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Final

Vapor Intrusion Evaluation Report
Volume 1 of 6

Marine Corps Base Camp Lejeune
Jacksonville, North Carolina

NAVFAC
Naval Facilities Engineering Command
NAVFAC MID-ATLANTIC

Prepared for
Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

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Prepared by

AGVIQ
AGVIQ ENVIRONMENTAL SERVICES
CH2M HILL
JOINT VENTURE

Final

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Department of the Navy
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Virginia Beach, Virginia

Executive Summary

This Vapor Intrusion Evaluation Report summarizes activities and results, and presents conclusions, for the phased basewide vapor intrusion evaluation performed at the Marine Corps Base (MCB) Camp Lejeune in Jacksonville, North Carolina (Figure V1-1). The evaluation encompassed hundreds of buildings throughout the 236-square-mile Base, and approximately 150,000 potential receptors, including military personnel, dependents, retirees, and civilians. Six investigation areas were identified for evaluation within MCB Camp Lejeune: Mainside; Hadnot Point; Marine Corps Air Station (MCAS), New River; Courthouse Bay; Camp Geiger; and Tarawa Terrace (Figure V1-2).

This vapor intrusion evaluation was conducted using a multiple lines of evidence approach consistent with the Department of Defense (DOD) Vapor Intrusion Handbook (2009) and the Interstate Technology & Regulatory Council (ITRC) (2007) and U.S. Environmental Protection Agency (USEPA) (2002) Vapor Intrusion Guidance documents.

Objective

The overall objective of this phased basewide vapor intrusion evaluation was to determine if complete or significant exposure pathways exist for vapor intrusion into buildings. This objective was accomplished by: (1) identifying buildings located within 100 feet (ft) of groundwater with volatile organic compound (VOC) concentrations above generic vapor intrusion screening values or North Carolina Groundwater Quality Standards (NCGWQS); and (2) collecting multiple lines of evidence (e.g., building usage/history; pressure differential; soil gas, subslab, indoor, and/or outdoor air samples) for evaluation of the vapor intrusion pathway.

Investigation Activities

The Final Vapor Intrusion Evaluation Work Plan (CH2M HILL, 2008a) presented the detailed screening steps of the phased evaluation and investigation process. The first step consisted of using the Base geographic information system (GIS) to identify buildings within 100 ft of shallow monitoring wells containing VOC concentrations (data collected between 2002 and 2007) which exceed USEPA (2002) generic screening levels or the NCGWQS. Initially, 168 buildings (shaded blue on Figures V1-4 through V1-9) were identified for further evaluation.

The next step consisted of generating investigation area-specific screening levels using USEPA's (2004) version of the Johnson and Ettinger (J&E) (1991) model and comparing the existing groundwater data to the area-specific screening levels using GIS. Buildings located within 100 ft of shallow monitoring wells containing groundwater concentrations in exceedance of the area-specific screening levels were retained for further evaluation. Buildings located within 100 ft of where non-aqueous phase liquids [NAPLs] have been previously identified were retained for further evaluation because the J&E model is limited

where NAPLs are present. Buildings located within 100 ft of remediation systems such as air or biosparge systems that can create pressure gradients that may promote vapor intrusion were also retained for further evaluation. This refined screening resulted in the identification of 50 buildings (shaded green on Figures V1-4 through V1-9) for further evaluation. A phased field investigation was conducted to assess the potential for vapor intrusion at these 50 buildings.

Phase I field activities were conducted in June 2008 and primarily included exterior sampling (i.e. groundwater grab sampling from the top of the water table and co-located soil vapor sampling) adjacent to the 50 buildings. However, interior sampling (i.e. indoor air and subslab soil gas sampling) was conducted at buildings near air or biosparge remediation systems and where NAPLs have been previously identified due to the complexity of the subsurface environment and potential vapor intrusion pathway in these areas.

Empirically-based screening levels were developed using the Phase I sample data. These screening levels were then compared with the site-specific modeled screening levels developed during the work planning phase using the J&E model. This preliminary comparison highlighted some of the variability and uncertainties in modifying default input parameters when conducting site-specific modeling. Because of this uncertainty and to prevent premature elimination of buildings of interest, the Phase I data were compared to screening levels based on the USEPA (2008) air Regional Screening Levels (RSLs) adjusted using USEPA's (2002) default shallow soil gas-to-indoor air attenuation factor (AF) (1E-01) and groundwater-to-indoor air AF (1E-03). Based on the results of this comparison, additional data collection was proposed at 28 buildings, including five buildings at Hadnot Point with existing active subslab depressurization (ASD) systems (shaded yellow on Figure V1-5).

To further evaluate the 28 buildings, Phase II field activities were conducted in September and October 2008 and included indoor and outdoor air and subslab sampling and detailed building surveys. Pressure differential monitoring and groundwater sampling were also conducted at the five Hadnot Point ASD system buildings.

Data Evaluation

Data collected during the Phase I and Phase II investigations were evaluated as described below:

- Empirical shallow soil gas-to-indoor air AFs were calculated using co-located subslab soil gas and indoor air sample data. Building-specific empirical AFs ranged from 1E-03 to 1E-05 based on the paired Phase I and Phase II subslab and indoor air data. A conservative basewide AF of 1E-03 was selected and used to generate base-specific empirical shallow Soil Gas Screening Levels (SGSLs).
- Multiple lines of evidence (MLE) were used to evaluate potential vapor intrusion impacts. The MLE approach is consistent with DOD (2009) and ITRC (2007) and the recently released USEPA (2009) Trichloroethene (TCE) Toxicity and Vapor Intrusion memorandum. Lines of evidence included, but were not limited to the following: a review of site history; historical groundwater data; building survey results; existing

remediation and/or vapor mitigation systems; the potential presence of NAPL; the magnitude, correlation, and spatial (horizontal and vertical) distribution of historical and Phase I and/or Phase II groundwater, exterior soil gas, interior subslab, indoor, and/or outdoor air data; chemical product and use inventory; pressure differential measurements; preferential pathways; and/or modeling results.

- Conceptual site models (CSMs) were developed for each building using the MLE. Preliminary CSMs based on current land use were developed during the work planning phase (CH2M HILL, 2008a) and generally describe potential contaminant sources, migration pathways, and human receptors. If the building-to-subslab pressure is negative a portion or all of a day, soil gas will migrate into the building through openings in the slab by diffusion, advection, and convection. The CSMs were refined based on the extent of depressurization, the size of the buildings, the type of construction material, number and size of openings in the buildings and their usage patterns, subsurface lithology, groundwater depth and flow, and media-specific results.
- Horizontal transport via preferential pathways (e.g., underground utilities) at other buildings in the investigation areas were evaluated. Four additional buildings were identified as buildings for future data collection (Buildings 4, HP-57, 1827, and 1606).

Results

The results of the Phase I and Phase II field investigations along with the MLE indicate that vapor intrusion is not a current significant pathway of concern at MCB Camp Lejeune. Conclusions for each of the six areas of the basewide vapor intrusion evaluation are summarized below.

Mainside

Groundwater, exterior soil gas, and subslab soil gas samples were collected within or near nine buildings (Buildings 3, 3B, 37, 43, 728, 820, 1828, 1855, and LCH-4014) at Mainside to evaluate the potential for vapor intrusion impacts. Indoor air related to vapor intrusion at these nine buildings neither exceeded the target cancer risk range (1E-06 to 1E-04) nor the non-cancer hazard quotient of 1. A detailed evaluation for each building is presented in Volume 2.

Hadnot Point

Twenty-four buildings of interest were retained within Hadnot Point. Groundwater, exterior soil gas, subslab soil gas and indoor/outdoor air samples were collected within or near 23 buildings (Buildings 901, 902, 903, 1502, 1601, 1603, 1707, 1817, 1819, 1611, 1613, 1005, 1068, 1114, 1220, 1100, 1111, 1115, 1108, 1200, 1201, 1202, and 1301) at Hadnot Point to evaluate the potential for vapor intrusion impacts. Building 1101 was excluded from sampling because vapor intrusion impacts have already been identified at this building and mitigation measures are in place.

In addition, pressure differential monitoring was conducted at six buildings (five ASD system buildings) to confirm the ASD systems were shut down for an adequate amount of time prior to sampling and were no longer causing the subslab environments to be

negatively pressurized within the range of 6-to-9 Pa that is typical for ASD systems, and Building 1115 due to the elevated VOC concentrations detected in subslab soil gas. It is acknowledged that barometric pressure can have an impact and often correlates with indoor-to-subslab pressure readings. Collecting differential pressure readings over a longer time period would reduce uncertainty; however, the building-specific differential pressure readings varied between positive, neutral, and negative and were not used in the refined CSMs as strong conclusive evidence. The differential pressure readings were collected were used only as a supporting line of evidence.

Indoor air related to vapor intrusion at these nine buildings neither exceeded the target cancer risk range (1E-06 to 1E-04) nor the non-cancer hazard quotient of 1. At Building 1200, 1,4-dichlorobenzene was detected in indoor air at a concentration exceeding the target levels; however, 1,4-dichlorobenzene was not detected in groundwater or subslab soil gas samples. Therefore, the detection is most likely related to an indoor source. With the exception of Building 1101, indoor air related to vapor intrusion at the 23 buildings evaluated neither exceeded the target cancer risk range (1E-06 to 1E-04) nor the non-cancer hazard quotient of 1. A detailed evaluation for each building is presented in Volume 3.

MCAS, New River

Groundwater, exterior soil gas and subslab soil gas samples were collected within or near seven buildings (Buildings AS502, AS510, AS515, AS541, AS4106, AS143, and AS4151) at the MCAS, New River to evaluate the potential for vapor intrusion impacts. Indoor air related to vapor intrusion at the seven buildings evaluated neither exceeded the target cancer risk range (1E-06 to 1E-04) nor the non-cancer hazard quotient of 1. A detailed evaluation for each building is presented in Volume 4.

Courthouse Bay

Subslab soil gas samples were collected within one building (Building A47) within Courthouse Bay. Indoor air related to vapor intrusion at Building A47 neither exceeded the target cancer risk range (1E-06 to 1E-04) nor the non-cancer hazard quotient of 1. A detailed evaluation for this building is presented in Volume 5.

Camp Geiger

Groundwater, exterior soil gas, subslab soil gas and indoor/outdoor air samples were collected within or near nine buildings (Building G480, G521, G530, G531, G532, G533, TC860, TC864, and G930) at Camp Geiger to evaluate the potential for vapor intrusion impacts. Indoor air related to vapor intrusion at these nine buildings neither exceeded the target cancer risk range (1E-06 to 1E-04) nor the non-cancer hazard quotient of 1. A detailed evaluation for each building is presented in Volume 6.

Tarawa Terrace

No buildings of interest were identified within Tarawa Terrace. Therefore, no sampling was conducted.

Recommendations

Although no significant pathway of concern for vapor intrusion was identified within each investigation area, the following additional actions are recommended at select buildings located within Mainside; Hadnot Point; MCAS, New River; Courthouse Bay; and/or Camp Geiger:

- Collect an additional round of subslab soil gas data within the next 2 years to assess temporal (and spatial) variability at buildings where subslab soil gas sampling was conducted as recommended in DOD (2009) and ITRC (2007). If recommendations were not made for moving or adding sampling locations then it is assumed that the location and number of sampling locations from Phase I and II were sufficient for that building. However, the final decision on whether sufficient data have been collected for each building should be considered by the partnering team.

- Collect concurrent indoor air and/or outdoor air data at the locations of the subslab soil gas data collected for temporal (and spatial) variability purposes. In general, it is considered to be more conservative to collect indoor air samples during the heating season because a building's windows and doors are more likely to be kept shut and the operation of the heating system may create a negative pressure differential between the indoor air and the subslab soil gas. The Phase I and II sampling events were performed in the summer and fall, respectively. If feasible, sampling during the winter should be considered for the Phase III sampling event.
- Consider the vapor intrusion pathway during construction planning and/or changes in building use at buildings that have exceedances of the generic and/or basewide SGSLs to ensure the slab is not compromised since cracks, holes, or other penetrations of the slab have the potential to invalidate the use of the base-specific AF. Consider air monitoring for construction activities that involve slab penetrations, such as removal of part of the slab or drilling holes through the slab. Additional data collection at the conclusion of construction may be warranted to ensure the base-specific AF remains appropriate.

- Identify the source, conduct active remediation, and/or conduct monitoring at buildings where site-related VOCs were detected in subslab or exterior soil gas samples at concentrations exceeding: (1) the base-specific and generic *carcinogenic-based* SGSLs by more than 100 and 10,000 times, respectively, since these magnitude of exceedances equate to a future vapor intrusion risk that exceeds the 10^{-4} upper end of the National Contingency Plan (NCP) target risk range; and (2) non-cancer base-specific SGSLs since this equates to a potential exceedance of a target non-cancer hazard quotient of one.

- Monitor subslab soil gas and concurrent indoor air concentrations every 5 years until three rounds of data indicate no unacceptable cancer risks or non-cancer hazards are present at buildings where site-related VOCs were detected in subslab or exterior soil gas samples at concentrations exceeding of the base-specific SGSLs by less than 100 times to ensure subslab soil gas levels do not increase significantly. To date, these buildings include Buildings 1601, 1817, 1100, 1111, TC860, and TC864.

- The potential for future impacts resulting from migration of higher nearby upgradient groundwater concentrations to beneath buildings should be considered during future vapor intrusion evaluations.

- Evaluate the need to continue operating and monitoring the buildings with ASD systems since there were no exceedances of the base-specific SGSLs in subslab samples collected 48 hours after turning off the ASD systems.
- Install and sample subslab probes where subslab soil gas sampling was not previously attempted or successfully carried out; collect subslab soil gas samples at buildings connected by underground utilities with elevated concentrations of VOCs in subslab soil gas to evaluate whether these utilities are acting as preferential pathways. GIS figures were used to identify buildings connected to other buildings containing possible vapor intrusion contaminants via utilities. Buildings positively identified through preferential pathway analysis include 4, HP-57, 1606, and 1827.
- Conduct building surveys to locate and remove potential indoor air sources at buildings where potentially significant indoor air sources were identified and prior to collecting additional indoor air data.
- Confirm the basewide subslab-to-indoor air AF of 1E-03 remains appropriate as additional data (concurrent subslab soil gas and indoor air data) are collected, and with a re-evaluation of the AF in 5 years. Data collected for the 5-year re-evaluation should include concurrent subslab soil gas and indoor air sampling at buildings that have had exceedances of the base-specific soil gas screening levels. To date, these buildings include Buildings 3B, 43, 37, 1601, 1817, 902, 1115, 1100, 1111, TC860, and TC864. Buildings may be added to this list if additional buildings are identified with subslab soil gas concentrations exceeding the established base-specific SGSLs are identified during future sampling events. These sample data will be used to verify that the base-specific AF of 1E-03 is still appropriate.

- Consider subslab sampling at Buildings G521 and G530 if subslab concentrations at Buildings G532 and G533 increase significantly.

Table V1-1 summarizes the recommendations for each building by area.

TABLE V1-1
Summary of Recommendations
MCB Camp Lejeune, North Carolina

Bldg #	Additional Round of Subslab Sampling Within Next 2 Years	Concurrent Indoor Air Sampling	Consider Vapor Intrusion Pathway During Construction Planning	Remediate VOC Source	Monitor Subslab Soil Gas Every 5 Years	Monitor Top-of-Water Table	ASD System May Not be Necessary	Install and Sample Subslab Probes	Remove Indoor VOC Source	Consider Subslab Sampling if VOC Concentrations at Buildings G532 and G533 Increase Significantly	Concurrent Subslab/Indoor Air Samples Every 5 Years for Attenuation Factor (AF) Evaluation
Mainside											
Buildings of Interest Sampled During Phase I and Phase II											
3	X	X	X	X							
3B	X	X	X	X							X
37	X	X	X	X							X
43	X	X	X	X							X
728	No Further Action										
1828	X		X								
1855	X		X								
820	X	X	X								
LCH-4014	X							X			
Buildings Recommended for Sampling Based on the Preferential Pathway Analysis											
4								X			
HP-57								X			

TABLE V1-1
Summary of Recommendations
MCB Camp Lejeune, North Carolina

Bldg #	Additional Round of Subslab Sampling Within Next 2 Years	Concurrent Indoor Air Sampling	Consider Vapor Intrusion Pathway During Construction Planning	Remediate VOC Source	Monitor Subslab Soil Gas Every 5 Years	Monitor Top-of-Water Table	ASD System May Not be Necessary	Install and Sample Subslab Probes	Remove Indoor VOC Source	Consider Subslab Sampling if VOC Concentrations at Buildings G532 and G533 Increase Significantly	Concurrent Subslab/Indoor Air Samples Every 5 Years for Attenuation Factor (AF) Evaluation
Hadnot Point											
Buildings of Interest Sampled During Phase I and Phase II											
901	X		X			X					
902	X	X	X	X							X
903	X		X			X					
1502	X		X								
1601	X	X	X		X						X
1603	X										
1707	X		X								
1817	X	X	X		X						X
1819	X		X								
1611	X		X								
1613	X		X								
1005	X	X	X								
1068	X										
1114	X		X								
1220	X		X								

TABLE V1-1
Summary of Recommendations
MCB Camp Lejeune, North Carolina

Bldg #	Additional Round of Subslab Sampling Within Next 2 Years	Concurrent Indoor Air Sampling	Consider Vapor Intrusion Pathway During Construction Planning	Remediate VOC Source	Monitor Subslab Soil Gas Every 5 Years	Monitor Top-of-Water Table	ASD System May Not be Necessary	Install and Sample Subslab Probes	Remove Indoor VOC Source	Consider Subslab Sampling if VOC Concentrations at Buildings G532 and G533 Increase Significantly	Concurrent Subslab/Indoor Air Samples Every 5 Years for Attenuation Factor (AF) Evaluation
1100	X	X	X		X						X
1111	X		X		X						X
1115	X	X	X	X							X
1108	X	X	X				X				
1200	X	X	X				X		X		
1201	X		X				X				
1202	X		X				X				
1301	X						X				
Buildings Recommended for Sampling Based on Preferential Pathway Analysis											
1606								X			
1827								X			
MCAS, New River											
Buildings of Interest Sampled During Phase I and Phase II											
AS502	X					X					
AS510	No Further Action										
AS515	No Further Action										
AS541	X					X					

TABLE V1-1
Summary of Recommendations
MCB Camp Lejeune, North Carolina

Bldg #	Additional Round of Subslab Sampling Within Next 2 Years	Concurrent Indoor Air Sampling	Consider Vapor Intrusion Pathway During Construction Planning	Remediate VOC Source	Monitor Subslab Soil Gas Every 5 Years	Monitor Top-of-Water Table	ASD System May Not be Necessary	Install and Sample Subslab Probes	Remove Indoor VOC Source	Consider Subslab Sampling if VOC Concentrations at Buildings G532 and G533 Increase Significantly	Concurrent Subslab/Indoor Air Samples Every 5 Years for Attenuation Factor (AF) Evaluation
AS4106								X			
AS143	No Further Action										
AS4151	No Further Action										
Courthouse Bay											
Buildings of Interest Sampled During Phase I and Phase II											
A47	X										
Camp Geiger											
Buildings of Interest Sampled During Phase I and Phase II											
G480	X		X								
G521										X	
G530										X	
G531	X		X								
G532	X		X								
G533	X		X								
TC860	X		X		X						X
TC864	X		X		X						X
G930	No Further Action										

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Abbreviations and Acronyms

AF	attenuation factor
amsl	above mean sea level
AS	air sparge
ASD	active subslab depressurization
bgs	below ground surface
Cal/EPA	California Environmental Protection Agency
CAP	Corrective Action Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain of custody
CSM	conceptual site model
°F	degree(s) Fahrenheit
DO	dissolved oxygen
DoN	Department of the Navy
DPT	direct push technology
FFA	Federal Facility Agreement
FSP	Field Sampling Plan
ft	feet/foot
ft^2	square feet/square foot
GIS	geographic information system
GWSL	groundwater screening level
Hg	mercury
HPFF	Hadnot Point Fuel Farm
HSWA	Hazardous and Solid Waste Amendments
HVAC	heating, ventilating, and air conditioning
IDW	investigation derived waste
IR	Installation Restoration
ITRC	Interstate Technology & Regulatory Council
J&E	Johnson and Ettinger
JV 2	Joint Venture 2
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MEC	Munitions and Explosives of Concern
mL/min	milliliter(s) per minute
MLE	multiple lines of evidence

MS/MSD	Matrix Spike/Matrix Spike Duplicate
NACIP	Navy Assessment and Control of Installation Pollutants
NAPL	nonaqueous phase liquid
NCDENR	North Carolina Department of Environment and Natural Resources
NCGWQS	North Carolina Groundwater Quality Standards
NCP	National Contingency Plan
NPL	National Priorities List
PCE	tetrachloroethene
PETG	polyethylene terephalate glycol
PPE	personnel protective equipment
PRT	post-run tubing
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act
SGSL	Soil Gas Screening Levels
SWMU	Solid Waste Management Unit
TCE	trichloroethene
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound

SECTION 1

Introduction

1.1 Site Background

The mission of Marine Corps Base (MCB) Camp Lejeune is to maintain combat-ready units for expeditionary deployment. MCB Camp Lejeune provides housing, training facilities, logistical support, and administrative supplies for Fleet Marine Force units and other assigned units. MCB Camp Lejeune is home to an active duty, dependent, retiree, and civilian population of approximately 150,000, of which approximately 47,000 are military personnel.

Thousands of structures are located on MCB Camp Lejeune, which covers approximately 236 square miles in Onslow County, North Carolina. The Base is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean (Figure V1-1). MCB Camp Lejeune lies within the outer part of the Atlantic Coastal Plain Physiographic Province in North Carolina. Low elevations and relatively low relief characterize topography across MCB Camp Lejeune. The surface elevations range from sea level to approximately 70 feet (ft) above mean sea level (amsl), with most of MCB Camp Lejeune's elevation ranging from 20 to 40 ft amsl. The subsurface at Camp Lejeune is generally sand and/or silt with sand/clay lenses. The depth to groundwater ranges from 0 (surface water) to 22 ft below ground surface (bgs).

