWMU #19 - Digester
 SWMU #20 - Dewatering Machine
 SWMU #21 - Former Emergency Basin
 SWMU #22 - Polishing Pond
 SWMU #40 - Historic Drainage Ditch
 SWMU #41 - Former Impoundment
 AOC A - Pipe Outfall into Ditch next to BTF Area
 AOC F - BTF Groundwater Plume

Land Disposal Area (LDA) - SMA 2
 SWMU #4 - BTF Sewer
 SWMU #23 - Biological Sludge Disposal Area
 SWMU #24 - Blast Furnace Emission Control Sludge Piles A and B
 SWMU #25 - Stormwater Ditch
 SWMU #38 - Construction Debris Landfill
 SWMU #39 - Blast Furnace Emission Control Sludge Waste Pile

Coke Manufacturing Plant - SMA 3
 SWMU #1 - Quench Towers & Sumps
 SWMU #2 - Quench Tower Pump Basins
 SWMU #3 - Old Quench Tower Settling Basins
 SWMU #5 - Coal Tar Storage Drainage System
 SWMU #6 - Spill Area Around Diesel Tank
 SWMU #7 - Coal Tar Collection Sump
 SWMU #8 - Flushing Liquor Decanter
 SWMU #9 - Flushing Liquor Decanter Sump
 SWMU #10 - Coal Tar Decanter
 SWMU #11 - Coal Tar Decanter
 SWMU #12 - Coal Tar Decanter
 SWMU #37 - BTF Sewer Tar Trap
 AOC E - Coke Plant Groundwater Plume

Former Pig Iron Foundry (PIF) - SMA 5
 SWMU #43 - Pig Machine Slurry Pits
 SWMU #44 - Blast Furnace Ash Boiler Pit
 SWMU #45 - Slag Drying Beds
 AOC C - Former Pig Iron Foundry

Former Chemical Plant (FCP) - SMA 4
 SWMU #26 - Main Process Building
 SWMU #27 - Floor Drain System
 SWMU #28 - Sulfonation Floor Drain
 SWMU #29 - Product Tank Containment Area
 SWMU #30 - Centrifuge Waste Water Tank
 SWMU #31 - Monohydrate Floor Drain and Sump
 SWMU #32 - Drum Storage Area
 SWMU #33 - Plant Drum Storage Area
 SWMU #34 - Wastewater Neutralization System
 SWMU #35 - Mineral Wool Waste Piles
 SWMU #36 - Used Oil Tank
 SWMU #42 - Former Aboveground Storage tanks (ASTs)
 AOC B - Drainage Ditch next to Shuttlesworth Drive and 35th Ave.
 AOC D - Former Chemical Plant (FCP) Groundwater Plume

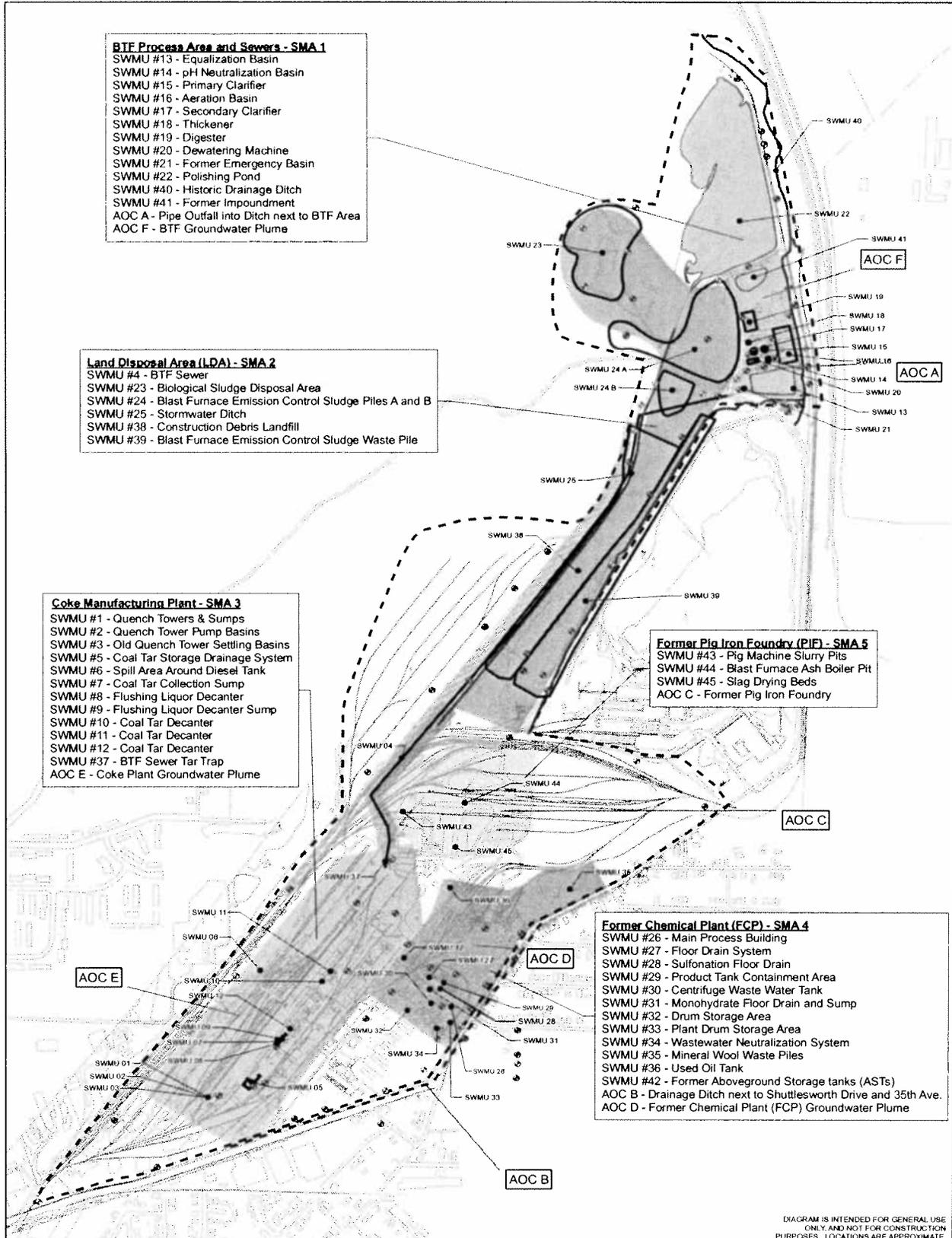
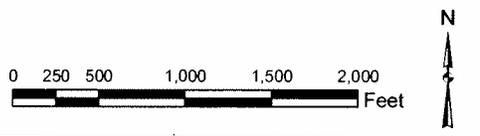


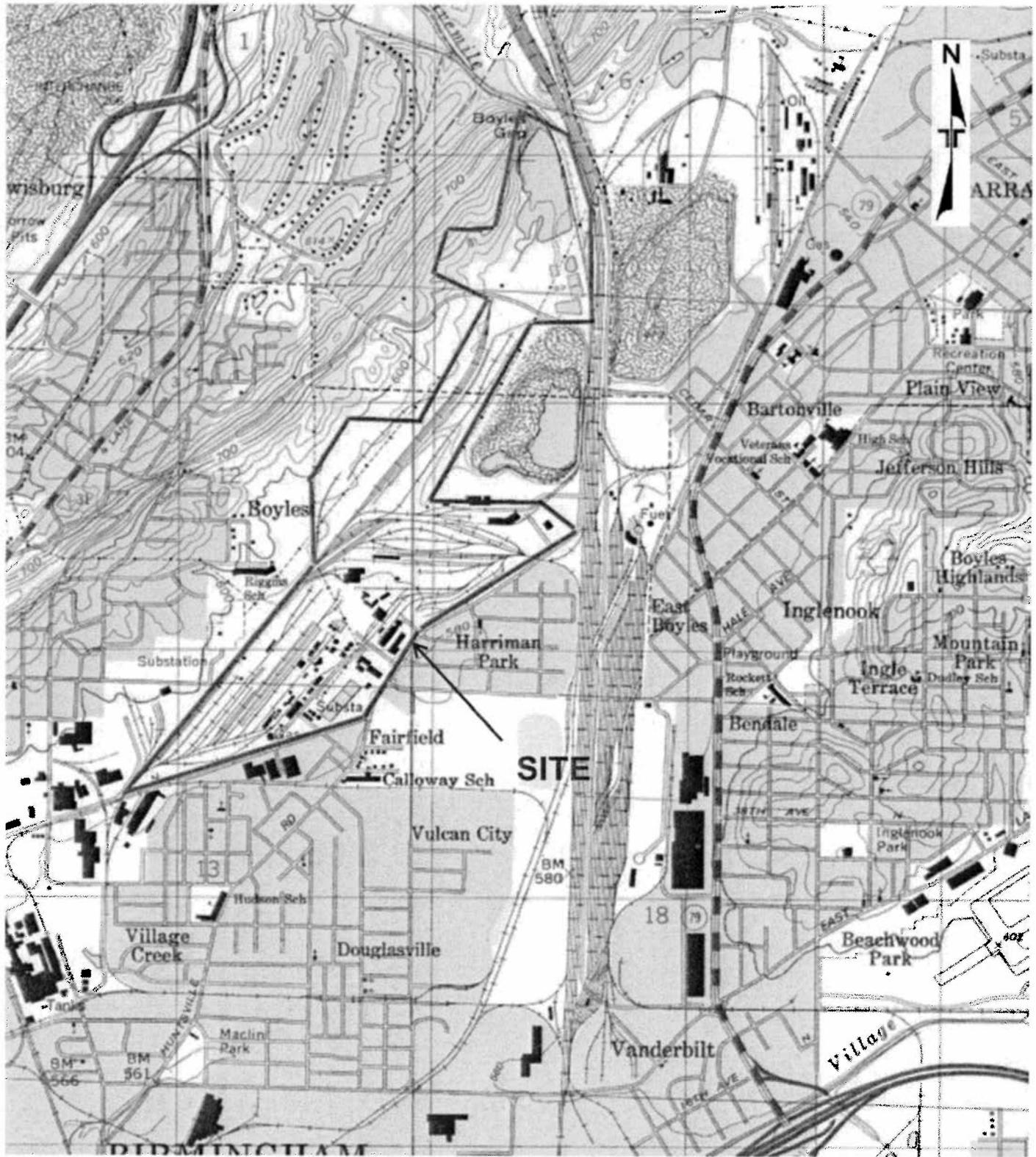
DIAGRAM IS INTENDED FOR GENERAL USE ONLY, AND NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE.