Climatic conditions in southeastern North Carolina and at MCB Camp Lejeune are characterized by winters that are mild with occasional short, cold periods. Summers are long, hot, and humid. Average annual net precipitation is approximately 50 inches. Ambient air temperatures generally range from 33 to 53 degrees Fahrenheit (°F) in the winter months and 71°F to 88°F during the summer months. Winds are generally south-southwesterly in the summer, and north-northwesterly in the winter (CH2M HILL, 2008a).

MCB Camp Lejeune has been actively engaged in environmental investigations and remediation programs since 1983, beginning with the Navy Assessment and Control of Installation Pollutants (NACIP) Program. The IR (IR) program was initiated in 1986 following enactment of the Superfund Amendments and Reauthorization Act (SARA) legislation. The IR program, which was implemented to follow the requirements of SARA, replaced the NACIP. MCB Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) on October 4, 1989 (54 *Federal Register* 41015, October 4, 1989). Following that listing, a Federal Facility Agreement (FFA) between United States Environmental protection Agency (USEPA) Region 4, North Carolina Department of Environment and Natural Resources (NCDENR), and the Department of the Navy (DoN) was signed in February 1991.

MCB Camp Lejeune was issued a Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Permit in September 1984. Subsequently, the permit was modified, and on January 10, 1997 the RCRA Part B Permit was approved to include corrective action at treatment, storage, and disposal facilities. Camp Lejeune has a

Hazardous and Solid Waste Amendments (HSWA) Permit that took effect in 2008, replacing the Part B Permit, which expired in January 2007.

Leaking petroleum underground storage tank (UST) sites are also present at the Base. These USTs are regulated under the NCDENR Division of Waste Management UST Section.

Detailed background information about each of the investigation areas and the general activities that occur there is presented in the work plan (CH2M HILL, 2008a).

1.2 Basewide Vapor Intrusion Evaluation Objectives

The following primary objectives were identified for this basewide vapor intrusion investigation during development of the Work Plan (CH2M HILL, 2008a):

1. Identify the buildings located 100 ft vertically or horizontally of existing monitoring wells with groundwater volatile organic compound (VOC) concentrations exceeding generic vapor intrusion screening values or North Carolina Groundwater Quality Standards (NCGWQS), and if present,
2. Determine whether a potentially complete and/or significant vapor intrusion exposure pathway could exist based on a review of the preliminary Conceptual Site Model (CSM), and if so,
3. Assess whether significant vapor intrusion impacts are occurring inside the buildings at levels that could adversely affect building occupants, and/or,
4. If necessary, provide recommendations to further investigate, remediate or mitigate the potential vapor intrusion pathway.

The results used to address the first objective were presented in the Vapor Intrusion Evaluation Work Plan (CH2M HILL, 2008a). The results from Phases I and II sampling events of this vapor intrusion investigation have been used in this report to begin addressing the second, third and fourth objectives.

The scope of this investigation is limited to currently occupied buildings; should land use change, additional vapor intrusion evaluations would be required. Several buildings on Base were omitted from this investigation because the buildings were not occupied at the time of the screening process. A future vapor intrusion evaluation may be required if these or other buildings (newly built) become occupied. Conversely, if buildings in this investigation become unoccupied, a future phase of this vapor intrusion evaluation may omit them. In addition, the scope of the Phase I and II sampling events was generally limited to a single round of data collected from one or more of the media (e.g., soil gas, subslab vapor, indoor/outdoor air) and the need to collect additional data to address temporal variability is discussed in this report.

For purposes of implementing this vapor intrusion evaluation, MCB Camp Lejeune was divided into six investigation areas (Figure V1-2). The six investigation areas of the Base are as follows:

- Mainside
- Hadnot Point

- Marine Corps Air Station (MCAS), New River
- Courthouse Bay
- Camp Geiger
- Tarawa Terrace (there were no buildings of interest identified in the investigation area)

Site background information, methodologies, and vapor intrusion evaluation results common to all investigative areas are presented separately from the vapor intrusion investigation results for each investigative area.

1.3 Report Organization

This basewide vapor intrusion report is divided into six volumes.

- **Volume 1 – Executive Summary, Introduction, Overall Investigation Methods, Screening Level Evaluations, and References.** The executive summary is contained in this volume and provides a brief overview of the objectives, investigative methods, results, conclusions, and recommendations for this basewide vapor intrusion investigation. In addition to the executive summary and the introduction (Section 1), Volume 1 also contains a discussion of the investigative methods common to all areas (Section 2); the development and evaluation of generic vapor intrusion screening levels and empirical basewide attenuation factors (AFs) (Section 3); and report references (Section 4).
- **Volume 2 – Mainside**
- **Volume 3 – Hadnot Point**
- **Volume 4 – MCAS, New River**
- **Volume 5 – Courthouse Bay**
- **Volume 6 – Camp Geiger**

There is no volume for Tarawa Terrace because no Phase I or II sampling activities were performed since no buildings of interest were identified.

Detailed information regarding the Phase I and Phase II field investigation activities and results for each building are provided in Volumes 2 through 6. Results by building are compared with applicable screening levels and are discussed in relation to background sources, spatial correlations, and building characteristics. Refined CSMs are provided for each building in Volumes 2 through 6, along with detailed conclusions and recommendations.

SECTION 2

Investigation Methods

The investigation methods used during the basewide vapor intrusion evaluation are consistent with the U.S. Department of Defense (DOD) (2009), Interstate Technology & Regulatory Council (ITRC) (2007) and USEPA (2002) Vapor Intrusion Guidance documents. The phased approach taken during this vapor intrusion evaluation is presented in Figure V1-3.

Phase I field work was performed in June 2008 and included groundwater grab samples from the top of the water table and co-located soil gas sampling conducted outside of the buildings of interest. These exterior sample locations were generally placed between the monitoring wells with exceedances of the site specific GWSLs and the buildings. Groundwater flow direction and the magnitude of the GWSL exceedances were also considered during sample location selection. Additional exterior sample locations were placed around large buildings to provide spatial coverage.

Subslab soil gas and indoor air sampling was performed during Phase I (instead of exterior groundwater and soil gas sampling) at buildings of interest with shallow (< 5 ft bgs), near active air or biosparge remediation systems, or with evidence of non-aqueous phase liquid (NAPL) beneath or in the vicinity of the buildings. Interior sampling was performed at these buildings because these remediation systems can create pressure gradients that may promote vapor intrusion and therefore result in a complex subsurface soil gas environment and the J&E model is limited where NAPLs are present. Subslab soil gas sample locations were generally placed towards the centers of the building but close to the groundwater monitoring wells with exceedances. Groundwater flow direction and the magnitude of the GWSL exceedances were also considered during subslab soil gas sample location selection. Indoor air samples were collected at buildings where confounding indoor sources were not present. Indoor air sample locations were generally placed in the center of buildings away from doors and windows.

Given the variability and uncertainties in modeled screening levels, co-located groundwater and exterior soil gas, along with subslab soil gas and indoor air data collected during Phase I, were used to evaluate the site-specific modeled screening levels developed with the Johnson & Ettinger (J&E) model during the work planning phase. This evaluation of the site-specific screening levels, which is described in detail in Section 3, concluded that generic screening levels based on the USEPA (2008) Regional Screening Levels (RSLs) for air should be used to select the buildings for Phase II sampling.

Twenty-eight of the highest priority buildings were selected for further evaluation during Phase II, including five at Hadnot Point with existing active subslab depressurization (ASD) systems. The Phase II field event performed in September and October 2008 included indoor and outdoor air and subslab sampling, detailed building surveys as well as pressure differential monitoring and groundwater sampling at the five Hadnot Point ASD system buildings.

The Phase I and Phase II co-located subslab soil gas and indoor air sample data were used to calculate empirical shallow soil gas-to-indoor air AFs as detailed in Section 3. A basewide AF of 1E-03 was selected and used to generate basewide empirical shallow soil gas screening levels (SGSLs) after reviewing the range of these empirical AFs.

Conceptual site models (CSMs) incorporating the multiple lines of evidence (MLE) methods in DOD (2009) and ITRC (2007) were developed for each of the buildings of interest. These CSMs and associated conclusions and recommendations are provided for each building of interest in each investigation area in Volumes 2 through 6.

2.1 Phase I Field Event – June 2008

There were 50 buildings selected for Phase I sampling. Detailed information regarding the selection of buildings for Phase I sampling is provided in the Final Vapor Intrusion Evaluation Work Plan (CH2M HILL, 2008a). The Base geographic information system (GIS) was used to identify 168 buildings located within 100 ft of shallow monitoring wells with VOC concentrations exceeding USEPA (2002) generic screening levels or the NCGWQS. Site-specific levels generated with USEPA's (2004) version of the J&E (1991) model were used to reduce the list of target buildings within each of the six investigation areas. Currently unoccupied or unenclosed structures were eliminated, resulting in a list of 50 buildings for Phase I sampling.

TABLE V1-2
Buildings of Interest Summary – Phase I
MCB Camp Lejeune, North Carolina

Investigation Area	Mainside	Hadnot Point	MCAS, New River	Courthouse Bay	Camp Geiger	Tarawa Terrace	Total
Buildings of Interest	40	55	30	7	34	2	168
Not Occupied	4	6	15	3	10	2	40
Not Enclosed	6	5	1	0	5	0	17
Demolished	0	0	1	0	2	0	3
Does not exceed site-specific levels	21	20	6	3	8	0	58
Remaining Buildings of Interest for Phase I Sampling	9	24	7	1	9	0	50

Note: Only 23 buildings of interest were sampled in Hadnot Point. Building 1101 was excluded from sampling because vapor intrusion impacts have already been identified at this building and mitigation measures are in place.

Phase I sampling was performed in June 2008 and included groundwater grab sampling from the top of the water table and exterior near-slab soil gas sampling. Exterior sampling was not performed at buildings near shallow groundwater (< 5 ft bgs), active air or biosparge remediation systems, and NAPL; subslab soil gas and indoor air sampling was performed at these buildings instead.

2.1.1 Phase I Sample Locations

Groundwater, soil gas, subslab, and indoor air samples were collected during Phase I sampling activities. Soil gas samples were not collected during Phase I when shallow groundwater was encountered at a depth of 6 ft bgs or less. The soil gas probe screen interval was 1 ft long and the bottom of the screen was located 1 ft above the water table to avoid the capillary fringe above the water table. According to the USEPA's (2002) draft Vapor Intrusion Guidance, exterior soil gas samples should not be collected at depths less than 5 ft bgs. Samples were not collected when shallow groundwater was encountered at 6 ft bgs to allow at least 1ft for the capillary fringe or less in order to act as a buffer zone against pulling water into the sample tubing, pump, and canister. Soil cores were drilled and logged before groundwater and/or soil gas sampling began so groundwater depths could be documented and used as a guide for the placement of temporary well points and/or soil gas sampling probes. Additional detail regarding the number, location, and types of samples collected during the Phase I sampling event is provided in Volumes 2 through 6 for each investigation area.

2.2 Phase II Field Event – September and October 2008

Of the 50 buildings sampled during Phase I, 23 were retained for Phase II sampling. Five additional buildings in Hadnot Point (Buildings 1108, 1200, 1201, 1202 and 1301) were included during Phase II to evaluate the existing ASD systems. Detailed explanations for retaining or excluding buildings for Phase II sampling are provided in the refined CSM section (Section 4) of Volumes 2 through 6. In general, the Phase I sample results were compared to the generic default screening levels and then Phase II sampling decisions were made on a case-by-case basis considering the Phase I results, current building use, and other lines of evidence. Buildings with concentrations that exceeded the carcinogenic-based generic SGSLs by greater than the upper end of the NCP risk management range of 1 E-06 to 1 E-04 were retained for the Phase II sampling. Additionally, buildings with concentrations that exceeded the non-carcinogenic-based generic SGSLs were retained for Phase II sampling. The criteria used to select buildings for Phase II sampling are provided below:

- Buildings with Phase I exterior soil gas sample results that exceeded the generic SGSLs by greater than two orders of magnitude (equivalent to greater than 1E-04 cancer risk and a non-cancer hazard quotient of 1) were retained for Phase II sampling.
- Several buildings with only one order magnitude exceedance of the generic SGSLs were also retained for Phase II sampling due to their proximity to other buildings with greater exceedances or because they are utilized as barracks.

Greater weight was placed on soil gas data compared to groundwater data given the increased uncertainties in predicting indoor air concentrations from groundwater concentrations. Therefore, buildings with Phase I indoor air sample results less than or within the target cancer risk range of 1E-06 to 1E-04 and/or the non-cancer hazard quotient of 1 or deemed unrelated to vapor intrusion were not retained for Phase II sampling. A summary of the number of buildings retained for Phase II sampling is provided in Table V1-3:

TABLE V1-3
Buildings of Interest Summary – Phase II
MCB Camp Lejeune, North Carolina

Investigation Area	Mainside	Hadnot Point	MCAS, New River	Courthouse Bay	Camp Geiger	Tarawa Terrace	Total
Buildings of Interest for Phase I Sampling	9	24	7	1	9	0	50
Buildings with active subslab depressurization systems		5					
Buildings Retained for Phase II Sampling	5	17	2	0	4	0	28

Phase II sampling was performed at 28 buildings (23 buildings of interest plus 5 buildings with ASD systems) in September and October 2008 and primarily included subslab and indoor/outdoor air sampling, with limited groundwater sampling. Additional investigation activities, including groundwater sampling and pressure differential monitoring, were performed at the five Hadnot Point ASD system buildings.

2.2.1 Phase II Sample Locations

Groundwater, subslab soil gas, indoor air and outdoor air samples were collected during Phase II sampling activities. Additional detail regarding the number, location, and types of samples collected during the Phase II sampling event is provided in Volumes 2 through 6.

2.3 Sample Collection Procedures

The Phase I and II sampling events were performed in accordance with the procedures detailed in the Field Sampling Plan (FSP) (CH2M HILL, 2008b).

The groundwater and soil gas sampling was performed with direct push technology (DPT). The direct push work was subcontracted to North Carolina licensed well drillers, ZEBRA Environmental Corp. based in Raleigh, North Carolina and EnviroTek based in Tampa, Florida. Hand augering was performed to 5 ft bgs at each DPT sample location to confirm that there were no underground utilities. The DPT boreholes were abandoned by the drillers following NCDENR guidelines by grouting from the bottom of the boring to the ground surface.

During the Phase II field event in September and October 2008, subslab soil gas, indoor air, and outdoor air samples were collected at four investigation areas in MCB Camp Lejeune. Groundwater samples were collected from existing monitoring wells near the five ASD system buildings in Hadnot Point. Pressure differential monitoring was also performed at these five buildings. Additional information on the groundwater sampling and pressure differential monitoring is provided in Volume 3 – Hadnot Point.

2.3.1 Site Preparation

Site preparation included utility clearance at each proposed exterior DPT sample location and Munitions and Explosives of Concern (MEC) avoidance at Building 1707 in Hadnot Point where potential MEC hazards exist.

Utility Clearance

For Phase I, 20 North Carolina One Call tickets were opened on June 10, 2008 to cover the proposed sample locations. These tickets were valid from June 13 through 30, 2008.

A utility clearance was performed by GEL Geophysics, LLC of Durham, NC, from June 10 to 12, 2008. Buildings 1613, 1601, 1502, 1603, and 1707 at Site 78 South and Buildings 901, 902, and 903 at Site 78 North on Hadnot Point were cleared on June 10. Building AS4106 at Solid Waste Management Unit (SWMU) 336 and Buildings AS4151, AS424, AS510, AS502, AS541, AS515 at Site 86 on MCAS, New River; and Building TC864 at Site 89, Buildings G521, G530, G531, G532, and G533 at Site 35, and Building G930 at Site 93 on Camp Geiger were cleared on June 11. Buildings 1220, 1200, 1108, 1201, 1202, 1111, 1100, 1005 at Hadnot Point Fuel Farm (HPFF), Building 820 at Site 820, and Building LCH-4014 at LCH-4015 on Mainside were cleared on June 12.

The utility clearance activities were overseen by a member of the JV 2 field team. The findings of the buried utility location activities were conducted in strict accordance with the CH2M HILL scope of work. As an additional precaution, hand augering was performed at each location before drilling to ensure that utilities were not encountered.

Before installation of Phase II subslab soil gas probes, a utility clearance was performed at each proposed sampling location by Construction Solutions, LLC from Paola, KS, on September 24 and 25, 2008. The utility clearance activities were overseen by a member of the JV 2 field team.

MEC Avoidance

MEC avoidance was conducted at Building 1707 at Site 78 in Hadnot Point where potential MEC hazards exist to ensure the safety of onsite workers who could potentially be exposed to munitions hazards. Building 1707 is located close to unexploded ordnance (UXO) Site UXO-08.

Potential MEC hazards were cleared as necessary in accordance with the Health and Safety Plan Section 3.20 (CH2M HILL, 2008a, Appendix C). CH2M HILL supplied a trained and qualified UXO technician who provided MEC escort and avoidance services during the Phase I sampling activities at Building 1707. At the start of each borehole, the UXO technician hand augered to five ft checking the borehole with a down hole magnetometer at 1-ft increments. No MEC hazards were encountered. A separate borehole was advanced, adjacent to the borehole cleared by the UXO technician to collect the subsurface sample.

2.3.2 Groundwater Grab Sampling

A soil core was collected at each sample location to determine the depth to the water table. The soil cores were collected using a Geoprobe Macro-Core® Sampler with polyethylene

terephalate glycol (PETG) liners. The soil cores were logged to record lithology. The soil boring logs for each investigation area are provided in Appendix A of Volumes 2 through 6.

Groundwater samples were collected from locations around the buildings of interest using the Geoprobe® Screen Point Sampler (stainless-steel retractable screen attached to the DPT rods). The sampler was placed within the top 1 ft of the water table where it was believed to contain the most representative VOC concentrations that may volatilize and migrate through the vadose zone. When insufficient volume was available to collect at this initial interval, the exposed portion of the screen was increased at 1-ft intervals, thus drawing groundwater from a larger vertical interval.

The groundwater samples were collected directly through the screen following the low-flow sampling protocol using a peristaltic pump. Field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and dissolved oxygen [DO]) were measured with a Horiba U-22 and recorded approximately every 5 minutes until the water appeared clear or for 15 to 20 minutes, whichever occurred first. The groundwater sampling field data sheets, which include the purge data and field indicator parameters collected, are provided in Appendix A of Volumes 2 through 6.

The groundwater samples were shipped via FedEx overnight under standard chain-of-custody procedures to Test America for VOC analysis by Method 8260. The chain of custody records (COCs) for each investigation area are provided in Appendix D of Volumes 2 through 6.

2.3.3 Soil Gas Sampling

Temporary soil gas sample probes were installed in locations around the buildings of interest using a Geoprobe® post-run tubing (PRT) system. The probes consisted of Teflon tubing attached to the drive rod with a drive point adapter. Soil gas samples were co-located with the groundwater samples described in Section 2.3.1. The soil gas probe screen interval was 1 ft long and the bottom of the screen was located approximately 1 ft above the water table. Samples were not collected at depths less than 5 ft bgs in accordance with USEPA's draft Vapor Intrusion Guidance (USEPA, 2002).

A helium leak check was performed before sampling to ensure the probe was installed correctly. The probe was purged with a sampling manifold (consisting of stainless steel Swagelok® gas tight valves and fittings and Teflon tubing) and an air pump. Three probe volumes of soil gas were purged at approximately 200 milliliters per minute (mL/min) into a Tedlar bag. A multi-gas meter was used to collect field measurements of VOCs, DO, carbon monoxide, methane, and hydrogen sulfide. Soil gas samples were collected in 1-L Summa™ canisters equipped with flow controllers. The flow controllers were regulated to sample at a rate of 200 mL/min, which resulted in sample collection period of 5 minutes. Summa™ canisters were filled until the pressure gauge read between -2 and -4 inches of mercury (Hg). The soil gas sampling field data sheets, which include the multi-gas meter readings, for each investigation area are provided in Appendix A of Volumes 2 through 6.

The soil gas samples were shipped via FedEx overnight under standard chain-of-custody procedures to Test America for VOC analysis by Method TO-15. The COCs for each investigation area are provided in Appendix D of Volumes 2 through 6.

2.3.4 Subslab Soil Gas Sampling

Permanent subslab soil gas probes were installed in the building foundations at appropriate locations; in the center of the building and away from underground water, sewer, heating, or electrical lines. The subslab probes consisted of stainless steel Swagelok® gas tight fittings (a length of one-quarter-inch stainless steel tubing (not to extend below the slab), a probe union, a sampling union and a probe cap). The probes were installed by drilling through the building foundation with a rotary hammer drill and securing the probe in place with Portland cement into the hole so that it was flush with the foundation. The cement was allowed to dry for 24 hours.

A helium leak check was performed before sampling to ensure the probe was installed correctly. The probe was purged with a sampling manifold (consisting of stainless steel Swagelok® gas tight valves and fittings and Teflon tubing) and an air pump. Two liters of subslab soil gas were purged at 200 mL/min into a Tedlar bag. Although the Work Plan (CH2M HILL, 2008a) specified that multi-gas readings would be collected from the subslab soil gas probes before sample collection, this did not occur because it was determined to be unnecessary as the laboratory analysis will provide the necessary data. Subslab soil gas samples were collected in 1-L Summa™ canisters equipped with flow controllers. The flow controllers regulated the sample collection rate to 200 mL/min, which resulted in sample collection period of 5 minutes. The Summa™ canisters were filled until the pressure gauge read between -2 and -4 inches of Hg. The subslab soil gas sampling field data sheets, which include the multi-gas meter readings, are for each investigation area are provided in Appendix A of Volumes 2 through 6.

The subslab soil gas samples were shipped via FedEx overnight under standard chain-of-custody procedures to Test America for VOC analysis by Method TO-15. The COCs for each investigation area are provided in Appendix D of Volumes 2 through 6.

2.3.5 Crawl Space Air Sampling

Crawl space air samples were collected at Building 728 in SMWU 118 at Mainside instead of indoor air and subslab soil gas samples during Phase I activities. This was done because the foundation of the building was elevated 1 to 3 ft above the ground surface with ambient air existing below the entire building foundation. Two crawl space air samples were collected from beneath the foundation; one at the north side and one at the south side of the building. The samples were collected by attaching a 10-ft piece of Teflon tubing to each Summa™ canister and placing the tubing effluent under the building. The Summa™ canisters were secured with a chain and padlock to the building. The crawl space samples were collected over a 24-hour period in 6L Summa™ canisters equipped with flow controllers. The Summa™ canisters were placed at the sampling locations and left undisturbed for 24 hours. The Summa™ canisters were checked after 20 hours to ensure that the canister pressure did not reach zero. The crawl space air field data sheets for each investigation area are provided in Appendix A of Volumes 2 through 6.