Legend
Proposed Solid Waste Management Areas (SMAs)
 [Pattern] BTF Process Area and Sewer - SMA 1
 [Pattern] Land Disposal Area - SMA 2
 [Pattern] Coke Manufacturing Plant - SMA 3
 [Pattern] Former Chemical Plant - SMA 4
 [Pattern] Former Pig Iron Foundry - SMA 5

Notes:
 1) SWMU - Solid Waste Management Unit
 2) Management Area boundaries are used for approximation.
 3) AOC - Area of Concern



Project Mgr: TWR	Scale: SHOWN	Terracon Consulting Engineers & Scientists 110 1/2th St North, Birmingham, Alabama 35203 Phone: (205) 942-1200 Fax: (205) 443-5302	SITE MAP	FIGURE
Checked By: TWR	Date: 7/24/2012		CLIENT: Walter Coke 3500 35th Avenue North Birmingham, AL 35207	1
Approved By: TWR	Project No: E1127096			
Drawn By: GFA	File Name: Figure 1			



Terracon

110 12TH STREET NORTH BIRMINGHAM, AL 35203
 P [205] 942-1289 F [205] 443-5302

PROJECT

VAPOR INTRUSION CHARACTERIZATION WORK PLAN
 WALTER COKE
 3500 35TH AVENUE NORTH
 BIRMINGHAM, JEFFERSON COUNTY, ALABAMA
 TERRACON PROJECT NO. E1127095

FIGURE 2

TOPOGRAPHIC MAP
 North Birmingham, AL
 7.5 Minute Quadrangle
 1997
 Scale 1"=2,000'



LEGEND	
--- (dashed line)	PROPERTY BOUNDARY
● (circle with crosshair)	PROPOSED SOIL VAPOR POINTS
● (circle with crosshair)	SHALLOW BEDROCK MONITORING WELL
● (circle with crosshair)	PROPOSED SHALLOW BEDROCK MONITORING WELL
● (circle with crosshair)	DEEP BEDROCK MONITORING WELL
● (circle with crosshair)	MIXED MONITORING WELL
● (circle with crosshair)	CONTAINMENT WELL LOCATIONS
→ (arrow)	GENERAL DIRECTION OF GROUNDWATER FLOW
--- (dotted line)	BENZENE PLUME (EPA MCL - 5 µg/L)
--- (dashed line)	TOLUENE PLUME (EPA MCL - 100 µg/L)
--- (dash-dot line)	DCE PLUME (EPA MCL - 70 µg/L)
--- (solid line)	PCE PLUME (EPA MCL - 5 µg/L)
--- (solid line)	VC PLUME (EPA MCL - 2 µg/L)
--- (dotted line)	CHLOROBENZENE PLUME (EPA MCL - 100 µg/L)
--- (solid line)	1,2,4-TRICHLOROBENZENE PLUME (EPA MCL - 70 µg/L)
--- (dashed line)	APPROXIMATE EXTENT OF COMBINED CONTAMINANTS PLUME