The crawl space air samples were shipped via FedEx overnight under standard chain-of-custody procedures to Test America for VOC analysis by method TO-15. The COCs for each investigation area are provided in Appendix D of Volumes 2 through 6.

2.3.6 Indoor Air Sampling

Indoor air samples were collected in buildings of interest at appropriate locations on the first floor towards the center of the building. Indoor air samples were collected over a 24-hour period in 6-L Summa™ canisters equipped with flow controllers. The Summa™ canisters were placed at the sampling location, turned on and left undisturbed for 24 hours. The Summa™ canisters were checked after 20 hours to ensure that the canister pressure did not reach zero. The indoor air field data sheets for each investigation area are provided in Appendix A of Volumes 2 through 6.

The indoor air samples were shipped via FedEx overnight under standard chain-of-custody procedures to Test America for VOC analysis by method TO-15. The COCs for each investigation area are provided in Appendix D of Volumes 2 through 6.

2.3.7 Outdoor Air Sampling

Outdoor air samples were collected in conjunction with indoor air samples. Three outdoor air samples were collected in each investigation area where indoor air sampling occurred. The outdoor air samples were placed in secure locations and secured to a fence or other structure with a chain and padlock. Outdoor air samples were collected over a 24-hour period in 6-L Summa™ canisters equipped with flow controllers. The Summa™ canisters were checked after 20 hours to ensure that the canister pressure did not read zero. The outdoor air field data sheets for each investigation area are provided in Appendix A of Volumes 2 through 6.

The outdoor air samples were shipped via FedEx overnight under standard chain-of-custody procedures to Test America for VOC analysis by Method TO-15 The COCs for each investigation area are provided in Appendix D of Volumes 2 through 6.

2.3.8 Investigation-derived Waste Management

Investigation-derived waste (IDW) generated from the Phase I activities consisted of drill cuttings from the DPT soil borings, purge groundwater, decontamination fluids, disposable equipment, and personnel protective equipment (PPE). Soils generated at locations that were not a source area or a highly contaminated area, were spread on the ground at the same location as the borehole. No soil was drummed during this field event. The location and approximate amount of soil was documented in the field notes. IDW generated from the Phase II activities consisted of purge groundwater, decontamination fluids, disposable equipment, and PPE. Water IDW was containerized in 55-gallon drums. The IDW water generated was identified as non-hazardous based on the results of waste characterization and properly disposed of within 90 days of generation by Potomac Environmental. Disposable equipment, including PPE, poly sheeting, paper towels, and aluminum foil, was disposed of in garbage bags as solid waste.

2.3.9 Data Management and Usability

During the field activities the following QA/QC samples were collected in accordance with the Quality Assurance Project Plan (QAPP), which is part of the work plan (CH2M HILL, 2008a) and the FSP (CH2M HILL, 2008b) to ensure precision, accuracy, representativeness, completeness, and comparability:

- Equipment rinsate blanks (all media except air); 1 per day for reusable equipment
- Trip blanks (all media except air); 1 per cooler shipped to laboratory
- Field blanks (all media except air); 1 per week of sampling
- Field duplicates; 1 per 10 samples per media
- Matrix Spike/Matrix Spike Duplicates (MS/MSDs) (all media except air; 1 per 20 samples per media

The duplicate samples were analyzed to verify the reproducibility of the laboratory results and the degree of variability of reported concentrations. The maximum concentration from the parent and field duplicate sample results were utilized for the purposes of this evaluation. All data that were received was usable. Further details on the usability of the data can be found in Section 3 of each volume.

SECTION 3

Screening Levels and Empirical Vapor Intrusion Attenuation Factors

The purpose of this section is to summarize the groundwater and soil gas screening levels used to evaluate the historical, Phase I, and Phase II data. As described in the Work Plan (CH2M HILL, 2008a), the lower of the USEPA (2002) generic groundwater screening levels (GWSLs) and the NCGWQS were used to identify the initial 168 buildings of interest. Site-specific groundwater levels were generated using USEPA's (2004) version of the J&E model (1991) and used to reduce the list to 50 buildings of interest for Phase I sampling. The modeling assumptions and detailed calculations are documented in the Work Plan (CH2M HILL, 2008a) and are not repeated herein. However, and as stated in Section 2, there are significant uncertainties and variability in modeled screening levels. Therefore, co-located Phase I groundwater and exterior soil gas were used to evaluate the site-specific modeled screening levels used during the work planning phase. In addition, Phase I and II co-located subslab soil gas and indoor air sample data were used to calculate empirical shallow soil gas-to-indoor air AFs. The details and conclusions from these evaluations are provided in this section.

The objective of the initial screening was to prioritize the buildings for subsequent investigations. As noted in the Executive Summary, 50 buildings were identified for Phase I sampling. Adjusting non-cancer-based screening levels downward to account for cumulative effects was not performed because: (1) it was not expected to change the recommendations since carcinogenic-based VOCs are typically co-contaminants; (2) the carcinogenic endpoint is generally more sensitive than the non-cancer endpoint for the constituents of general concern; and (3) the screening levels were based on conservative AFs, which were confirmed to be conservative based on the empirical AFs. The validity of these assumptions has been confirmed based on a review of the Phase I and II groundwater, soil gas, subslab, and indoor air data.

A review of the Phase I and II data indicated there were a limited number of samples from select buildings with exceedances of the conservative generic non-cancer GWSL and SGSL values. However, there was only one building (1115) at Hadnot Point with an exceedance of the non-cancer base-specific empirical SGSLs. The conclusions and recommendations for Building 1115 would not change based on the potential for cumulative non-cancer effects since: (1) there were no exceedances of the indoor air non-cancer screening levels at this or any other building investigated; and (2) subslab soil gas concentrations exceeded the cancer-based SGSL by more than 100 times.

3.1 Use of Phase I Data to Evaluate the Modeled Site-Specific Groundwater Screening Levels

Co-located groundwater and exterior soil gas data collected concurrently during Phase I near select buildings (Buildings 1502 and 1601 [Hadnot Point]; Buildings 37 and 43 [Mainside]); and for indicator VOCs (tetrachloroethene [PCE], trichloroethene [TCE] [chlorinated solvents] and benzene [petroleum hydrocarbon]) generally detected in both media were used in this analysis. Groundwater concentrations and the corresponding depths were used as inputs in the USEPA (2004) advanced groundwater J&E model to predict indoor air concentrations, with all other input parameters consistent with those documented in the Work Plan (CH2M HILL, 2008a). The predicted indoor air concentrations and all other input parameters listed in the Work Plan (CH2M HILL, 2008a) were used as inputs in the USEPA (2004) advanced soil gas J&E model to back-calculate modeled depth-specific soil gas concentrations, which were compared with the measured soil gas concentrations (Table V1-4). As shown in Table V1-4, the groundwater-to-soil gas modeled concentrations both over- and under-estimated the Phase I measured soil gas concentrations. Because of the uncertainty about whether the modeled site-specific screening values are over- or under-estimating vapor intrusion potential and to prevent premature elimination of buildings of interest, the Phase I data were compared to screening levels calculated using methods consistent with USEPA (2002), USEPA (2008) air RSLs, and the USEPA (2002) default generic shallow soil gas-to-indoor air AF (1E-01) and groundwater-to-indoor air AF (1E-03). These calculations are discussed in the following section.

3.2 Calculation of Generic Screening Levels

Generic GWSLs and SGSLs are provided in Tables V1-5 and V1-6, respectively. The GWSLs and SGSLs were calculated using the USEPA (2008) RSLs for air adjusted by USEPA (2002) default AFs of 1E-03 for groundwater, 1E-01 for shallow soil gas, and 1E-02 for deep soil gas. The RSLs were finalized in September 2008, after the Work Plan (CH2M HILL, 2008a) was published. A description of the methodologies used to calculate generic GWSLs and SGSLs is provided in the following sections.

3.2.1 Generic Groundwater Screening Levels

Generic GWSLs were calculated using the methodology in Appendix D of the *Draft Vapor Intrusion Guidance* (USEPA, 2002) for calculating target groundwater concentrations corresponding to target indoor air concentration. The target groundwater concentration (i.e., GWSL) corresponding to a chemical's target indoor air concentration is calculated by dividing the target indoor air concentration [i.e., the RSLs for residential and industrial air (USEPA, 2008)] by the default AF (1E-03) and then converting the vapor concentration to an equivalent groundwater concentration assuming equilibrium between the aqueous and vapor phases at the water table. The equation is presented below:

$$C_{gw}\ [\mu g/L] = [C_{target,ia}\ (ppbv)*MW/24.45]\mu g/m^3 * 10^{-3}\ m^3/L * 1/H * 1/\alpha$$

where,

Cgw	=	target groundwater concentration (i.e., GWSL),
$C_{target,ia}$	=	target indoor air concentration (i.e., RSLs for residential and industrial air),
MW	=	molecular weight (g/mole)
α	=	AF (ratio of indoor air concentration to source vapor concentration; 1E-03), and
H	=	dimensionless Henry's Law Constant at 25C [(mg/L – vapor)/(mg/L – H2O)].

The generic GWSLs are presented in Table V1-5.

3.2.2 Soil Gas

Generic SGSLs were developed for chemicals detected in soil vapor and subslab samples using the methodology in Appendix D of the Draft Vapor Intrusion Guidance (USEPA, 2002) for calculating target soil gas concentration corresponding to target indoor air concentration. SGSLs were calculated for both shallow soil gas (i.e., soil gas < 6 ft) and deep soil gas (i.e., soil gas > 6 ft). The target soil gas concentration (i.e., SGSL) corresponding to a chemical's target indoor air concentration (i.e. RSL for industrial and residential air) was calculated by dividing the indoor air concentration by the USEPA (2002) default AF for shallow or deep soil gas. The equation is presented below:

$$C_{soil\text{-}gas}\ [\mu g/m^3] = C_{target,ia}\ [\mu g/m^3] / \alpha$$

where,

$C_{soil\text{-}gas}$	=	target soil gas concentration (i.e., SGSL),
$C_{target,ia}$	=	target indoor air concentration (i.e., RSLs for residential and industrial air),and
α	=	AF [ratio of indoor air concentration to source vapor concentration; 1E-01 for shallow soil gas (i.e., soil gas <6 ft) and 1E-02 for deep soil gas (i.e., soil gas > 6 ft)]

The generic SGSLs are presented in Table V1-6.

3.3 Empirical Soil Gas-to-Indoor Air Attenuation Factors Derived Using Phase I and II Data

Concurrent subslab and indoor air data collected from 20 buildings sampled at multiple areas during Phase I and/or Phase II were assessed when calculating empirical AFs and subsequent empirically based SGSLs. As discussed in USEPA (2008), AFs can be biased high (by up to orders of magnitude) if AFs are calculated without considering the subslab source strength. Consistent with the data evaluation and filtering approaches described in USEPA's (2008) Vapor Intrusion Database technical support document, empirical AFs were only calculated for constituents that had relatively high subslab soil gas concentrations (i.e., greater than 100 times the minimum subslab reporting limits). In addition and per USEPA (2008), empirical AFs were not calculated for VOCs that were non-detect in the subslab samples since it is assumed the chemical is either absent in the subsurface or present below levels of concern; however, that same chemical can be present in the indoor air due to

background sources, which would result in AFs that are biased artificially high. The empirical AF calculations for all of the buildings with concurrent indoor and subslab results are provided in Table V1-7. Concurrent indoor air concentrations were paired with each subslab soil gas sample collected at a given building and the ratios (i.e., AFs) of indoor air concentrations to subslab soil gas concentrations were calculated for VOCs with subslab concentrations greater than 100 times the minimum Phase I and II reporting limits (RLs). Non-detect results were replaced with the value of the RL in order to calculate worst-case AFs for those samples with non-detect indoor air results. As shown in Table V1-7, subslab soil gas RLs for non-detects were significantly elevated for some VOCs at select buildings (e.g., Building 1115) where very high subslab concentrations of site-related VOCs were observed. This was due to significantly diluting the samples during analyses. However, these elevated RLs do not affect the empirical calculations since AFs were not calculated for VOCs with non-detect subslab results.

Empirical AFs based on indoor air results which were 2 times greater than outdoor air concentrations were differentiated from AFs based on indoor air results which were similar to background outdoor levels (refer to the footnote in Table V1-7). USEPA (2008) states that:

> "*When background indoor air concentrations are equivalent to or greater than the concentration contributed by vapor intrusion, the empirical attenuation factor will be biased high relative to the true attenuation factor (i.e., towards higher, more conservative values) by the contribution of background sources to indoor air. The bias varies in proportion to the relative contribution of background sources to the total indoor air concentration. … The empirical attenuation factor is most likely to represent the attenuation due to vapor intrusion when the indoor air concentration from vapor intrusion is substantially greater than the background indoor air concentration, which is most likely to occur when subsurface vapor concentrations are high.*"

As discussed by USEPA (2008), it is important to consider background indoor and/or outdoor air concentrations when calculating and interpreting empirical AFs. There is no hard-and-fast rule when attempting to determine if the indoor air concentrations are significantly greater than background levels, particularly when it is not possible to perform statistical calculations. Some partnering team members (USEPA and state regulators) have suggested during other site evaluations for the Navy that indoor air concentrations may start to approach the point of being significantly different from outdoor air concentrations if they were more than 2 times the outdoor air concentrations. Therefore, 2 times the outdoor air concentrations was selected when highlighting the results in Table V1-7.

The empirical AFs were plotted against the subslab soil gas concentrations for chlorinated VOCs and petroleum hydrocarbons (Figures V1-10 and V1-11). The AFs shown in Figure V1-10 and V1-11 were based on the AFs listed in Table V1-7 for those VOCs with subslab concentrations greater than 100 times the minimum reporting limits. There were 12 buildings with subslab concentrations greater than 100 times the minimum subslab RLs (Table V1-7). Additional information (e.g., building number, VOC, Phase, subslab and indoor air concentration, 2 times the outdoor air concentration) associated with each of the AFs presented on Figures V1-10 and V1-11 is provided in Table V1-8. The following building characteristics for the 12 buildings are summarized in Table V1-9: (1) size of the building (the cutoff for small and large buildings was selected at 5,000 square feet (ft^2); with

the total square footage for all 12 of these buildings ranging from <1,000 ft^2 to more than 50,000 ft^2); (2) the presence and operation of heating, ventilating, and air conditioning (HVAC) systems during sampling; 3) ceiling height; 4) whether the building is primarily made up of offices, warehouse space, or both; and 5) if the windows and/or doors are typically closed or left open. There are no apparent correlations between the building characteristics and AFs listed in Tables V1-8 and V1-9, respectively.

The empirical subslab-to-indoor air AFs ranged from 1E-03 to 1E-06 for those constituents with indoor air results 2 times greater than outdoor air (Figures V1-10 and V1-11). These results indicate that the shallow SGSLs based on USEPA's (2002) default AF of 1E-01 significantly (at least 100 times) over-predict indoor air concentrations. The most conservative (rather than a statistical estimate given the limited data) AF of 1E-03 from buildings with indoor air concentrations greater than 2 times the outdoor air concentrations shown in figures V1-10 and V1-11 was selected as a representative basewide AF for the wide range of building types and sizes encountered at Camp Lejeune. Shallow SGSLs were re-calculated based on an assumed basewide empirical AF of 1E-03 and were used in the final evaluation of the soil gas and subslab results in subsequent volumes. Refer to Table V1-10 for a list of the base-specific SGSLs that were calculated using the assumed shallow soil gas-to-indoor air empirical AF of 1E-03. Note that a shallow soil gas-to-indoor air AF of 1E-03 is similar to the default used by select states (e.g., California Environmental Protection Agency [Cal/EPA], 2004) and the same as the sandy (most conservative) scenario-specific AF listed in USEPA's (2002) draft Vapor Intrusion Guidance.

The base-specific SGSLs will be used for future vapor intrusion evaluations at MCB Camp Lejeune. In order to ensure that these screening levels remain appropriate over time a re-evaluation should be performed in 5 years. Concurrent subslab soil gas and indoor air sampling should be performed at buildings where exceedances of the base-specific SGSLs have occurred. These sample data will be used to re-calculate a base-specific empirical AF. Re-evaluation of the base-specific AF is necessary because AFs at buildings can change over time as the building ages because cracks may develop in the slab.

SECTION 4

References

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Tables

TABLE V1-4
Validation of Johnson and Ettinger Model Input Parameters used to Calculate Site-Specific Groundwater Screening Level
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

Building Number	Co-located Sample ID	Chemical[1]	Measured Groundwater Result[2] (ug/L)	Modeled Soil Gas Result[3] (ug/m^3)	Measured Soil Gas Result[2] (ug/m^3)	Comment
Study Area: Mainside						
37	IR88-IS05	Tetrachloroethene	11	3165	81399	Model under-estimated soil gas concentration
37	IR88-IS05 (duplicate)	Tetrachloroethene	11	3165	176364	Model under-estimated soil gas concentration
37	IR88-IS06	Tetrachloroethene	0.16 J	49	3934	Model under-estimated soil gas concentration
43	IR88-IS04	Tetrachloroethene	52	9822	332	Model over-estimated soil gas concentration
43	IR88-IS03	Tetrachloroethene	750	141614	1153	Model over-estimated soil gas concentration
Study Area: Hadnot Point						
1601	IR78-IS13	Benzene	0.026 J	3	4	
1601	IR78-IS15	Benzene	450	38539	9	Model over-estimated soil gas concentration
1601	IR78-IS15 (duplicate)	Benzene	450	38539	7	Model over-estimated soil gas concentration
1601	IR78-IS15	Trichloroethene	5.3 J	799	33	Model over-estimated soil gas concentration
1601	IR78-IS15 (duplicate)	Trichloroethene	5.3 J	776	26	Model over-estimated soil gas concentration
1601 & 1502	IR78-IS16-GW-17-18-08B	Trichloroethene	9.6	1434	11286	Model under-estimated soil gas concentration

1 Indicator compound representative of site contamination (e.g., solvent-based contamination, petroleum-based contamination).
2 Analytical results from Phase I sampling event.
3 Soil gas concentrations estimated from measured groundwater concentrations via the Johnson and Ettinger model. Model input parameters were presented in the *Final Vapor Intrusion Evaluation Work Plan,* Marine Corps Base Lejeune, Jacksonville, North Carolina, June 2008.

TABLE V1-5
Generic Groundwater Screening Levels (GWSLs)
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

CAS #	Volatile Organic Compounds	RSL Industrial Air[1] µg/m^3	RSL Residential Air[1] µg/m^3	Groundwater Attenuation Factor[2] (unitless)	Henry's law constant (H')[3] (unitless)	Generic Industrial GWSLs (ug/L)	Generic Unrestricted GWSLs (ug/L)
71-55-6	1,1,1-Trichloroethane	2.20E+04	5.20E+03	1.00E-03	7.03E-01	3.13E+04	7.39E+03
79-34-5	1,1,2,2-Tetrachloroethane	2.10E-01	4.20E-02	1.00E-03	1.41E-02	1.49E+01	2.98E+00
79-00-5	1,1,2-Trichloroethane	7.70E-01	1.50E-01	1.00E-03	3.73E-02	2.06E+01	4.02E+00
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1.30E+05	3.10E+04	1.00E-03	1.97E+01	6.61E+03	1.58E+03
75-34-3	1,1-Dichloroethane	7.70E+00	1.50E+00	1.00E-03	2.30E-01	3.35E+01	6.53E+00
75-35-4	1,1-Dichloroethylene	8.80E+02	2.10E+02	1.00E-03	1.07E+00	8.24E+02	1.97E+02
120-82-1	1,2,4-Trichlorobenzene	1.80E+01	4.20E+00	1.00E-03	5.81E-02	3.10E+02	7.20E+01
107-06-2	1,2-Dichloroethane	4.70E-01	9.40E-02	1.00E-03	4.00E-02	1.17E+01	2.35E+00
78-87-5	1,2-Dichloropropane	1.20E+00	2.40E-01	1.00E-03	1.15E-01	1.05E+01	2.10E+00
106-46-7	1,4-Dichlorobenzene	1.10E+00	2.20E-01	1.00E-03	9.82E-02	1.12E+01	2.24E+00
78-93-3	2-Butanone (MEK)	2.20E+04	5.20E+03	1.00E-03	2.29E-03	9.62E+06	2.27E+06
591-78-6	2-Hexanone	1.30E+04	5.20E+03	1.00E-03	3.38E-03	3.84E+06	1.54E+06
108-10-1	4-Methyl-2-pentanone (MIBK)	1.30E+04	3.10E+03	1.00E-03	5.64E-03	2.30E+06	5.49E+05
67-64-1	Acetone	1.40E+05	3.20E+04	1.00E-03	1.59E-03	8.82E+07	2.02E+07
71-43-2	Benzene	1.60E+00	3.10E-01	1.00E-03	2.27E-01	7.05E+00	1.37E+00
75-27-4	Bromodichloromethane[4]	NA	NA	1.00E-03	6.54E-02	NA	NA
74-83-9	Bromomethane	2.20E+01	5.20E+00	1.00E-03	2.55E-01	8.62E+01	2.04E+01
75-15-0	Carbon disulfide	3.10E+03	7.30E+02	1.00E-03	1.24E+00	2.50E+03	5.89E+02
56-23-5	Carbon tetrachloride	8.20E-01	1.60E-01	1.00E-03	1.24E+00	6.60E-01	1.29E-01
108-90-7	Chlorobenzene	2.20E+02	5.20E+01	1.00E-03	1.51E-01	1.45E+03	3.44E+02
75-00-3	Chloroethane	4.40E+04	1.00E+04	1.00E-03	3.61E-01	1.22E+05	2.77E+04
67-66-3	Chloroform	5.30E-01	1.10E-01	1.00E-03	1.50E-01	3.53E+00	7.33E-01
74-87-3	Chloromethane	6.80E+00	1.40E+00	1.00E-03	3.61E-01	1.89E+01	3.88E+00
156-59-2	cis-1,2-Dichloroethene[4]	NA	NA	1.00E-03	1.67E-01	NA	NA
98-82-8	Cumene	1.80E+03	4.20E+02	1.00E-03	4.74E+01	3.79E+01	8.85E+00
110-82-7	Cyclohexane	2.60E+04	6.30E+03	1.00E-03	6.68E+00	3.89E+03	9.43E+02
75-71-8	Dichlorodifluoromethane	8.80E+02	2.10E+02	1.00E-03	1.40E+01	6.27E+01	1.50E+01
100-41-4	Ethylbenzene	4.90E+00	9.70E-01	1.00E-03	3.22E-01	1.52E+01	3.01E+00
79-20-9	Methyl acetate[4]	NA	NA	1.00E-03	4.84E-03	NA	NA
75-09-2	Methylene chloride	2.60E+01	5.20E+00	1.00E-03	8.96E-02	2.90E+02	5.81E+01
1634-04-4	Methyl tert-butyl ether	4.70E+01	9.40E+00	1.00E-03	2.56E-02	1.84E+03	3.68E+02
108-87-2	Methylcyclohexane	1.30E+04	3.10E+03	1.00E-03	4.22E+00	3.08E+03	7.35E+02
1330-20-7	m-Xylene & p-Xylene	4.40E+02	1.00E+02	1.00E-03	3.13E-01	1.40E+03	3.19E+02
95-47-6	o-Xylene	3.10E+03	7.30E+02	1.00E-03	2.12E-01	1.46E+04	3.44E+03
100-42-5	Styrene	4.40E+03	1.00E+03	1.00E-03	1.12E-01	3.91E+04	8.89E+03
127-18-4	Tetrachloroethylene	2.10E+00	4.10E-01	1.00E-03	7.53E-01	2.79E+00	5.45E-01
108-88-3	Toluene	2.20E+04	5.20E+03	1.00E-03	2.72E-01	8.10E+04	1.91E+04
156-60-5	trans-1,2-Dichloroethene	2.60E+02	6.30E+01	1.00E-03	3.84E-01	6.78E+02	1.64E+02
79-01-6	Trichloroethylene	6.10E+00	1.20E+00	1.00E-03	4.21E-01	1.45E+01	2.85E+00
75-69-4	Trichlorofluoromethane	3.10E+03	7.30E+02	1.00E-03	3.97E+00	7.81E+02	1.84E+02
75-01-4	Vinyl chloride	2.80E+00	1.60E-01	1.00E-03	1.10E+00	2.54E+00	1.45E-01

[1] Industrial and residential air screening level from the Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (USEPA, September 12, 2008).
RSL value for MIBK used as surrogate for 2-hexanone
RSL value for xylene, mixture used as surrogate for m,p-xylene

[2] Attenuation factor for groundwater recommended in Draft Vapor Intrusion Guidance (USEPA, 2002)

[3] Henry's Law Constants obtained from J&E model spreadsheets except where noted.
2-Hexanone and cyclohexane values form Texas Risk Reduction Program chem/phys properties table.

[4] Inhalation toxicity values not available for chemical; therefore, no RSL available.

TABLE V1-6
Generic Soil Gas Screening Levels (SGSLs)
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

CAS #	Volatile Organic Compounds	RSL Industrial Air[1] ppbv	RSL Residential Air[1] ppbv	Shallow Soil Gas Infinite Source Indoor Attenuation Coefficient[2] (unitless)	Deep Soil Gas Infinite Source Indoor Attenuation Coefficient[2] (unitless)	Industrial Shallow Soil Gas Generic SGSL ppbv	Industrial Deep Soil Gas Generic SGSL ppbv	Unrestricted Shallow Soil Gas Generic SGSL ppbv	Unrestricted Deep Soil Gas Generic SGSL ppbv
71-55-6	1,1,1-Trichloroethane	4.03E+03	9.53E+02	0.1	0.01	4.03E+04	4.03E+05	9.53E+03	9.53E+04
79-34-5	1,1,2,2-Tetrachloroethane	3.06E-02	6.12E-03	0.1	0.01	3.06E-01	3.06E+00	6.12E-02	6.12E-01
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1.70E+04	4.04E+03	0.1	0.01	1.70E+05	1.70E+06	4.04E+04	4.04E+05
75-34-3	1,1-Dichloroethane	1.90E+00	3.71E-01	0.1	0.01	1.90E+01	1.90E+02	3.71E+00	3.71E+01
75-35-4	1,1-Dichloroethene	2.22E+02	5.30E+01	0.1	0.01	2.22E+03	2.22E+04	5.30E+02	5.30E+03
120-82-1	1,2,4-Trichlorobenzene	2.42E+00	5.66E-01	0.1	0.01	2.42E+01	2.42E+02	5.66E+00	5.66E+01
107-06-2	1,2-Dichloroethane	1.16E-01	2.32E-02	0.1	0.01	1.16E+00	1.16E+01	2.32E-01	2.32E+00
78-87-5	1,2-Dichloropropane	2.60E-01	5.19E-02	0.1	0.01	2.60E+00	2.60E+01	5.19E-01	5.19E+00
106-46-7	1,4-Dichlorobenzene	1.83E-01	3.66E-02	0.1	0.01	1.83E+00	1.83E+01	3.66E-01	3.66E+00
78-93-3	2-Butanone (MEK)	7.46E+03	1.76E+03	0.1	0.01	7.46E+04	7.46E+05	1.76E+04	1.76E+05
591-78-6	2-Hexanone	3.17E+03	7.57E+02	0.1	0.01	3.17E+04	3.17E+05	7.57E+03	7.57E+04
108-10-1	4-Methyl-2-pentanone (MIBK)	3.17E+03	7.56E+02	0.1	0.01	3.17E+04	3.17E+05	7.56E+03	7.56E+04
67-64-1	Acetone	5.89E+04	1.35E+04	0.1	0.01	5.89E+05	5.89E+06	1.35E+05	1.35E+06
71-43-2	Benzene	5.01E-01	9.70E-02	0.1	0.01	5.01E+00	5.01E+01	9.70E-01	9.70E+00
75-27-4	Bromodichloromethane[3]	NA	NA	0.1	0.01	NA	NA	NA	NA
74-83-9	Bromomethane	5.67E+00	1.34E+00	0.1	0.01	5.67E+01	5.67E+02	1.34E+01	1.34E+02
75-15-0	Carbon disulfide	9.95E+02	2.34E+02	0.1	0.01	9.95E+03	9.95E+04	2.34E+03	2.34E+04
56-23-5	Carbon tetrachloride	1.30E-01	2.54E-02	0.1	0.01	1.30E+00	1.30E+01	2.54E-01	2.54E+00
108-90-7	Chlorobenzene	4.78E+01	1.13E+01	0.1	0.01	4.78E+02	4.78E+03	1.13E+02	1.13E+03
75-00-3	Chloroethane	1.67E+04	3.79E+03	0.1	0.01	1.67E+05	1.67E+06	3.79E+04	3.79E+05
67-66-3	Chloroform	1.09E-01	2.25E-02	0.1	0.01	1.09E+00	1.09E+01	2.25E-01	2.25E+00
74-87-3	Chloromethane	3.29E+00	6.78E-01	0.1	0.01	3.29E+01	3.29E+02	6.78E+00	6.78E+01
156-59-2	cis-1,2-Dichloroethene[3]	NA	NA	0.1	0.01	NA	NA	NA	NA
98-82-8	Cumene	3.66E+02	8.54E+01	0.1	0.01	3.66E+03	3.66E+04	8.54E+02	8.54E+03
110-82-7	Cyclohexane	7.55E+03	1.83E+03	0.1	0.01	7.55E+04	7.55E+05	1.83E+04	1.83E+05
75-71-8	Dichlorodifluoromethane	1.78E+02	4.25E+01	0.1	0.01	1.78E+03	1.78E+04	4.25E+02	4.25E+03
100-41-4	Ethylbenzene	1.13E+00	2.23E-01	0.1	0.01	1.13E+01	1.13E+02	2.23E+00	2.23E+01
1634-04-4	Methyl tert-butyl ether	1.30E+01	2.61E+00	0.1	0.01	1.30E+02	1.30E+03	2.61E+01	2.61E+02
75-09-2	Methylene chloride	7.48E+00	1.50E+00	0.1	0.01	7.48E+01	7.48E+02	1.50E+01	1.50E+02
1330-20-7	m-Xylene & p-Xylene	1.01E+02	2.30E+01	0.1	0.01	1.01E+03	1.01E+04	2.30E+02	2.30E+03
95-47-6	o-Xylene	7.14E+02	1.68E+02	0.1	0.01	7.14E+03	7.14E+04	1.68E+03	1.68E+04
100-42-5	Styrene	1.03E+03	2.35E+02	0.1	0.01	1.03E+04	1.03E+05	2.35E+03	2.35E+04
127-18-4	Tetrachloroethene	3.10E-01	6.05E-02	0.1	0.01	3.10E+00	3.10E+01	6.05E-01	6.05E+00
108-88-3	Toluene	5.84E+03	1.38E+03	0.1	0.01	5.84E+04	5.84E+05	1.38E+04	1.38E+05
156-60-5	trans-1,2-Dichloroethene	6.56E+01	1.59E+01	0.1	0.01	6.56E+02	6.56E+03	1.59E+02	1.59E+03
79-01-6	Trichloroethene	1.14E+00	2.23E-01	0.1	0.01	1.14E+01	1.14E+02	2.23E+00	2.23E+01
75-69-4	Trichlorofluoromethane	5.52E+02	1.30E+02	0.1	0.01	5.52E+03	5.52E+04	1.30E+03	1.30E+04
75-01-4	Vinyl chloride	1.10E+00	6.26E-02	0.1	0.01	1.10E+01	1.10E+02	6.26E-01	6.26E+00

[1] Industrial and residential air screening level from the Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (USEPA, September 12, 2008).
Values converted from ug/m3 to ppbv using the following equation: ppbv = (ug/m3 * 24.45)/molecular weight.
RSL value for MIBK used as surrogate for 2-hexanone
RSL value for xylene, mixture used as surrogate for m,p-xylene

[2] Attenuation factor for soil gas recommended in Draft Vapor Intrusion Guidance (USEPA, 2002)

[3] Inhalation toxicity values not available for chemical; therefore, no RSL available.

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

MAINSIDE - PHASE I															
Building					**Building LCH 4014 A**				**Building 820**				**Building 820**		
Station ID	**Min. Phase I**	**Outdoor**		**Indoor**		**Soil Gas**	**Indoor to**	**Indoor**		**Soil Gas**	**Indoor to**	**Indoor**		**Soil Gas**	**Indoor to**
Sample ID	**Subslab**	2-Times Max		LCH4015-IA02-08B		LCH4015-SG02-08B	**Subslab**	IR820-IA03-08B		IR820-SG03-08B	**Subslab**	IR820-IA04-08B		IR820-SG04-08B	**Subslab**
Sample Date	**RL (ppbv)**	Detected Value		06/23/08		06/22/08	**Ratio**	06/24/08		06/24/08	**Ratio**	06/24/08		06/24/08	**Ratio**
Chemical Name															
VOA (ppbv)															
1,1,1-Trichloroethane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,1,2,2-Tetrachloroethane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.192	J	3.3 U		2 U	NC	**0.09 J**		2 U	NC	0.2 U		2 U	NC
1,1,2-Trichloroethane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,1-Dichloroethane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,1-Dichloroethene	2.00	0.1	J	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,2,4-Trichlorobenzene	10.00	1	U	17 U		10 U	NC	1 U		10 U	NC	1 U		10 U	NC
1,2-Dibromoethane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,2-Dichlorobenzene	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,2-Dichloroethane	2.00	0.132	J	3.3 U		2 U	NC	**0.096 J**		2 U	NC	0.2 U		2 U	NC
1,2-Dichloropropane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,3-Dichlorobenzene	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
1,4-Dichlorobenzene	2.00	0.2	U	3.3 U		2 U	NC	**0.53**	1	2 U	NC	0.2 U		2 U	NC
2-Butanone	10.00	6.2		17 U		10 U	NC	**4.9**		10 U	NC	**0.23 J**		10 U	NC
2-Hexanone	5.00	0.24	J	8.3 U		5 U	NC	**0.42 J**	1	5 U	NC	0.5 U		5 U	NC
4-Methyl-2-pentanone	5.00	0.32	J	8.3 U		**3.5 J**	NC	**0.31 J**		5 U	NC	0.5 U		5 U	NC
Acetone	50.00	36		**260**	1	**18 J**	NC	**45**	1	**20 J**	NC	**3.1 J**		50 U	NC
Benzene	2.00	0.64		3.3 U		**1.1 J**	NC	**1.2**	1	2 U	NC	**0.15 J**		2 U	NC
Bromodichloromethane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
Bromoform	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
Bromomethane	2.00	0.2	U	3.3 U		**0.34 J**	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
Carbon disulfide	5.00	0.78	J	8.3 U		5 U	NC	**0.19 J**		5 U	NC	**0.034 J**		5 U	NC
Carbon tetrachloride	2.00	0.24	J	3.3 U		2 U	NC	**0.24**		2 U	NC	0.2 U		2 U	NC
Chlorobenzene	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
Chloroethane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
Chloroform	2.00	0.078	J	**3 J**	1	2 U	NC	**0.28**	1	2 U	NC	**0.045 J**		2 U	NC
Chloromethane	5.00	2.6		8.3 U		5 U	NC	**1.3**		5 U	NC	0.5 U		5 U	NC
Cyclohexane	5.00	0.178	J	8.3 U		**1.9 J**	NC	**1.1**	1	5 U	NC	**0.072 J**		5 U	NC
Dibromochloromethane	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.36		3.3 U		**0.85 J**	NC	**12**	1	**190**	NC	0.65		2 U	NC
Ethylbenzene	2.00	0.3	J	3.3 U		**37**	NC	**0.52**	1	**13**	NC	0.2 U		**4.1**	NC
Isopropylbenzene	4.00	0.4	U	6.7 U		**3.5 J**	NC	**0.075 J**		**0.99 J**	NC	0.4 U		4 U	NC
Methyl-tert-butyl ether (MTBE)	10.00	1	U	17 U		10 U	NC	1 U		10 U	NC	1 U		10 U	NC
Methylene chloride	5.00	1.02		8.3 U		**7.8**	NC	0.87 U		**1.5 J**	NC	0.5 U		5 U	NC
Styrene	2.00	0.174	J	3.3 U		2 U	NC	**0.9**	1	2 U	NC	0.2 U		2 U	NC
Tetrachloroethene	2.00	0.146	J	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
Toluene	2.00	1.94		**1.4 J**		**4.8**	NC	**11**	1	**2.4**	NC	**0.6**		**1.3 J**	NC
Trichloroethene	2.00	0.2	U	**0.81 J**	1	**0.46 J**	NC	**0.047 J**		2 U	NC	0.2 U		2 U	NC
Trichlorofluoromethane(Freon-11)	2.00	0.2	U	**0.89 J**	1	**1.4 J**	NC	**7.4**	1	**4.5**	NC	**0.3**	1	2 U	NC
Vinyl chloride	2.00	0.2	U	3.3 U		2 U	NC	**0.096 J**		2 U	NC	0.2 U		2 U	NC
cis-1,2-Dichloroethene	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
cis-1,3-Dichloropropene	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC
m- and p-Xylene	2.00	1		3.3 U		**90**	NC	**1.5**	1	**28**	NC	0.2 U		**7.9**	NC
o-Xylene	2.00	0.36	J	3.3 U		**34**	NC	**0.53**	1	**9.3**	NC	0.2 U		**2.2**	NC
trans-1,2-Dichloroethene	2.00	0.2	U	3.3 U		2 U	NC	0.2 U		2 U	NC	0.2 U		2 U	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE I																		
Building			**Building 1220**						**Building 1100**				**Building 1114**					
Station ID	**Min. Phase I**	**Outdoor**	**Indoor**		**Soil Gas**			**Indoor to**	**Indoor to**	**Indoor**		**Soil Gas**		**Indoor to**	**Indoor**		**Soil Gas**		**Indoor to**
Sample ID	**Subslab**	2-Times Max	HPFF-IA01-08B		HPFF-SG01-08B		HPFF-SG01D-08B	**Subslab (P)**	**Subslab (Dup)**	HPFF-IA03-08B		HPFF-SG03-08B		**Subslab**	HPFF-IA05-08B		HPFF-SG05-08B		**Subslab**
Sample Date	**RL (ppbv)**	Detected Value	06/20/08		06/21/08		06/21/08	**Ratio**	**Ratio**	06/20/08		06/20/08		**Ratio**	06/20/08		06/20/08		**Ratio**
Chemical Name																			
VOA (ppbv)																			
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,1,2-Trichloro-1,2,2-trifluoroethane	2.00	0.168 J	**0.074 J**		2 U		2 U	NC	NC	**0.081 J**		38 U		NC	**0.073 J**		150 U		NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 U		10 U		10 U	NC	NC	1 U		190 U		NC	1 U		740 U		NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
1,4-Dichlorobenzene	2.00	0.2 U	**2**	1	2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
2-Butanone	10.00	4	**1**		**5.3 J**		**3.8 J**	NC	NC	**3.4**		190 U		NC	**0.9 J**		740 U		NC
2-Hexanone	5.00	0.34 J	0.5 U		**0.98 J**		5 U	NC	NC	**0.54**	1	95 U		NC	0.5 U		370 U		NC
4-Methyl-2-pentanone	5.00	0.38 J	0.5 U		5 U		5 U	NC	NC	**0.19 J**		95 U		NC	0.5 U		370 U		NC
Acetone	50.00	32	**15**		**40 J**		**29 J**	NC	NC	**30**		950 U		NC	**6.8**		3,700 U		NC
Benzene	2.00	0.92	**0.32**		**1.7 J**		**1.8 J**	NC	NC	**0.35**		**120**		NC	**0.45**		**91 J**		NC
Bromodichloromethane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	**0.076 J**		38 U		NC	0.2 U		150 U		NC
Bromoform	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
Bromomethane	2.00	0.09 J	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	**0.075 J**		150 U		NC
Carbon disulfide	5.00	0.098 J	0.5 U		**0.35 J**		5 U	NC	NC	**0.051 J**		95 U		NC	**0.1 J**	1	370 U		NC
Carbon tetrachloride	2.00	0.22 J	**0.068 J**		2 U		2 U	NC	NC	**0.087 J**		38 U		NC	**0.079 J**		150 U		NC
Chlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
Chloroethane	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
Chloroform	2.00	0.102 J	**0.053 J**		2 U		2 U	NC	NC	**0.31**	1	38 U		NC	**0.049 J**		150 U		NC
Chloromethane	5.00	1.88	**0.74**		5 U		5 U	NC	NC	0.99		95 U		NC	**0.57**		370 U		NC
Cyclohexane	5.00	0.84 J	**0.065 J**		**11**		**11**	NC	NC	**0.13 J**		**140**		NC	**0.32 J**		**11,000**	2	2.9E-05
Dibromochloromethane	2.00	0.2 U	0.2 U		2 U		**2 U**	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
Dichlorodifluoromethane (Freon-12	2.00	1.18	**0.54**		**7**		**7**	NC	NC	**0.53**		38 U		NC	**0.47**		150 U		NC
Ethylbenzene	2.00	0.38 J	**0.18 J**		**89**		**85**	NC	NC	**0.32**		**4,100**	2	7.8E-05	**0.11 J**		**270**	2	4.1E-04
Isopropylbenzene	4.00	0.4 U	0.4 U		**8.6**		**8**	NC	NC	0.4 U		**340**		NC	0.4 U		300 U		NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U		10 U		10 U	NC	NC	1 U		190 U		NC	1 U		740 U		NC
Methylene chloride	5.00	2.6	0.5 U		5.3 U		5 U	NC	NC	0.5 U		95 U		NC	0.5 U		370 U		NC
Styrene	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	**0.1 J**		38 U		NC	0.2 U		150 U		NC
Tetrachloroethene	2.00	0.2 U	**0.048 J**		2 U		2 U	NC	NC	0.2 U		**8.2 J**		NC	0.2 U		150 U		NC
Toluene	2.00	1.58	**1.5**		**9.1**		**8.7**	NC	NC	**1.4**		**600**	2	2.3E-03	**0.82**		**80 J**		NC
Trichloroethene	2.00	0.2 U	**0.16 J**		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**2**	1	**4.6**		**4.8**	NC	NC	**0.28**		38 U		NC	**0.25**		150 U		NC
Vinyl chloride	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC
m- and p-Xylene	2.00	1.12	**0.42**		**220**	2	**210**	2 1.9E-03	2.0E-03	**0.61**		**9,300**	2	6.6E-05	**0.33**		**610**	2	5.4E-04
o-Xylene	2.00	0.4	**0.15 J**		**88**		**83**	NC	NC	**0.27**		**3,700**	2	7.3E-05	**0.12 J**		**250**	2	4.8E-04
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U		2 U		2 U	NC	NC	0.2 U		38 U		NC	0.2 U		150 U		NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE I																
Building			**Building 1068**					**Building 1005**								
Station ID	**Min. Phase I**	**Outdoor**	**Indoor**		**Soil Gas**	**Indoor (P) to Subslab Ratio**	**Indoor (Dup) to Subslab Ratio**	**Indoor**		**Soil Gas**		**Indoor (P) to Subslab (P) Ratio**	**Indoor (D) to Subslab (P) Ratio**	**Indoor (P) to Subslab (D) Ratio**	**Indoor (D) to Subslab (D) Ratio**
Sample ID	**Subslab**	2-Times Max	HPFF-IA06-08B	HPFF-IA06D-08B	HPFF-SG06-08B			HPFF-IA07-08B	HPFF-IA07D-08B	HPFF-SG07-08B	HPFF-SG07D-08B				
Sample Date	**RL (ppbv)**	Detected Value	06/22/08	06/22/08	06/20/08			06/21/08	06/21/08	06/22/08	06/22/08				
Chemical Name																
VOA (ppbv)																
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	**0.083 J**	**0.084 J**	2 U	2 U	NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	**0.098 J**	2 U	2 U	NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane	2.00	0.168 J	**0.079 J**	**0.077 J**	2 U	NC	NC	**0.088 J**	**0.085 J**	2 U	2 U	NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 U	1 U	10 U	NC	NC	1 U	1 U	**1.4 J**	10 U	NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	**0.076 J**	**0.082 J**	2 U	2 U	NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
2-Butanone	10.00	4	**0.98 J**	**0.82 J**	10 U	NC	NC	**1.1**	**0.87 J**	**3.6 J**	**4.7 J**	NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	**0.06 J**	0.5 U	5 U	NC	NC	0.5 U	**0.08 J**	5 U	5 U	NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	0.5 U	0.5 U	5 U	NC	NC	**0.076 J**	**0.066 J**	5 U	5 U	NC	NC	NC	NC
Acetone	50.00	32	**8.4**	**7.9**	50 U	NC	NC	**23**	**23**	**17 J**	**44 J**	NC	NC	NC	NC
Benzene	2.00	0.92	**0.55**	**0.48**	2 U	NC	NC	**0.2**	**0.21**	2 U	**0.63 J**	NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	**0.46 J**	2 U	NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	**0.039 J**	0.5 U	**4.2 J**	NC	NC	**0.087 J**	**0.12 J** 1	**1 J**	5 U	NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.058 J**	**0.065 J**	2 U	NC	NC	**0.084 J**	**0.089 J**	**1 J**	**0.8 J**	NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
Chloroform	2.00	0.102 J	**0.18 J** 1	**0.18 J** 1	2 U	NC	NC	**0.047 J**	**0.043 J**	**16**	**16**	NC	NC	NC	NC
Chloromethane	5.00	1.88	**0.99**	**1**	5 U	NC	NC	**1.2**	**1**	5 U	5 U	NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.95** 1	**0.82**	**0.93 J**	NC	NC	**0.16 J**	**0.1 J**	**0.9 J**	**0.77 J**	NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12	2.00	1.18	**0.5**	**0.49**	2 U	NC	NC	**3.4** 1	**3.4** 1	**6.6**	**6.3**	NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	**0.071 J**	0.2 U	2 U	NC	NC	**0.25**	**0.26**	**14**	**20**	NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U	0.4 U	4 U	NC	NC	0.4 U	0.4 U	**1.2 J**	**2 J**	NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	1 U	10 U	NC	NC	1 U	1 U	10 U	10 U	NC	NC	NC	NC
Methylene chloride	5.00	2.6	0.5 U	0.5 U	**7.8**	NC	NC	**0.59**	**0.55**	5 U	5 U	NC	NC	NC	NC
Styrene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	**0.19 J**	**0.26** 1	2 U	2 U	NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	**0.55** 1	**0.53** 1	**1.3 J**	**1.2 J**	NC	NC	NC	NC
Toluene	2.00	1.58	**0.63**	**0.41**	2 U	NC	NC	**3** 1	**3.1** 1	**1.8 J**	**2.8**	NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	0.2 U	**0.058 J**	**0.47 J**	NC	NC	**0.11 J**	**0.11 J**	2 U	2 U	NC	NC	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.43**	**0.44**	**0.87 J**	NC	NC	**0.45**	**0.39**	**0.42 J**	**0.45 J**	NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.22**	0.2 U	**1.5 J**	NC	NC	**0.66**	**0.7**	**33**	**50**	NC	NC	NC	NC
o-Xylene	2.00	0.4	**0.092 J**	0.2 U	**0.66 J**	NC	NC	**0.22**	**0.24**	**13**	**20**	NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U	0.2 U	2 U	NC	NC	0.2 U	0.2 U	2 U	2 U	NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