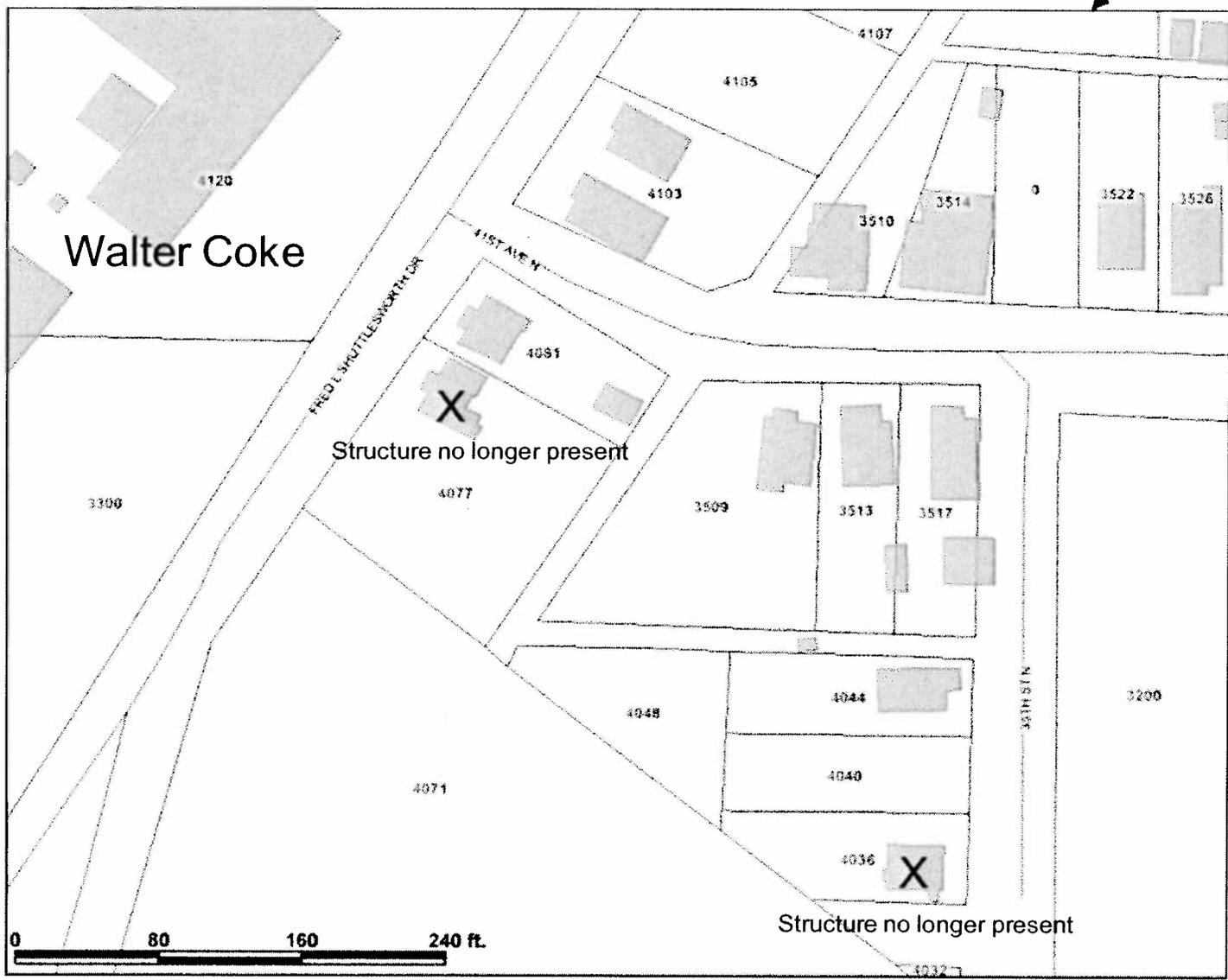
NOTES:
1) DISTANCES SHOWN BETWEEN WELLS IS APPROXIMATE.

Project Manager	TWR	Project No.	E1127096
Drawn By	LJK	Scale	AS SHOWN
Checked By	TWR	File No.	
Approved By	TWR	Date	10.24.2012



SITE DIAGRAM	
WALTER COKE 3500 35th AVENUE NORTH BIRMINGHAM, JEFFERSON COUNTY, ALABAMA	

FIG. No.	3
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PROJECT
VAPOR INTRUSION CHARACTERIZATION WORK PLAN
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FIGURE 4
TAX MAP
City of Birmingham Mapping
Scale as Shown'

Appendix B

Listing of Residences in Study Area

List of Residences and Properties

Initial Properties where soil Vapor Sampling will be conducted

4081 FL Shuttlesworth Drive, Birmingham, Alabama 35207 (residence)

4077 FL Shuttlesworth Drive, Birmingham, Alabama 35207 (property owned by Walter Coke)

Additional Downgradient Residences

[REDACTED], Birmingham, Alabama 35207 (residence)

[REDACTED], Birmingham, Alabama 35207 (residence)

[REDACTED], Birmingham, Alabama 35207 (residence)

[REDACTED], Birmingham, Alabama 35207 (residence)