CAMP GEIGER PHASE I																					
Building			**Building G480**					**Building G480**					**Building TC860**					**Building TC860**			
Station ID	**Min. Phase I**	**Outdoor**	**Indoor**		**Soil Gas**		**Indoor to**	**Indoor**		**Soil Gas**		**Indoor to**	**Indoor**		**Soil Gas**		**Indoor to**	**Indoor**		**Soil Gas**		**Indoor to**
Sample ID	**Subslab**	2-Times Max	IR35-IA05-08B		IR35-SG05-08B		**Subslab**	IR35-IA06-08B		IR35-SG06-08B		**Subslab**	IR89-IA01-08B		IR89-SG01-08B		**Subslab**	IR89-IA02-08B		IR89-SG02-08B		**Subslab**
Sample Date	**RL (ppbv)**	Detected Value	06/24/08		06/24/08		**Ratio**	06/24/08		06/24/08		**Ratio**	06/21/08		06/21/08		**Ratio**	06/21/08		06/21/08		**Ratio**
Chemical Name																					
VOA (ppbv)																					
1,1,1-Trichloroethane	2.00	0.112 J	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,1,2,2-Tetrachloroethane	2.00	0.34 J	0.2 U		2 U		NC	0.2 U		2 U		NC	**0.13 J**		**1.6 J**		NC	**0.15 J**		2 U		NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.172 J	**0.11 J**		2 U		NC	**0.11 J**		2 U		NC	**0.074 J**		3.6 U		NC	**0.081 J**		2 U		NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,1-Dichloroethene	2.00	0.22 J	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,2,4-Trichlorobenzene	10.00	1 U	1 U		10 U		NC	1 U		10 U		NC	1 U		18 U		NC	1 U		10 U		NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,2-Dichloroethane	2.00	0.2 U	**0.053 J**		2 U		NC	**0.13 J**		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		NC	**0.2 U**		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
1,4-Dichlorobenzene	2.00	0.24 J	**12**	1	2 U		NC	**11**	1	2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
2-Butanone	10.00	4.8	**2.3**		**5.2 J**		NC	**6.6**	1	**6.9 J**		NC	**0.72 J**		18 U		NC	**0.76 J**		**4.1 J**		NC
2-Hexanone	5.00	0.3 J	**0.12 J**		**0.58 J**		NC	**0.11 J**		5 U		NC	0.5 U		9.1 U		NC	0.5 U		5 U		NC
4-Methyl-2-pentanone	5.00	0.78 J	**0.23 J**		5 U		NC	**0.48 J**		**2.5 J**		NC	0.5 U		9.1 U		NC	**0.054 J**		5 U		NC
Acetone	50.00	44	**39**		**44 J**		NC	**30**		**220**		NC	**9.7**		91 U		NC	**10**		**67**		NC
Benzene	2.00	0.66	**1.8**	1	2 U		NC	**2.7**	1	**0.67 J**		NC	**0.28**		3.6 U		NC	**0.28**		**0.9 J**		NC
Bromodichloromethane	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
Bromoform	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
Bromomethane	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
Carbon disulfide	5.00	2.2	**0.039 J**		**0.44 J**		NC	**0.5**		**0.58 J**		NC	0.5 U		**0.75 J**		NC	**0.038 J**		5 U		NC
Carbon tetrachloride	2.00	0.24 J	**0.12 J**		2 U		NC	**0.13 J**		2 U		NC	**0.067 J**		3.6 U		NC	**0.066 J**		2 U		NC
Chlorobenzene	2.00	0.2 U	0.2 U		2 U		NC	**0.18 J**		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
Chloroethane	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
Chloroform	2.00	0.084 J	**0.1 J**	1	2 U		NC	**0.096 J**	1	2 U		NC	**0.062 J**		3.6 U		NC	**0.066 J**		2 U		NC
Chloromethane	5.00	2.4	**1.3**		5 U		NC	**1.4**		5 U		NC	**0.65**		9.1 U		NC	**0.84**		5 U		NC
Cyclohexane	5.00	0.16 J	**0.72**	1	**0.62 J**		NC	**3.8**	1	**0.86 J**		NC	**0.071 J**		**3.8 J**		NC	**0.088 J**		**2.2 J**		NC
Dibromochloromethane	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
Dichlorodifluoromethane (Freon-12)	2.00	1.36	**0.68**		2 U		NC	**0.7**		**0.75 J**		NC	**0.49**		3.6 U		NC	**0.48**		2 U		NC
Ethylbenzene	2.00	0.54	**0.95**	1	**20**		NC	**2.4**	1	**27**		NC	**0.1 J**		**23**		NC	**0.11 J**		**33**		NC
Isopropylbenzene	4.00	1.9	0.4 U		**1.4 J**		NC	**0.2 J**		**2.2 J**		NC	0.4 U		**1.8 J**		NC	0.4 U		**2.4 J**		NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U		10 U		NC	1 U		10 U		NC	1 U		18 U		NC	1 U		10 U		NC
Methylene chloride	5.00	4.2	**1.1**		5 U		NC	**3.7**		5 U		NC	0.5 U		19 U		NC	**0.86**		**4.8 J**		NC
Styrene	2.00	0.2 U	**0.13 J**		2 U		NC	**0.92**	1	2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
Tetrachloroethene	2.00	0.22 J	0.2 U		2 U		NC	**0.18 J**		2 U		NC	**0.1 J**		**23**		NC	**0.12 J**		**6**		NC
Toluene	2.00	1.86	**5.8**	1	**2.6**		NC	**17**	1	**3.6**		NC	**0.65**		**3 J**		NC	**0.71**		**4.1**		NC
Trichloroethene	2.00	1.06	0.2 U		**1.2 J**		NC	**0.15 J**		**3.8**		NC	**0.51**		**230**	2	2.2E-03	**0.52**		**22**		NC
Trichlorofluoromethane(Freon-11)	2.00	1.2	**0.45**		**0.35 J**		NC	**0.73**		**0.87 J**		NC	**0.25**		3.6 U		NC	**0.37**		**0.59 J**		NC
Vinyl chloride	2.00	1.08	0.2 U		2 U		NC	0.2 U		2 U		NC	**0.41**		3.6 U		NC	**0.44**		2 U		NC
cis-1,2-Dichloroethene	2.00	13.8	**0.13 J**		2 U		NC	**0.066 J**		2 U		NC	**7**		**6.5**		NC	**6.5**		2 U		NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U		2 U		NC	0.2 U		2 U		NC	0.2 U		3.6 U		NC	0.2 U		2 U		NC
m- and p-Xylene	2.00	3	**3.5**	1	**42**		NC	**7.7**	1	**66**		NC	**0.28**		**54**		NC	**0.29**		**71**		NC
o-Xylene	2.00	0.72	**1.1**	1	**15**		NC	**2.2**	1	**24**		NC	**0.11 J**		**21**		NC	**0.1 J**		**25**		NC
trans-1,2-Dichloroethene	2.00	3.8	0.2 U		2 U		NC	0.2 U		2 U		NC	**2**		**7.7**		NC	**1.9**		2 U		NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

CAMP GEIGER PHASE I													
Building			**Building TC864**					**Building TC864**					
Station ID	**Min. Phase I**	**Outdoor**	**Indoor**		**Soil Gas**		**Indoor to**	**Indoor**		**Soil Gas**		**Indoor to**
Sample ID	**Subslab**	2-Times Max	IR89-IA03-08B		IR89-SG03-08B		**Subslab**	IR89-IA04-08B		IR89-SG04-08B		**Subslab**
Sample Date	**RL (ppbv)**	Detected Value	06/24/08		06/23/08		**Ratio**	06/24/08		06/23/08		**Ratio**
Chemical Name												
VOA (ppbv)												
1,1,1-Trichloroethane	2.00	0.112 J	0.2 U		**3.4 J**		NC	0.2 U		13 U		NC
1,1,2,2-Tetrachloroethane	2.00	0.34 J	**0.082 J**		14 U		NC	**0.074 J**		13 U		NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.172 J	**0.074 J**		14 U		NC	**0.073 J**		13 U		NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
1,1-Dichloroethene	2.00	0.22 J	0.2 U		14 U		NC	0.2 U		13 U		NC
1,2,4-Trichlorobenzene	10.00	1 U	1 U		72 U		NC	1 U		65 U		NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
1,4-Dichlorobenzene	2.00	0.24 J	0.2 U		14 U		NC	0.2 U		13 U		NC
2-Butanone	10.00	4.8	**0.65 J**		72 U		NC	**0.73 J**		65 U		NC
2-Hexanone	5.00	0.3 J	0.5 U		36 U		NC	**0.091 J**		32 U		NC
4-Methyl-2-pentanone	5.00	0.78 J	0.5 U		36 U		NC	**0.051 J**		32 U		NC
Acetone	50.00	44	**5.1**		**110 J**		NC	**5.3**		320 U		NC
Benzene	2.00	0.66	**0.11 J**		14 U		NC	**0.11 J**		13 U		NC
Bromodichloromethane	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
Bromoform	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
Bromomethane	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
Carbon disulfide	5.00	2.2	**0.21 J**		36 U		NC	**0.1 J**		32 U		NC
Carbon tetrachloride	2.00	0.24 J	**0.066 J**		14 U		NC	**0.071 J**		13 U		NC
Chlorobenzene	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
Chloroethane	2.00	0.2 U	**0.04 J**		14 U		NC	0.2 U		13 U		NC
Chloroform	2.00	0.084 J	0.2 U		14 U		NC	0.2 U		**3.6 J**		NC
Chloromethane	5.00	2.4	**0.89**		36 U		NC	**0.57**		32 U		NC
Cyclohexane	5.00	0.16 J	0.5 U		36 U		NC	0.5 U		32 U		NC
Dibromochloromethane	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
Dichlorodifluoromethane (Freon-12)	2.00	1.36	**0.41**		14 U		NC	**0.42**		13 U		NC
Ethylbenzene	2.00	0.54	0.2 U		**47**		NC	**0.096 J**		**36**		NC
Isopropylbenzene	4.00	1.9	0.4 U		29 U		NC	0.4 U		**4.1 J**		NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U		72 U		NC	1 U		65 U		NC
Methylene chloride	5.00	4.2	0.5 U		36 U		NC	**0.44 J**		32 U		NC
Styrene	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
Tetrachloroethene	2.00	0.22 J	0.2 U		**79**		NC	0.2 U		**110**		NC
Toluene	2.00	1.86	**0.14 J**		**8.2 J**		NC	**0.17 J**		**6.1 J**		NC
Trichloroethene	2.00	1.06	**0.12 J**		**2,000**	2	6.0E-05	**0.11 J**		**1,900**	2	5.8E-05
Trichlorofluoromethane(Freon-11)	2.00	1.2	**0.23**		14 U		NC	**0.25**		13 U		NC
Vinyl chloride	2.00	1.08	**0.2**		14 U		NC	**0.17 J**		13 U		NC
cis-1,2-Dichloroethene	2.00	13.8	**2.3**		**40**		NC	**2**		**54**		NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U		14 U		NC	0.2 U		13 U		NC
m- and p-Xylene	2.00	3	0.2 U		**110**		NC	**0.26**		**90**		NC
o-Xylene	2.00	0.72	0.2 U		**41**		NC	**0.087 J**		**34**		NC
trans-1,2-Dichloroethene	2.00	3.8	**0.44**		**50**		NC	**0.41**		**48**		NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

MAINSIDE PHASE II													
Building			**Building 3B**										
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**		**Soil Gas**			**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	IR88-IA07-08C	IR88-IA07D-08C	IR88-SG13-08C	IR88-SG05-08C	IR88-SG05D-08C	**Subslab (P13)**	**Subslab (P05)**	**Subslab (P05D)**	**Subslab (D13)**	**Subslab (D05)**	**Subslab (D05D)**
Sample Date	**RL (ppbv)**	Detected Value	10/08/08	10/08/08	10/06/08	10/06/08	10/06/08	**Ratio**	**Ratio**	**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name													
VOA (ppbv)													
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.1 J**	**0.1 J**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 U	1 U	53,000 U	660 U	1,000 U	NC	NC	NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	**0.053 J**	**0.061 J**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	0.094 J	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
2-Butanone	10.00	4	**1.4**	**1.3**	53,000 U	660 U	1,000 U	NC	NC	NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	0.5 U	0.5 U	27,000 U	330 U	510 U	NC	NC	NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	**0.056 J**	0.5 U	27,000 U	330 U	510 U	NC	NC	NC	NC	NC	NC
Acetone	50.00	32	**20 J**	**20**	270,000 UJ	3,300 UJ	5,100 UJ	NC	NC	NC	NC	NC	NC
Benzene	2.00	0.92	**0.12 J**	**0.15 J**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	0.5 U	0.5 U	27,000 U	330 U	510 U	NC	NC	NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.061 J**	**0.078 J**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Chloroform	2.00	0.102 J	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Chloromethane	5.00	1.88	**0.5**	**0.64**	27,000 U	330 U	510 U	NC	NC	NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.14 J**	**0.14 J**	27,000 U	330 U	510 U	NC	NC	NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**	**0.2 U**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.44**	**0.46**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	0.2 U	**0.13 J**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U	0.4 U	21,000 U	260 U	410 U	NC	NC	NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	1 U	53,000 U	660 U	1,000 U	NC	NC	NC	NC	NC	NC
Methylene chloride	5.00	2.6	0.99 U	0.57 U	27,000 U	330 U	510 U	NC	NC	NC	NC	NC	NC
Styrene	2.00	0.2 U	0.2 U	**0.15 J**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	**1.3** 1	**2.4** 1	**2,500,000** 2	**24,000** 2	**16,000** 2	5.2E-07	5.4E-05	8.1E-05	9.6E-07	1.0E-04	1.5E-04
Toluene	2.00	1.58	**0.45**	**0.8**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	**0.6** 1	**0.64** 1	**6,700 J** 2	130 U	200 U	9.0E-05	NC	NC	9.6E-05	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.22**	**0.23**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	0.2 U	**0.21 J**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
o-Xylene	2.00	0.4	0.2 U	**0.096 J**	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U	0.2 U	11,000 U	130 U	200 U	NC	NC	NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

MAINSIDE PHASE II																
Building			**Building 3B**										**Building 43**			
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**		**Soil Gas**				**Indoor to**	**Indoor to**	**Indoor to**	**Indoor**		**Soil Gas**		**Indoor to**
Sample ID	**Subslab**	2-Times Max	IR88-IA04-08C	IR88-SG05-08C	IR88-SG05D-08C		IR88-SG13-08C		**Subslab (05)**	**Subslab (05D)**	**Subslab (13)**	IR88-IA03-08C		IR88-SG06-08C		**Subslab (P37)**
Sample Date	**RL (ppbv)**	Detected Value	09/12/08	10/06/08	10/06/08		10/06/08		**Ratio**	**Ratio**	**Ratio**	09/12/08		09/28/08		**Ratio**
Chemical Name																
VOA (ppbv)																
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.1 J**	130 U	200 U		11,000 U		NC	NC	NC	**0.09 J**		310 U		NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 U	660 U	1,000 U		53,000 U		NC	NC	NC	1 U		1,600 U		NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,2-Dichloroethane	2.00	0.2 U	**0.08 J**	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		**100 J**		NC
2-Butanone	10.00	4	**0.8 J**	660 U	1,000 U		53,000 U		NC	NC	NC	0.49 J		1,600 U		NC
2-Hexanone	5.00	0.34 J	0.5 UJ	330 U	510 U		27,000 U		NC	NC	NC	0.5 UJ		780 U		NC
4-Methyl-2-pentanone	5.00	0.38 J	**0.22 J**	330 U	510 U		27,000 U		NC	NC	NC	**0.051 J**		780 U		NC
Acetone	50.00	32	**21**	3,300 UJ	5,100 UJ		270,000 UJ		NC	NC	NC	**16**		**4,600 J**		NC
Benzene	2.00	0.92	**0.12 J**	130 U	200 U		11,000 U		NC	NC	NC	**0.19 J**		**150 J**		NC
Bromodichloromethane	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
Bromoform	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
Bromomethane	2.00	0.09 J	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
Carbon disulfide	5.00	0.098 J	**0.06 J**	330 U	510 U		27,000 U		NC	NC	NC	**0.045 J**		780 U		NC
Carbon tetrachloride	2.00	0.22 J	**0.091 J**	130 U	200 U		11,000 U		NC	NC	NC	**0.11 J**		310 U		NC
Chlorobenzene	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
Chloroethane	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
Chloroform	2.00	0.102 J	**0.041 J**	130 U	200 U		11,000 U		NC	NC	NC	**0.11 J**	1	310 U		NC
Chloromethane	5.00	1.88	**1.2**	330 U	510 U		27,000 U		NC	NC	NC	**0.99**		780 U		NC
Cyclohexane	5.00	0.84 J	**0.14 J**	330 U	510 U		27,000 U		NC	NC	NC	**0.075 J**		780 U		NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**	130 U	200 U		11,000 U		NC	NC	NC	**0.2 U**		310 U		NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**5.2**	1	130 U		200 U		11,000 U		NC	NC	**3.2**	1	310 U		NC
Ethylbenzene	2.00	0.38 J	**0.072 J**	130 U	200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
Isopropylbenzene	4.00	0.4 U	0.4 U	260 U	410 U		21,000 U		NC	NC	NC	0.4 U		620 U		NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	660 U	1,000 U		53,000 U		NC	NC	NC	1 U		1,600 U		NC
Methylene chloride	5.00	2.6	0.5 U	330 U	510 U		27,000 U		NC	NC	NC	0.5 U		**9,000**	2	5.6E-05
Styrene	2.00	0.2 U	0.2 U	130 U	200 U		11,000 U		NC	NC	NC	**0.06 J**		310 U		NC
Tetrachloroethene	2.00	0.2 U	**12**	1	**24,000**	2	**16,000**	2	**2,500,000**	2	5.0E-04	7.5E-04	4.8E-06	**1.6**	1	**36,000**	2	4.4E-05
Toluene	2.00	1.58	**1.4**		130 U		200 U		11,000 U		NC	NC	NC	**0.69**		430	2	1.6E-03
Trichloroethene	2.00	0.2 U	**1.2**	1	130 U		200 U		**6,700 J**	2	NC	NC	1.8E-04	**0.055 J**		310 U		NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.25**		130 U		200 U		11,000 U		NC	NC	NC	**0.27**		**180 J**		NC
Vinyl chloride	2.00	0.2 U	0.2 U		130 U		200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U		130 U		200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U		130 U		200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC
m- and p-Xylene	2.00	1.12	**0.16 J**		130 U		200 U		11,000 U		NC	NC	NC	**0.17 J**		310 U		NC
o-Xylene	2.00	0.4	0.2 U		130 U		200 U		11,000 U		NC	NC	NC	**0.065 J**		310 U		NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U		130 U		200 U		11,000 U		NC	NC	NC	0.2 U		310 U		NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

MAINSIDE PHASE II																				
Building			**Building 43**						**Building 37**											
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**		**Soil Gas**		**Indoor to**		**Indoor**		**Soil Gas**				**Indoor to**		**Indoor to**		**Indoor to**	
Sample ID	**Subslab**	2-Times Max	IR88-IA08-08C		IR88-SG06-08C		**Subslab (P38)**		IR88-IA01-08C		IR88-IA01D-08C		IR88-SG07-08C		IR88-SG08-08C		**Subslab (P07)**	**Subslab (P08)**	**Subslab (D07)**	**Subslab (D08)**
Sample Date	**RL (ppbv)**	Detected Value	09/28/08		09/28/08		**Ratio**		09/12/08		09/12/08		10/06/08		10/06/08		**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name																				
VOA (ppbv)																				
1,1,1-Trichloroethane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.084 J**		310 U		NC		**0.084 J**		**0.082 J**		9.1 U		62 U		NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	2 U		1,600 U		NC		1 U		1 U		46 U		310 U		NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.4 U		**100 J**		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
2-Butanone	10.00	4	**6.8**	1	1,600 U		NC		**0.55 J**		**0.38 J**		46 U		310 U		NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	1 U		780 U		NC		0.5 UJ		0.5 UJ		23 U		150 U		NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	**0.38 J**		780 U		NC		**0.15 J**		0.5 U		23 U		150 U		NC	NC	NC	NC
Acetone	50.00	32	**40**	1	**4,600 J**		NC		**12**		**13**		230 U		1,500 UJ		NC	NC	NC	NC
Benzene	2.00	0.92	**0.26 J**		**150 J**		NC		**0.16 J**		**0.073 J**		9.1 U		62 U		NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	**2.4**	1	780 U		NC		**0.075 J**		0.5 U		23 U		150 U		NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.09 J**		310 U		NC		**0.098 J**		**0.082 J**		9.1 U		62 U		NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
Chloroform	2.00	0.102 J	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
Chloromethane	5.00	1.88	**2**	1	780 U		NC		**0.83**		**0.94**		23 U		150 U		NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.14 J**		780 U		NC		**0.081 J**		**0.058 J**		23 U		150 U		NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.4 U**		310 U		NC		**0.2 U**		**0.2 U**		9.1 U		62 U		NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**3.4**	1	310 U		NC		**0.52**		**0.5**		9.1 U		62 U		NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	0.4 U		310 U		NC		**0.069 J**		0.2 U		9.1 U		62 U		NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.8 U		620 U		NC		0.4 U		0.4 U		18 U		120 U		NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	2 U		1,600 U		NC		1 U		1 U		46 U		310 U		NC	NC	NC	NC
Methylene chloride	5.00	2.6	**4.8**	1	**9,000**	2	5.3E-04		0.5 U		0.56 U		23 U		150 U		NC	NC	NC	NC
Styrene	2.00	0.2 U	0.4 U		310 U		NC		**0.064 J**		0.2 U		9.1 UJ		62 U		NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	**2**	1	**36,000**	2	5.6E-05		**0.11 J**		0.2 U		**1,700**	2	**11,000**	2	6.5E-05	1.0E-05	1.2E-04	1.8E-05
Toluene	2.00	1.58	**1.2**		430	2	2.8E-03		**1.7**	1	**0.14 J**		9.1 U		62 U		NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		**2.1 J**		**12 J**		NC	NC	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.58**		**180 J**		NC		**0.24**		**0.24**		9.1 U		62 U		NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.25 J**		310 U		NC		**0.19 J**		0.2 U		9.1 UJ		62 U		NC	NC	NC	NC
o-Xylene	2.00	0.4	0.4 U		310 U		NC		**0.071 J**		0.2 U		9.1 U		62 U		NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.4 U		310 U		NC		0.2 U		0.2 U		9.1 U		62 U		NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

MAINSIDE PHASE II																											
Building													**Building 37**														
Station ID	**Min. Phase II**	**Outdoor**		**Indoor**		**Soil Gas**			**Indoor to**	**Indoor to**	**Indoor**		**Soil Gas**			**Indoor to**	**Indoor to**	**Indoor**		**Soil Gas**			**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max		IR88-IA09-08C		IR88-SG07-08C		IR88-SG08-08C	**Subslab (07)**	**Subslab (08)**	IR88-IA02-08C		IR88-SG08-08C	IR88-SG07-08C		**Subslab (05)**	**Subslab (05D)**	IR88-IA10-08C		IR88-SG08-08C	IR88-SG07-08C		**Subslab (05)**	**Subslab (05D)**
Sample Date	**RL (ppbv)**	Detected Value		10/07/08		10/06/08		10/06/08	**Ratio**	**Ratio**	09/12/08		10/06/08	10/06/08		**Ratio**	**Ratio**	10/07/08		10/06/08	10/06/08		**Ratio**	**Ratio**
Chemical Name																								
VOA (ppbv)																								
1,1,1-Trichloroethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168	J	0.081 J		9.1 U		62 U	NC	NC	**0.08 J**		62 U	9.1 U		NC	NC	**0.043 J**		62 U	9.1 U		NC	NC
1,1,2-Trichloroethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,1-Dichloroethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,1-Dichloroethene	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,2,4-Trichlorobenzene	10.00	0.2	J	1 UJ		46 U		310 U	NC	NC	1 U		310 U	46 U		NC	NC	1 UJ		310 U	46 U		NC	NC
1,2-Dibromoethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,2-Dichlorobenzene	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,2-Dichloroethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,2-Dichloropropane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,3-Dichlorobenzene	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
1,4-Dichlorobenzene	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
2-Butanone	10.00	4		1.1		46 U		310 U	NC	NC	**0.73 J**		310 U	46 U		NC	NC	1 U		310 U	46 U		NC	NC
2-Hexanone	5.00	0.34	J	0.12 J		23 U		150 U	NC	NC	**0.061 J**		150 U	23 U		NC	NC	0.5 U		150 U	23 U		NC	NC
4-Methyl-2-pentanone	5.00	0.38	J	1.1	1	23 U		150 U	NC	NC	**0.13 J**		150 U	23 U		NC	NC	0.5 U		150 U	23 U		NC	NC
Acetone	50.00	32		17 J		230 U		1,500 UJ	NC	NC	**19**		1,500 UJ	230 U		NC	NC	**16 J**		1,500 UJ	230 U		NC	NC
Benzene	2.00	0.92		0.21		9.1 U		62 U	NC	NC	**0.17 J**		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Bromodichloromethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Bromoform	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Bromomethane	2.00	0.09	J	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	**0.15 J**	1	62 U	9.1 U		NC	NC
Carbon disulfide	5.00	0.098	J	0.047 J		23 U		150 U	NC	NC	**0.051 J**		150 U	23 U		NC	NC	0.5 U		150 U	23 U		NC	NC
Carbon tetrachloride	2.00	0.22	J	0.098 J		9.1 U		62 U	NC	NC	**0.097 J**		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Chlorobenzene	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Chloroethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Chloroform	2.00	0.102	J	0.1 J		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Chloromethane	5.00	1.88		0.71		23 U		150 U	NC	NC	**1.2**		150 U	23 U		NC	NC	**0.96**		150 U	23 U		NC	NC
Cyclohexane	5.00	0.84	J	0.13 J		23 U		150 U	NC	NC	**0.09 J**		150 U	23 U		NC	NC	0.5 U		150 U	23 U		NC	NC
Dibromochloromethane	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	**0.2 U**		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18		0.56		9.1 U		62 U	NC	NC	**0.52**		62 U	9.1 U		NC	NC	**0.58**		62 U	9.1 U		NC	NC
Ethylbenzene	2.00	0.38	J	0.075 J		9.1 U		62 U	NC	NC	**0.069 J**		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Isopropylbenzene	4.00	0.4	U	0.4 U		18 U		120 U	NC	NC	0.4 U		120 U	18 U		NC	NC	0.4 U		120 U	18 U		NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1	U	1 U		46 U		310 U	NC	NC	1 U		310 U	46 U		NC	NC	1 U		310 U	46 U		NC	NC
Methylene chloride	5.00	2.6		1.7		23 U		150 U	NC	NC	0.5 U		150 U	23 U		NC	NC	0.5 U		150 U	23 U		NC	NC
Styrene	2.00	0.2	U	0.078 J		9.1 UJ		62 U	NC	NC	**0.065 J**		62 U	9.1 UJ		NC	NC	0.2 U		62 U	9.1 UJ		NC	NC
Tetrachloroethene	2.00	0.2	U	0.26	1	**1,700**	2	**11,000**	2 1.5E-04	2.4E-05	**0.099 J**		**11,000**	2 **1,700**	2	9.0E-06	5.8E-05	0.2 U		**11,000**	2 **1,700**	2	1.8E-05	1.2E-04
Toluene	2.00	1.58		2.7	1	9.1 U		62 U	NC	NC	**2.1**	1	62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
Trichloroethene	2.00	0.2	U	0.2 U		**2.1 J**		**12 J**	NC	NC	0.2 U		**12 J**	**2.1 J**		NC	NC	0.2 U		**12 J**	**2.1 J**		NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82		0.25		9.1 U		62 U	NC	NC	**0.23**		62 U	9.1 U		NC	NC	**0.23**		62 U	9.1 U		NC	NC
Vinyl chloride	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
cis-1,2-Dichloroethene	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
cis-1,3-Dichloropropene	2.00	0.2	U	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
m- and p-Xylene	2.00	1.12		0.22		9.1 UJ		62 U	NC	NC	**0.21**		62 U	9.1 UJ		NC	NC	0.2 U		62 U	9.1 UJ		NC	NC
o-Xylene	2.00	0.4		0.08 J		9.1 U		62 U	NC	NC	**0.075 J**		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC
trans-1,2-Dichloroethene	2.00	0.112	J	0.2 U		9.1 U		62 U	NC	NC	0.2 U		62 U	9.1 U		NC	NC	0.2 U		62 U	9.1 U		NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II															
Building			**Building 1200**												
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**		**Soil Gas**						**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	HPFF-IA11-08C		HPFF-SG40-08C		HPFF-SG41-08C		HPFF-SG42-08C		**Subslab (40)**	**Subslab (41)**	**Subslab (42)**
Sample Date	**RL (ppbv)**	Detected Valu	09/28/08		09/28/08		09/30/08		09/30/08		**Ratio**	**Ratio**	**Ratio**
Chemical Name													
VOA (ppbv)													
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U		2 U		**0.9 J**		2 U		NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**4.6**	1	**2.8**		**4.2**		**2.3**		NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 U		10 U		10 UJ		10 U		NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	**0.15 J**		2 U		2 U		2 U		NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	**0.11 J**		2 U		2 U		2 U		NC	NC	NC
2-Butanone	10.00	4	**1.6**		**2.2 J**		**2.4 J**		10 U		NC	NC	NC
2-Hexanone	5.00	0.34 J	0.5 U		5 U		5 U		5 U		NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	**0.06 J**		5 U		5 U		5 U		NC	NC	NC
Acetone	50.00	32	**25**		**40 J**		**25 J**		50 U		NC	NC	NC
Benzene	2.00	0.92	**0.21**		2 U		2 U		2 U		NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 UJ		2 UJ		2 U		2 UJ		NC	NC	NC
Carbon disulfide	5.00	0.098 J	**0.15 J**	1	**0.39 J**		**0.48 J**		5 U		NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.11 J**		2 U		2 U		2 U		NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
Chloroethane	2.00	0.2 U	**0.051 J**		2 U		2 U		2 U		NC	NC	NC
Chloroform	2.00	0.102 J	**0.08 J**		2 U		2 U		**0.98 J**		NC	NC	NC
Chloromethane	5.00	1.88	**0.96**		5 U		5 U		5 U		NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.16 J**		5 U		5 U		5 U		NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**		2 U		2 U		2 U		NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.71**		**0.73 J**		2 U		**0.76 J**		NC	NC	NC
Ethylbenzene	2.00	0.38 J	**0.11 J**		2 U		2 U		2 U		NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U		4 U		4 U		4 U		NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U		10 U		10 U		10 U		NC	NC	NC
Methylene chloride	5.00	2.6	0.98 U		**14**		5 U		5 U		NC	NC	NC
Styrene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
Tetrachloroethene	2.00	0.2 U	**0.044 J**		**8.4**		**4.5**		**6.2**		NC	NC	NC
Toluene	2.00	1.58	**0.37**		**1.6 J**		**0.66 J**		**0.86 J**		NC	NC	NC
Trichloroethene	2.00	0.2 U	**0.12 J**		2 U		2 U		2 U		NC	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**5.6**	1	**50**		**11**		**6.5**		NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.23**		2 U		2 U		2 U		NC	NC	NC
o-Xylene	2.00	0.4	0.2 U		2 U		2 U		2 U		NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U		2 U		2 U		2 U		NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II													
Building						**Building 1201**							
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**			**Soil Gas**			**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	HPFF-IA13-08C	HPFF-SG44-08C	HPFF-SG43-08C	HPFF-SG43D-08C	HPFF-SG45-08C	HPFF-SG46-08C	**Subslab (44)**	**Subslab (43)**	**Subslab (43D)**	**Subslab (45)**	**Subslab (46)**
Sample Date	**RL (ppbv)**	Detected Valu	10/01/08	10/01/08	09/30/08	09/30/08	10/01/08	10/01/08	**Ratio**	**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name													
VOA (ppbv)													
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.075 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 UJ	10 UJ	10 U	10 U	10 UJ	10 UJ	NC	NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
2-Butanone	10.00	4	**0.52 J**	10 U	10 U	10 U	10 U	10 U	NC	NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	0.5 U	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	0.5 U	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
Acetone	50.00	32	**6**	50 U	50 U	50 U	50 U	50 U	NC	NC	NC	NC	NC
Benzene	2.00	0.92	**0.27**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U	2 U	2 UJ	2 U	2 U	2 U	NC	NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	0.5 U	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.083 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Chloroform	2.00	0.102 J	0.2 U	2 U	**4.3**	**3.7**	2 U	2 U	NC	NC	NC	NC	NC
Chloromethane	5.00	1.88	**0.64**	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.15 J**	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.43**	2 U	**0.72 J**	2 U	**0.72 J**	**1.1 J**	NC	NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	**0.1 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U	4 U	4 U	4 U	4 U	4 U	NC	NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	10 U	10 U	10 U	10 U	10 U	NC	NC	NC	NC	NC
Methylene chloride	5.00	2.6	0.72 U	5 U	**13**	**29**	5 U	5 U	NC	NC	NC	NC	NC
Styrene	2.00	0.2 U	**0.059 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	0.2 U	**0.81 J**	**1.8 J**	**1.5 J**	**3.8**	**1.2 J**	NC	NC	NC	NC	NC
Toluene	2.00	1.58	**0.86**	**0.66 J**	**1.3 J**	**1.2 J**	2 U	2 U	NC	NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	**0.091 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.22**	**0.41 J**	**0.69 J**	**1.1 J**	**0.39 J**	**0.75 J**	NC	NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.34**	2 U	2 U	**2.5**	2 U	2 U	NC	NC	NC	NC	NC
o-Xylene	2.00	0.4	**0.13 J**	2 U	2 U	**0.73 J**	2 U	2 U	NC	NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II														
Building							**Building 1201**							
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**			**Soil Gas**			**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	HPFF-IA14-08C	HPFF-SG46-08C	HPFF-SG45-08C	HPFF-SG44-08C	HPFF-SG43-08C	HPFF-SG43D-08C	**Subslab (46)**	**Subslab (45)**	**Subslab (44)**	**Subslab (43)**	**Subslab (43D)**
Sample Date	**RL (ppbv)**	Detected Valu	10/01/08	10/01/08	10/01/08	10/01/08	09/30/08	09/30/08	**Ratio**	**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name													
VOA (ppbv)													
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.076 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 UJ	10 UJ	10 UJ	10 UJ	10 U	10 U	NC	NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.074 J	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
2-Butanone	10.00	4	**1.9**	10 U	10 U	10 U	10 U	10 U	NC	NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	**0.12 J**	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	0.5 U	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
Acetone	50.00	32	**19**	50 U	50 U	50 U	50 U	50 U	NC	NC	NC	NC	NC
Benzene	2.00	0.92	**0.94**	1 2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U	2 U	2 U	2 U	2 UJ	2 U	NC	NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	**0.14 J**	1 5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.082 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Chloroethane	2.00	0.2 U	**0.17 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Chloroform	2.00	0.102 J	0.2 U	2 U	2 U	2 U	**4.3**	**3.7**	NC	NC	NC	NC	NC
Chloromethane	5.00	1.88	**0.86**	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.082 J**	5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.47**	**1.1 J**	**0.72 J**	2 U	**0.72 J**	2 U	NC	NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	**0.11 J**	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U	4 U	4 U	4 U	4 U	4 U	NC	NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	10 U	10 U	10 U	10 U	10 U	NC	NC	NC	NC	NC
Methylene chloride	5.00	2.6	0.58 U	5 U	5 U	5 U	**13**	**29**	NC	NC	NC	NC	NC
Styrene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	0.2 U	**1.2 J**	**3.8**	**0.81 J**	**1.8 J**	**1.5 J**	NC	NC	NC	NC	NC
Toluene	2.00	1.58	**0.79**	2 U	2 U	**0.66 J**	**1.3 J**	**1.2 J**	NC	NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.22**	**0.75 J**	**0.39 J**	**0.41 J**	**0.69 J**	**1.1 J**	NC	NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.4**	2 U	2 U	2 U	2 U	**2.5**	NC	NC	NC	NC	NC
o-Xylene	2.00	0.4	**0.14 J**	2 U	2 U	2 U	2 U	**0.73 J**	NC	NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U	2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II												
Building			**Building 1202**									
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**	**Soil Gas**				**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	HPFF-IA15-08C	HPFF-SG47-08C	HPFF-SG48-08C	HPFF-SG49-08C	HPFF-SG50-08C	**Subslab (47)**	**Subslab (48)**	**Subslab (49)**	**Subslab (50)**
Sample Date	**RL (ppbv)**	Detected Valu	10/02/08	10/01/08	10/02/08	10/01/08	10/02/08	**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name											
VOA (ppbv)											
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	0.45 J	2 U	NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	0.089 J	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 UJ	10 UJ	10 UJ	10 UJ	10 UJ	NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
2-Butanone	10.00	4	1.6	10 U	5.6 J	10 U	10 U	NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	0.16 J	5 U	5 U	5 U	5 U	NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	0.21 J	5 U	5 U	5 U	5 U	NC	NC	NC	NC
Acetone	50.00	32	15	18 J	75	24 J	21 J	NC	NC	NC	NC
Benzene	2.00	0.92	0.22	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	0.5 U	5 U	0.44 J	5 U	5 U	NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	0.077 J	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Chloroform	2.00	0.102 J	0.2 U	0.89 J	6	9.4	2 U	NC	NC	NC	NC
Chloromethane	5.00	1.88	0.56	5 U	5 U	5 U	5 U	NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	0.5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	0.39	9.3	3.2	1.4 J	2 U	NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	0.13 J	2	2 U	2 U	2 U	NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U	4 U	4 U	4 U	4 U	NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	10 U	10 U	10 U	10 U	NC	NC	NC	NC
Methylene chloride	5.00	2.6	1.6	5 U	5 U	5 U	5 U	NC	NC	NC	NC
Styrene	2.00	0.2 U	0.087 J	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	22 1	5.8	6.6	6.5	1.3 J	NC	NC	NC	NC
Toluene	2.00	1.58	1.1	0.61 J	2	0.64 J	0.66 J	NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	0.2 U	5.4	210 2	150	2.9	NC	9.5E-04	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	0.54	1.6 J	1.7 J	3.1	0.81 J	NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	0.39	5.7	1.2 J	2 U	2 U	NC	NC	NC	NC
o-Xylene	2.00	0.4	0.14 J	1.2 J	2 U	2 U	2 U	NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.39 1	7.4	2 U	2 U	2 U	NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II																
Building					**Building 1202**											
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**		**Soil Gas**								**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	HPFF-IA16-08C		HPFF-SG49-08C		HPFF-SG48-08C		HPFF-SG50-08C		HPFF-SG47-08C		**Subslab (49)**	**Subslab (48)**	**Subslab (50)**	**Subslab (47)**
Sample Date	**RL (ppbv)**	Detected Valu	10/02/08		10/01/08		10/02/08		10/02/08		10/01/08		**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name																
VOA (ppbv)																
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U		**0.45 J**		2 U		2 U		2 U		NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.07 J**		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 UJ		10 UJ		10 UJ		10 UJ		10 UJ		NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
2-Butanone	10.00	4	**1.2**		10 U		**5.6 J**		10 U		10 U		NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	0.5 U		5 U		5 U		5 U		5 U		NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	**0.17 J**		5 U		5 U		5 U		5 U		NC	NC	NC	NC
Acetone	50.00	32	**12**		**24 J**		**75**		**21 J**		**18 J**		NC	NC	NC	NC
Benzene	2.00	0.92	**0.92**		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	**0.063 J**		5 U		**0.44 J**		5 U		5 U		NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.054 J**		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Chloroform	2.00	0.102 J	**0.045 J**		**9.4**		**6**		2 U		**0.89 J**		NC	NC	NC	NC
Chloromethane	5.00	1.88	**0.75**		5 U		5 U		5 U		5 U		NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.48 J**		5 U		5 U		5 U		5 U		NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.64**		**1.4 J**		**3.2**		2 U		**9.3**		NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	**0.3**		2 U		2 U		2 U		**2**		NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U		4 U		4 U		4 U		4 U		NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U		10 U		10 U		10 U		10 U		NC	NC	NC	NC
Methylene chloride	5.00	2.6	0.6 U		5 U		5 U		5 U		5 U		NC	NC	NC	NC
Styrene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	**0.28**	1	**6.5**		**6.6**		**1.3 J**		**5.8**		NC	NC	NC	NC
Toluene	2.00	1.58	**2.3**	1	**0.64 J**		**2**		**0.66 J**		**0.61 J**		NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	0.2 U		**150**		**210**	2	**2.9**		**5.4**		NC	9.5E-04	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.49**		**3.1**		**1.7 J**		**0.81 J**		**1.6 J**		NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.74**		2 U		**1.2 J**		2 U		**5.7**		NC	NC	NC	NC
o-Xylene	2.00	0.4	**0.22**		2 U		2 U		2 U		**1.2 J**		NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	**0.41**	1	2 U		2 U		2 U		**7.4**		NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II																								
Building																								
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**																					
Sample ID	**Subslab**	2-Times Max	HPFF-IA17-08C		HPFF-SG51-08C		HPFF-SG52-08C		HPFF-SG54-08C		HPFF-SG53-08C		**Indoor to Subslab (51) Ratio**		**Indoor to Subslab (52) Ratio**		**Indoor to Subslab (54) Ratio**		**Indoor to Subslab (53) Ratio**					
Sample Date	**RL (ppbv)**	Detected Valu	10/03/08		10/02/08		10/02/08		10/02/08		10/03/08													
Chemical Name																								
VOA (ppbv)																								
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		**0.45 J**		2 U		NC		NC		NC		NC					
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.089 J**		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,1-Dichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,1-Dichloroethene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,2,4-Trichlorobenzene	10.00	0.2 J	1 UJ		10 UJ		10 UJ		10 UJ		10 UJ		NC		NC		NC		NC					
1,2-Dibromoethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,2-Dichloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,2-Dichloropropane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
2-Butanone	10.00	4	**1.5**		10 U		**5.6 J**		10 U		10 U		NC		NC		NC		NC					
2-Hexanone	5.00	0.34 J	0.5 U		5 U		5 U		5 U		5 U		NC		NC		NC		NC					
4-Methyl-2-pentanone	5.00	0.38 J	**0.16 J**		5 U		5 U		5 U		5 U		NC		NC		NC		NC					
Acetone	50.00	32	**12**		**18 J**		**75**		**24 J**		**21 J**		NC		NC		NC		NC					
Benzene	2.00	0.92	**0.44**		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Bromodichloromethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Bromoform	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Bromomethane	2.00	0.09 J	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Carbon disulfide	5.00	0.098 J	**0.044 J**		5 U		**0.44 J**		5 U		5 U		NC		NC		NC		NC					
Carbon tetrachloride	2.00	0.22 J	**0.087 J**		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Chlorobenzene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Chloroethane	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Chloroform	2.00	0.102 J	**0.059 J**		**0.89 J**		**6**		**9.4**		2 U		NC		NC		NC		NC					
Chloromethane	5.00	1.88	**1**		5 U		5 U		5 U		5 U		NC		NC		NC		NC					
Cyclohexane	5.00	0.84 J	**0.32 J**		5 U		5 U		5 U		5 U		NC		NC		NC		NC					
Dibromochloromethane	2.00	0.2 U	**0.2 U**		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.56**		**9.3**		**3.2**		**1.4 J**		2 U		NC		NC		NC		NC					
Ethylbenzene	2.00	0.38 J	**0.19 J**		**2**		2 U		2 U		2 U		NC		NC		NC		NC					
Isopropylbenzene	4.00	0.4 U	0.4 U		4 U		4 U		4 U		4 U		NC		NC		NC		NC					
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U		10 U		10 U		10 U		10 U		NC		NC		NC		NC					
Methylene chloride	5.00	2.6	0.5 U		5 U		5 U		5 U		5 U		NC		NC		NC		NC					
Styrene	2.00	0.2 U	**0.19 J**		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
Tetrachloroethene	2.00	0.2 U	0.2 U		**5.8**		**6.6**		**6.5**		**1.3 J**		NC		NC		NC		NC					
Toluene	2.00	1.58	**1.3**		**0.61 J**		**2**		**0.64 J**		**0.66 J**		NC		NC		NC		NC					
Trichloroethene	2.00	0.2 U	**0.098 J**		**5.4**		**210**	2	**150**		**2.9**		NC		4.7E-04		NC		NC					
Trichlorofluoromethane(Freon-11)	2.00	0.82	**2.8**	1	**1.6 J**		**1.7 J**		**3.1**		**0.81 J**		NC		NC		NC		NC					
Vinyl chloride	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U		2 U		2 U		2 U		2 U		NC		NC		NC		NC					
m- and p-Xylene	2.00	1.12	**0.47**		**5.7**		**1.2 J**		2 U		2 U		NC		NC		NC		NC					
o-Xylene	2.00	0.4	**0.21**		**1.2 J**		2 U		2 U		2 U		NC		NC		NC		NC					
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U		7.4		2 U		2 U		2 U		NC		NC		NC		NC					

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II												
Building			**Building 1301**									
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**	**Soil Gas**					**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	HPFF-IA18-08C	HPFF-SG54-08C	HPFF-SG53-08C	HPFF-SG52-08C	HPFF-SG51-08C		**Subslab (54)**	**Subslab (53)**	**Subslab (52)**	**Subslab (51)**
Sample Date	**RL (ppbv)**	Detected Valu	10/03/08	10/02/08	10/03/08	10/02/08	10/02/08		**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name												
VOA (ppbv)												
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	**0.45 J**	2 U	2 U	2 U		NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.084 J**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 UJ	10 UJ	10 UJ	10 UJ	10 UJ		NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
2-Butanone	10.00	4	**1.2**	10 U	10 U	**5.6 J**	10 U		NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	0.5 U	5 U	5 U	5 U	5 U		NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	**0.25 J**	5 U	5 U	5 U	5 U		NC	NC	NC	NC
Acetone	50.00	32	**7.1**	**24 J**	**21 J**	**75**	**18 J**		NC	NC	NC	NC
Benzene	2.00	0.92	**0.56**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	**0.063 J**	5 U	5 U	**0.44 J**	5 U		NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.086 J**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Chloroform	2.00	0.102 J	**0.06 J**	**9.4**	2 U	**6**	**0.89 J**		NC	NC	NC	NC
Chloromethane	5.00	1.88	**0.95**	5 U	5 U	5 U	5 U		NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.44 J**	5 U	5 U	5 U	5 U		NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.49**	**1.4 J**	2 U	**3.2**	**9.3**		NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	**0.32**	2 U	2 U	2 U	**2**		NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U	4 U	4 U	4 U	4 U		NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	10 U	10 U	10 U	10 U		NC	NC	NC	NC
Methylene chloride	5.00	2.6	**5.5**	1	5 U	5 U	5 U	5 U		NC	NC	NC	NC
Styrene	2.00	0.2 U	**0.33**	1	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	**0.041 J**	**6.5**	**1.3 J**	**6.6**	**5.8**		NC	NC	NC	NC
Toluene	2.00	1.58	**1.7**	1	**0.64 J**	**0.66 J**	**2**	**0.61 J**		NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	**0.15 J**	**150**	**2.9**	**210**	2	**5.4**		NC	NC	7.1E-04	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**2.5**	1	**3.1**	**0.81 J**	**1.7 J**	**1.6 J**		NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	**0.074 J**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	**0.2 U**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.83**	2 U	2 U	**1.2 J**	**5.7**		NC	NC	NC	NC
o-Xylene	2.00	0.4	**0.36**	2 U	2 U	2 U	**1.2 J**		NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U	2 U	2 U	2 U	7.4		NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II											
Building			**Building 1817**								
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**	**Soil Gas**				**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	SWMU360-IA19-08C	SWMU360-SG58-08C	SWMU360-SG59-08C	SWMU360-SG59D-08C	SWMU360-SG57-08C	**Subslab (58)**	**Subslab (59)**	**Subslab (59D)**	**Subslab (57)**
Sample Date	**RL (ppbv)**	Detected Valu	10/05/08	10/04/08	10/04/08	10/04/08	10/04/08	**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name											
VOA (ppbv)											
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.075 J**	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 UJ	10 U	10 U	10 U	10 U	NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
2-Butanone	10.00	4	**0.59 J**	10 U	**2.2 J**	**3.4 J**	**2.2 J**	NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	0.5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	0.5 U	**0.54 J**	5 U	5 U	5 U	NC	NC	NC	NC
Acetone	50.00	32	**8.6**	50 U	**30 J**	**43 J**	**33 J**	NC	NC	NC	NC
Benzene	2.00	0.92	**0.2**	2 U	**1.8 J**	**2.2**	2 U	NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	**0.037 J**	**0.31 J**	**8.9**	**9.2**	5 U	NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.078 J**	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Chloroform	2.00	0.102 J	**0.067 J**	**200** 2	2 U	2 U	**2.2**	3.4E-04	NC	NC	NC
Chloromethane	5.00	1.88	**0.86**	5 U	**2.2 J**	**2 J**	5 U	NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.045 J**	5 U	5 U	5 U	5 U	NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.46**	**0.71 J**	**0.7 J**	**0.72 J**	**0.77 J**	NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	**0.088 J**	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U	4 U	4 U	4 U	4 U	NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	10 U	10 U	10 U	10 U	NC	NC	NC	NC
Methylene chloride	5.00	2.6	0.5 U	5 U	5 U	5 U	5 U	NC	NC	NC	NC
Styrene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	**0.049 J**	**23**	**0.44 J**	**0.47 J**	**3.1**	NC	NC	NC	NC
Toluene	2.00	1.58	**1.1**	2 U	**1.2 J**	**1.4 J**	2 U	NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	0.2 U	**0.78 J**	2 U	2 U	2 U	NC	NC	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.24**	**0.38 J**	**0.47 J**	**0.54 J**	**0.42 J**	NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U	2 U	**4.5**	**5.1**	2 U	NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U	2 U	**13**	**16**	2 U	NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.19 J**	2 U	2 U	2 U	2 U	NC	NC	NC	NC
o-Xylene	2.00	0.4	**0.069 J**	2 U	2 U	2 U	2 U	NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U	2 U	2 U	2 U	2 U	NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-7
Calculation of Indoor Air to Soil Gas Empirical Attenuation Factors
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

HADNOT POINT PHASE II												
Building						**Building 1817**						
Station ID	**Min. Phase II**	**Outdoor**	**Indoor**			**Soil Gas**			**Indoor to**	**Indoor to**	**Indoor to**	**Indoor to**
Sample ID	**Subslab**	2-Times Max	SWMU360-IA20-08C	SWMU360-SG59-08C	SWMU360-SG59D-08C	SWMU360-SG58-08C	SWMU360-SG57-08C		**Subslab (59)**	**Subslab (59D)**	**Subslab (58)**	**Subslab (57)**
Sample Date	**RL (ppbv)**	Detected Valu	10/05/08	10/04/08	10/04/08	10/04/08	10/04/08		**Ratio**	**Ratio**	**Ratio**	**Ratio**
Chemical Name												
VOA (ppbv)												
1,1,1-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1,2,2-Tetrachloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2.00	0.168 J	**0.081 J**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1,2-Trichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,1-Dichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,2,4-Trichlorobenzene	10.00	0.2 J	1 UJ	10 U	10 U	10 U	10 U		NC	NC	NC	NC
1,2-Dibromoethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,2-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,2-Dichloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,2-Dichloropropane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,3-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
1,4-Dichlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
2-Butanone	10.00	4	**0.71 J**	**2.2 J**	**3.4 J**	10 U	**2.2 J**		NC	NC	NC	NC
2-Hexanone	5.00	0.34 J	0.5 U	5 U	5 U	5 U	5 U		NC	NC	NC	NC
4-Methyl-2-pentanone	5.00	0.38 J	0.5 U	5 U	5 U	**0.54 J**	5 U		NC	NC	NC	NC
Acetone	50.00	32	**16**	**30 J**	**43 J**	50 U	**33 J**		NC	NC	NC	NC
Benzene	2.00	0.92	**0.22**	**1.8 J**	**2.2**	2 U	2 U		NC	NC	NC	NC
Bromodichloromethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Bromoform	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Bromomethane	2.00	0.09 J	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Carbon disulfide	5.00	0.098 J	**0.049 J**	**8.9**	**9.2**	**0.31 J**	5 U		NC	NC	NC	NC
Carbon tetrachloride	2.00	0.22 J	**0.083 J**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Chlorobenzene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Chloroethane	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Chloroform	2.00	0.102 J	**0.052 J**	2 U	2 U	**200**	2	**2.2**	NC	NC	2.6E-04	NC
Chloromethane	5.00	1.88	**0.82**	**2.2 J**	**2 J**	5 U	5 U		NC	NC	NC	NC
Cyclohexane	5.00	0.84 J	**0.059 J**	5 U	5 U	5 U	5 U		NC	NC	NC	NC
Dibromochloromethane	2.00	0.2 U	**0.2 U**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Dichlorodifluoromethane (Freon-12)	2.00	1.18	**0.5**	**0.7 J**	**0.72 J**	**0.71 J**	**0.77 J**		NC	NC	NC	NC
Ethylbenzene	2.00	0.38 J	**0.14 J**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Isopropylbenzene	4.00	0.4 U	0.4 U	4 U	4 U	4 U	4 U		NC	NC	NC	NC
Methyl-tert-butyl ether (MTBE)	10.00	1 U	1 U	10 U	10 U	10 U	10 U		NC	NC	NC	NC
Methylene chloride	5.00	2.6	0.64 U	5 U	5 U	5 U	5 U		NC	NC	NC	NC
Styrene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
Tetrachloroethene	2.00	0.2 U	**0.098 J**	**0.44 J**	**0.47 J**	**23**	**3.1**		NC	NC	NC	NC
Toluene	2.00	1.58	**1.8**	1	**1.2 J**	**1.4 J**	2 U		NC	NC	NC	NC
Trichloroethene	2.00	0.2 U	0.2 U	2 U	2 U	**0.78 J**	2 U		NC	NC	NC	NC
Trichlorofluoromethane(Freon-11)	2.00	0.82	**0.26**	**0.47 J**	**0.54 J**	**0.38 J**	**0.42 J**		NC	NC	NC	NC
Vinyl chloride	2.00	0.2 U	0.2 U	**4.5**	**5.1**	2 U	2 U		NC	NC	NC	NC
cis-1,2-Dichloroethene	2.00	0.2 U	0.2 U	**13**	**16**	2 U	2 U		NC	NC	NC	NC
cis-1,3-Dichloropropene	2.00	0.2 U	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC
m- and p-Xylene	2.00	1.12	**0.33**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
o-Xylene	2.00	0.4	**0.11 J**	2 U	2 U	2 U	2 U		NC	NC	NC	NC
trans-1,2-Dichloroethene	2.00	0.112 J	0.2 U	2 U	2 U	2 U	2 U		NC	NC	NC	NC

Notes:
Bold = Detected level
1 = Exceeds 2-times maximum background
2 = Exceeds 100-times the minimum subslab soil gas reporting limit (RL)
P = Parent sample
D = Duplicate sample
NC = Not Calculated

TABLE V1-8
Camp Lejeune Phase I and II Data - Paired Subslab and Indoor Air Samples
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

Bldg	VOC	Phase	Subslab (ppb)	Indoor Air (ppb)	2X Outdoor Air (ppb)	Attenuation Factor (unitless)
Chlorinated Solvents						
3B	Tetrachloroethene	PII	2,500,000 (PCE)	1	<0.2	5E-07
3B	Tetrachloroethene	PII	2,500,000 (PCE)	2	<0.2	1E-06
3B	Tetrachloroethene	PII	2,500,000 (PCE)	12	<0.2	5E-06
43	Tetrachloroethene	PII	36,000 (PCE)	2	<0.2	4E-05
43	Tetrachloroethene	PII	36,000 (PCE)	2	<0.2	6E-05
3B	Tetrachloroethene	PII	24,000 (PCE)	1	<0.2	5E-05
3B	Tetrachloroethene	PII	24,000 (PCE)	2	<0.2	1E-04
3B	Tetrachloroethene	PII	24,000 (PCE)	12	<0.2	5E-04
3B	Tetrachloroethene	PII	16,000 (PCE)	1	<0.2	8E-05
3B	Tetrachloroethene	PII	16,000 (PCE)	2	<0.2	2E-04
3B	Tetrachloroethene	PII	16,000 (PCE)	12	<0.2	8E-04
43	Methylene Chloride	PII	9,000 (MeCl)	5	3	5E-04
3B	Trichloroethene	PII	6,700 (TCE)	0.6	<0.2	9E-05
3B	Trichloroethene	PII	6,700 (TCE)	0.64	<0.2	1E-04
3B	Trichloroethene	PII	6,700 (TCE)	1	<0.2	2E-04
37	Tetrachloroethene	PII	11,000 (PCE)	0.1	<0.2	9E-06
37	Tetrachloroethene	PII	11,000 (PCE)	0.1	<0.2	1E-05
37	Tetrachloroethene	PII	11,000 (PCE)	<0.2	<0.2	2E-05
37	Tetrachloroethene	PII	11,000 (PCE)	<0.2	<0.2	2E-05
37	Tetrachloroethene	PII	11,000 (PCE)	0.3	<0.2	2E-05
43	Methylene Chloride	PII	9,000 (MeCl)	<0.5	3	6E-05
TC864	Trichloroethene	PI	2,000 (TCE)	0.1	1	6E-05
TC864	Trichloroethene	PI	1,900 (TCE)	0.1	1	6E-05
37	Tetrachloroethene	PII	1,700 (PCE)	0.1	<0.2	7E-05
37	Tetrachloroethene	PII	1,700 (PCE)	0.1	<0.2	6E-05
37	Tetrachloroethene	PII	1,700 (PCE)	<0.2	<0.2	1E-04
37	Tetrachloroethene	PII	1,700 (PCE)	<0.2	<0.2	1E-04
37	Tetrachloroethene	PII	1,700 (PCE)	0.3	<0.2	2E-04
1115	1,1-Dichloroethane	PII	1,300 (11DCA)	0.1	<0.2	5E-05
TC860	Trichloroethene	PI	230 (TCE)	0.5	1	2E-03
1202	Trichloroethene	PII	210 (TCE)	<0.2	<0.2	1E-03
1202	Trichloroethene	PII	210 (TCE)	<0.2	<0.2	1E-03
1301	Trichloroethene	PII	210 (TCE)	0.1	<0.2	5E-04
1301	Trichloroethene	PII	210 (TCE)	0.2	<0.2	7E-04
1817	Chloroform	PII	200 (Chloroform)	0.07	0.1	3E-04
1817	Chloroform	PII	200 (Chloroform)	0.05	0.1	3E-04

= Significantly greater than 2-times the outdoor air concentration.

TABLE V1-8
Camp Lejeune Phase I and II Data - Paired Subslab and Indoor Air Samples
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

Bldg	VOC	Phase	Subslab (ppb)	Indoor Air (ppb)	2X Outdoor Air (ppb)	Attenuation Factor (unitless)
Petroleum Hydrocarbons						
1115	m-&p-Xylene	PII	650,000 (m-&p-Xyl	34	1	5E-05
1115	Toluene	PII	610,000 (toluene)	51	2	8E-05
1115	m-&p-Xylene	PII	470,000 (m-&p-Xyl	34	1	7E-05
1115	Ethylbenzene	PII	220,000 (EtB)	10	0.4	5E-05
1115	o-Xylene	PII	220,000 (o-Xyl)	13	0.4	6E-05
1115	o-Xylene	PII	160,000 (o-Xyl)	13	0.4	8E-05
1115	Ethylbenzene	PII	81,000 (EtB)	10	0.4	1E-04
1115	Toluene	PII	61,000 (toluene)	51	2	8E-04
1115	Benzene	PII	31,000 (benzene)	11	0.9	4E-04
1115	Cyclohexane	PII	1,000 (cyclohexan	6	0.8	2E-04
1115	Benzene	PII	26,000 (benzene)	11	0.9	4E-04
1115	Cyclohexane	PII	9,000 (cyclohexan	6	0.8	3E-04
1114	Cyclohexane	PI	1,000 (cyclohexan	0.3	0.8	3E-05
1115	Isopropylbenzene	PII	00 (isopropylbenze	0.6	<0.4	7E-05
1100	m- & p-Xylenes	PI	9,300 (m-&p-Xyl)	0.6	1	7E-05
1100	Ethylbenzene	PI	4,100 (EtB)	0.3	0.4	8E-05
1100	o-Xylene	PI	3,700 (o-Xyl)	0.3	0.4	7E-05
1115	Isopropylbenzene	PII	00 (isopropylbenze	0.6	<0.4	2E-04
1114	m- & p-Xylenes	PI	610 (m-&p-Xyl)	0.3	1	5E-04
1100	Toluene	PI	600 (toluene)	1.4	2	2E-03
43	Toluene	PII	430 (toluene)	0.7	2	2E-03
43	Toluene	PII	430 (toluene)	1	2	3E-03
1114	Ethylbenzene	PI	270 (EtB)	0.1	0.4	4E-04
1114	o-Xylene	PI	250 (o-Xyl)	0.1	0.4	5E-04
1220	m- & p-Xylenes	PI	220 (m-&p-Xyl)	0.4	1	2E-03
1220	m- & p-Xylenes	PI	210 (m-&p-Xyl)	0.4	1	2E-03

= Significantly greater than 2-times the outdoor air concentration.

TABLE V1-9
Building Characteristics Considered During Empirical Attenuation Factor (AF) Calculations
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

Building	Size [a/]	HVAC Running?	Ceiling Height (ft)	Offices or Warehouse	Windows or Doors Typically Open or Closed?
3B	Small	Yes	8	Offices	Closed
43	Small	Yes	8	Offices	Closed
37	Large	Yes	8	Offices	Closed
TC864	Large	No HVAC	15	Warehouse	Closed
TC860	Large	Yes	10	Offices	Closed
1202	Large	Yes	10	Both	Closed
1301	Large	No HVAC	25-30	Warehouse	Open
1817	Large	No HVAC	30	Both	Closed
1115	Small	No HVAC	8	Warehouse	Open
1114	Large	No HVAC	30	Warehouse	Open
1100	Small	Window A/Cs	8	Offices	Closed
1220	Large	Yes	10	Both	Closed

[a/] Cutoff between small and large buildings is approximately 5,000 ft^2.

TABLE V1-10
Generic and Base-Specific Soil Gas Screening Levels (SGSLs)
Vapor Intrusion Report
MCB Camp Lejeune, North Carolina

	Industrial Shallow Generic SGSL (AF=0.1) (ppbv)	Industrial Shallow Base-Specific SGSL (AF=0.001) (ppbv)	Unrestricted Shallow Generic SGSL (AF=0.1) (ppbv)	Unrestricted Shallow Base-Specific SGSL (AF=0.001) (ppbv)
Chemical Name				
Volatile Organic Compounds (ppbv)				
1,1,1-Trichloroethane	40,300	4,030,000	9,530	953,000
1,1,2,2-Tetrachloroethane	0.306	30.6	0.0612	6.12
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	170,000	17,000,000	40,400	4,040,000
1,1-Dichloroethane	19	1,900	3.71	371
1,1-Dichloroethene	2,220	222,000	530	53,000
1,2,4-Trichlorobenzene	24	2400	5.66	566
1,2-Dichloroethane	1.16	116	0.232	23.2
1,2-Dichloropropane	2.6	260	0.519	51.9
1,4-Dichlorobenzene	1.83	183	0.366	36.6
2-Butanone	74,600	7,460,000	17,600	1,760,000
2-Hexanone	31,700	3,170,000	7,570	757,000
4-Methyl-2-pentanone	31,700	3,170,000	7,560	756,000
Acetone	589,000	58,900,000	135,000	13,500,000
Benzene	5.01	501	0.97	97
Bromomethane	56.7	5,670	13.4	1,340
Carbon disulfide	9,950	995,000	2,340	234,000
Carbon tetrachloride	1.3	130	0.254	25.4
Chlorobenzene	478	47,800	113	11,300
Chloroethane	167,000	16,700,000	37,900	3,790,000
Chloroform	1.09	109	0.225	22.5
Chloromethane	32.9	3290	6.78	678
Cyclohexane	75,500	7,550,000	18,300	1,830,000
Dichlorodifluoromethane (Freon-12)	1,780	178,000	425	42,500
Ethylbenzene	11.3	1130	2.23	223
Isopropylbenzene	3,660	366,000	854	85,400
Methyl-tert-butyl ether (MTBE)	130	13,000	26.1	2,610
Methylene chloride	74.8	7480	15	1,500
Styrene	10,300	1,030,000	2,350	235,000
Tetrachloroethene	3.1	310	0.605	60.5
Toluene	58,400	5,840,000	13,800	1,380,000
Trichloroethene	11.4	1140	2.23	223
Trichlorofluoromethane(Freon-11)	5,520	552,000	1,300	130,000
Vinyl chloride	11	1110	0.626	62.2
m- and p-Xylene	1,010	101,000	230	23,000
o-Xylene	7,140	714,000	1,680	168,000
trans-1,2-Dichloroethene	656	65,600	159	15,900

Figures

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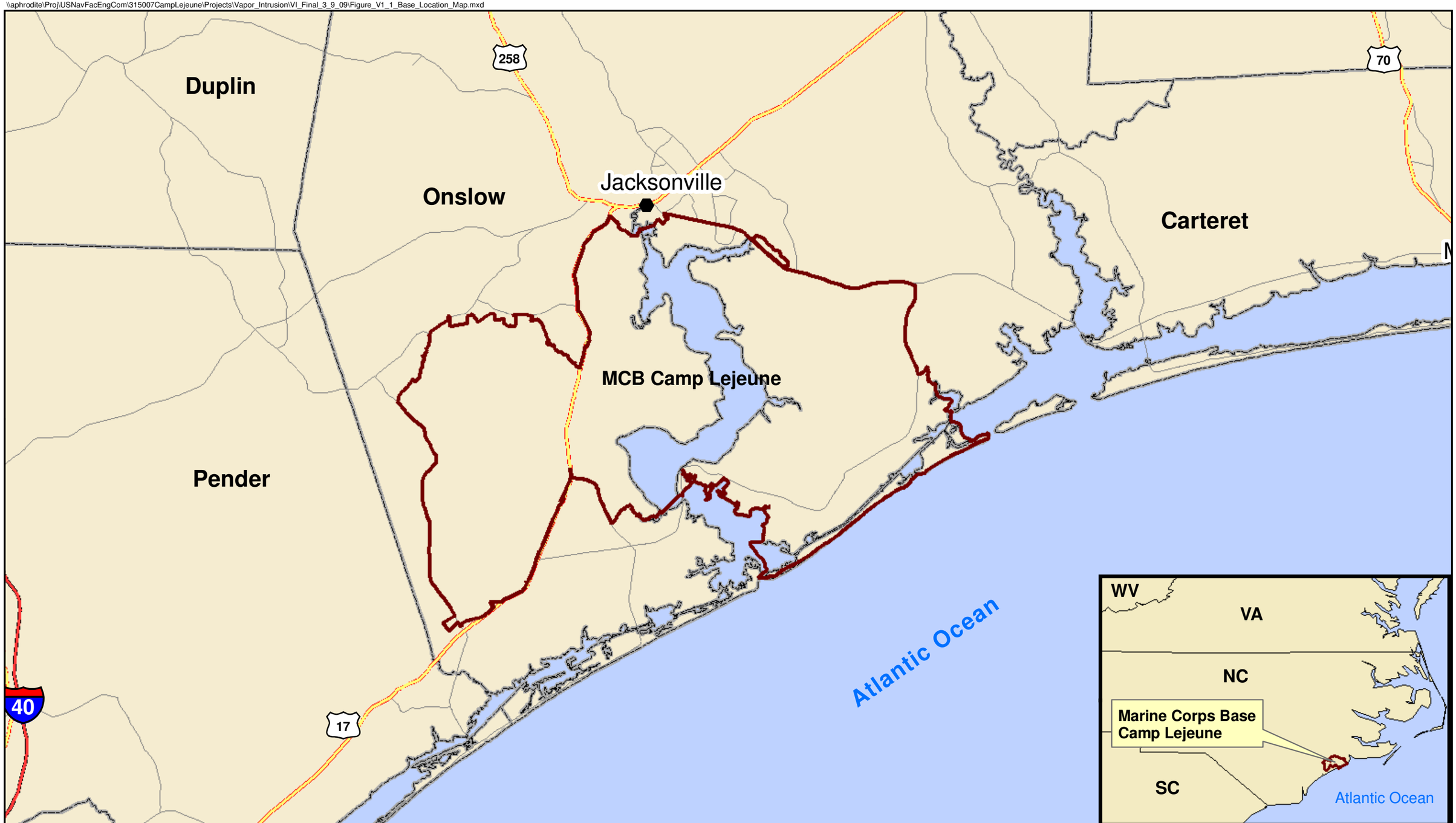

Legend
- Installation Area
- Limited Access Higwhay
- Highway
- Local Roads
- Cities

N

0 10,000 20,000 40,000 Feet

1 inch = 20,000 feet

Figure V1-1
Base Location Map
MCB Camp Lejeune
North Carolina

AGVIQ CH2M HILL

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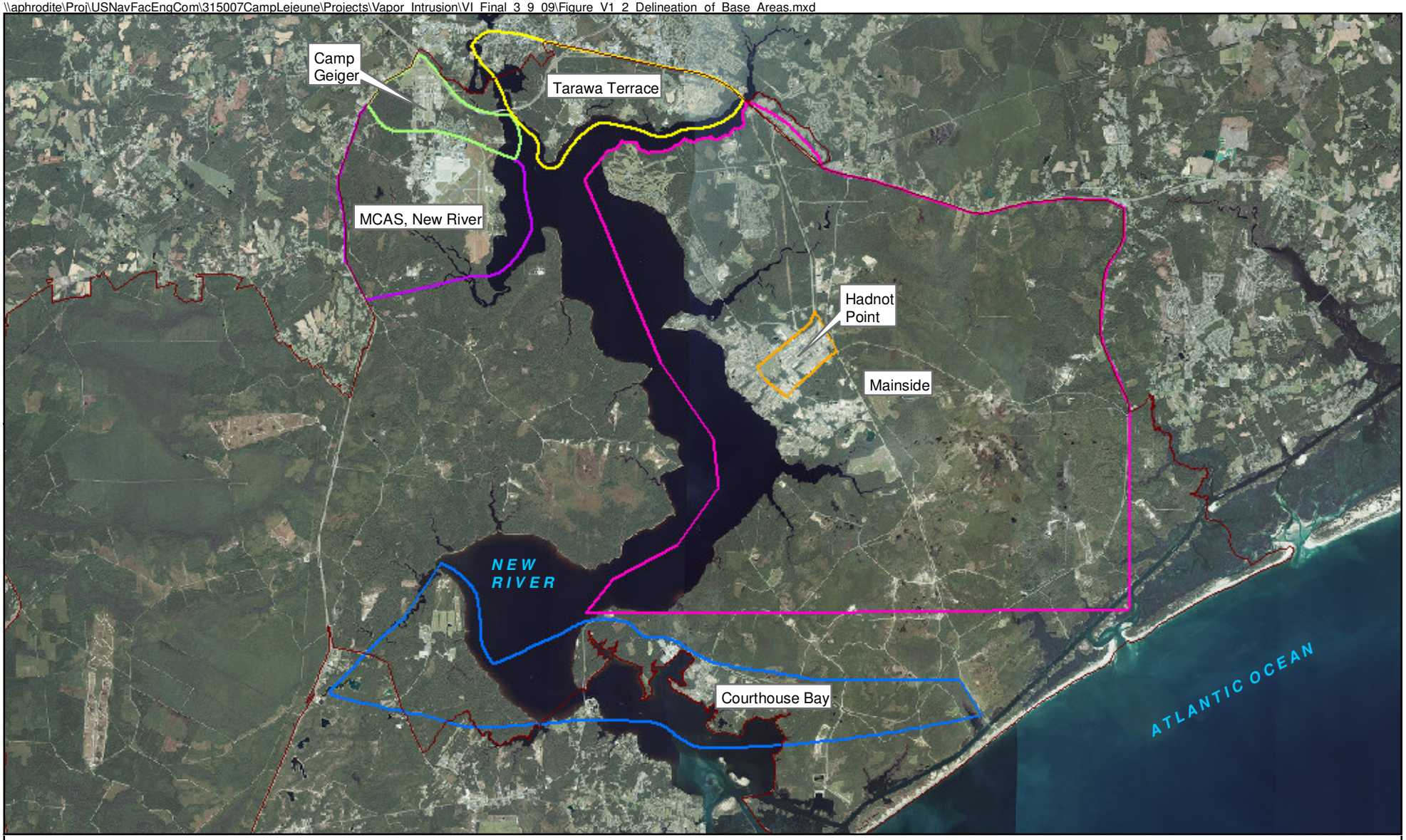


Legend

- MCAS, New River
- Installation Area
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

N

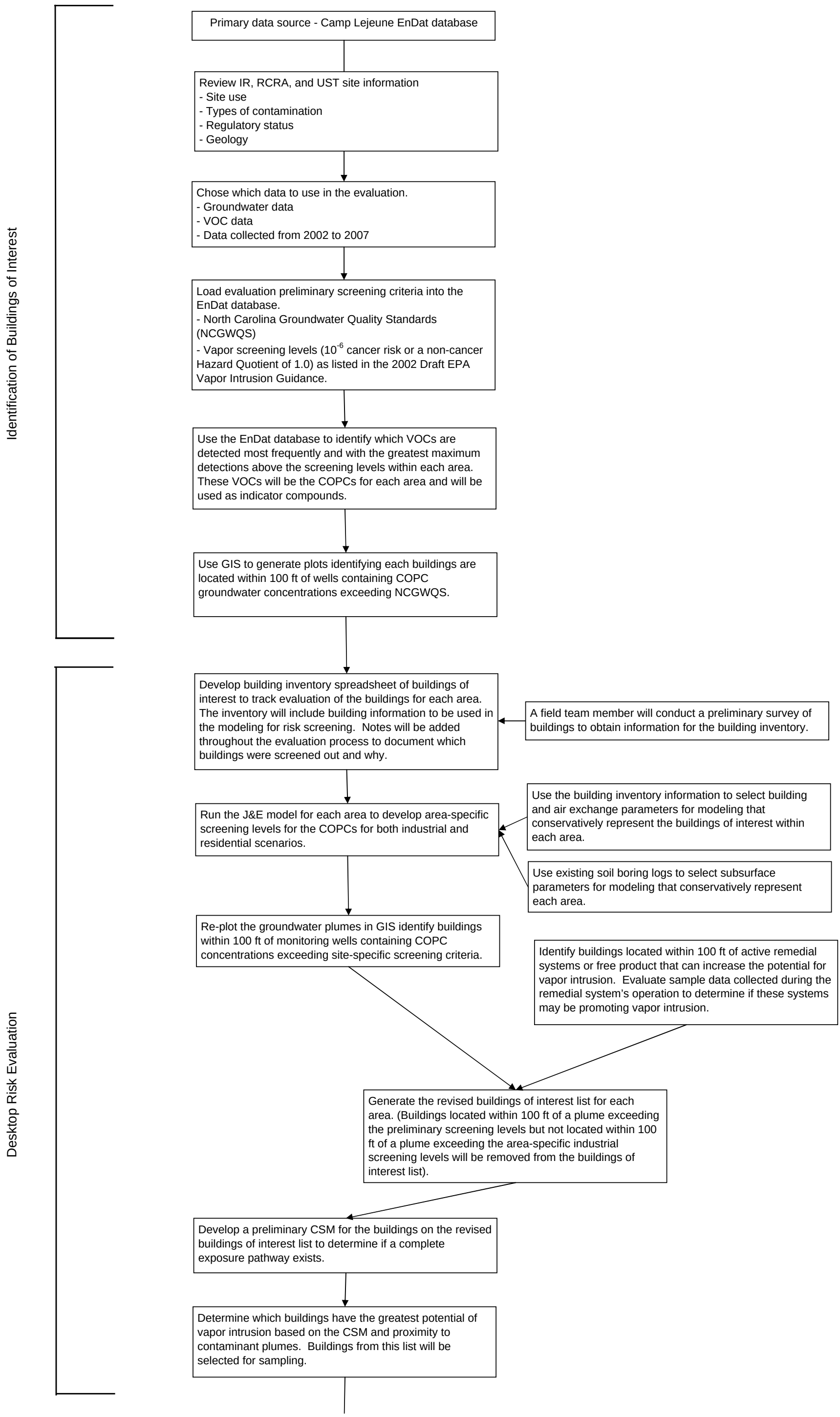
0 6,500 13,000 26,000 Feet

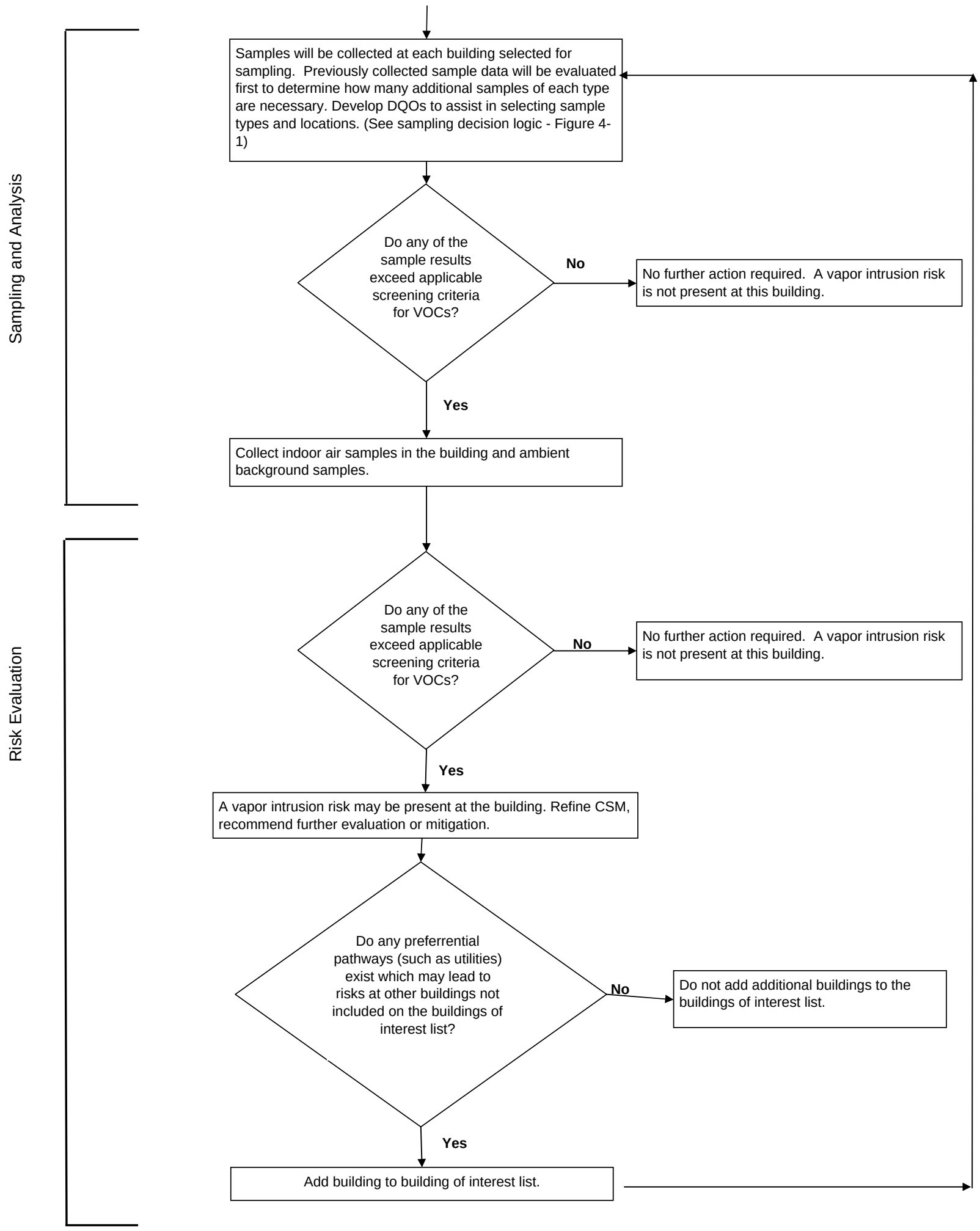
1 inch = 13,000 feet

Figure V1-2
Delineation of Base Areas
MCB Camp Lejeune
North Carolina

AGVIQ CH2M HILL

Figure V1-3
Vapor Intrusion Evaluation Approach




Sampling and Analysis
Samples will be collected at each building selected for sampling. Previously collected sample data will be evaluated first to determine how many additional samples of each type are necessary. Develop DQOs to assist in selecting sample types and locations. (See sampling decision logic - Figure 4-1)
Do any of the sample results exceed applicable screening criteria for VOCs?
No
No further action required. A vapor intrusion risk is not present at this building.
Yes
Collect indoor air samples in the building and ambient background samples.
Risk Evaluation
Do any of the sample results exceed applicable screening criteria for VOCs?
No
No further action required. A vapor intrusion risk is not present at this building.
Yes
A vapor intrusion risk may be present at the building. Refine CSM, recommend further evaluation or mitigation.
Do any preferrential pathways (such as utilities) exist which may lead to risks at other buildings not included on the buildings of interest list?
No
Do not add additional buildings to the buildings of interest list.
Yes
Add building to building of interest list.

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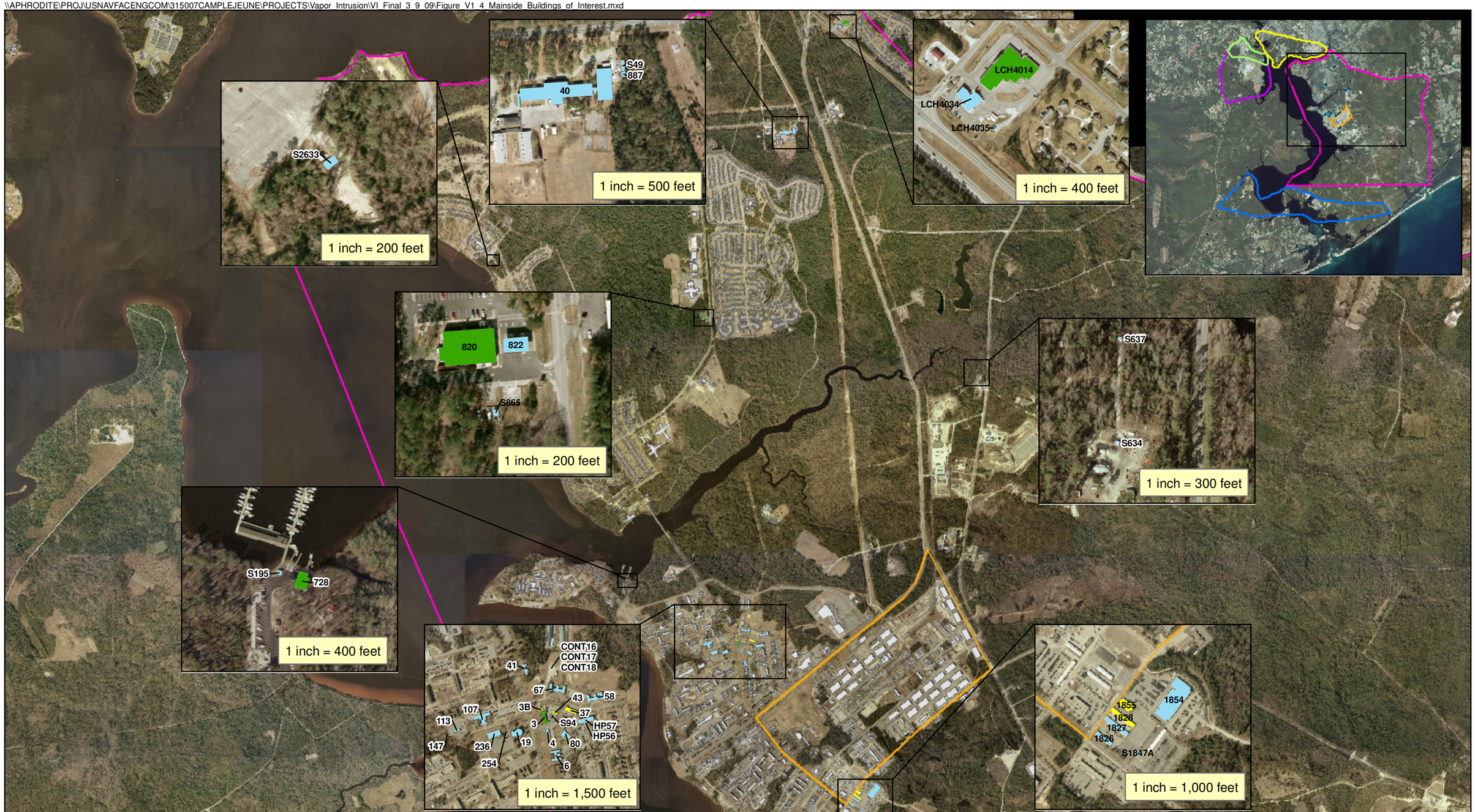


Legend

- Buildings Investigation - Initial Screening
- Buildings Investigated - Phase I
- Buildings Investigated - Phase II
- Air Station
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarrawa Terrace
- Buildings

N

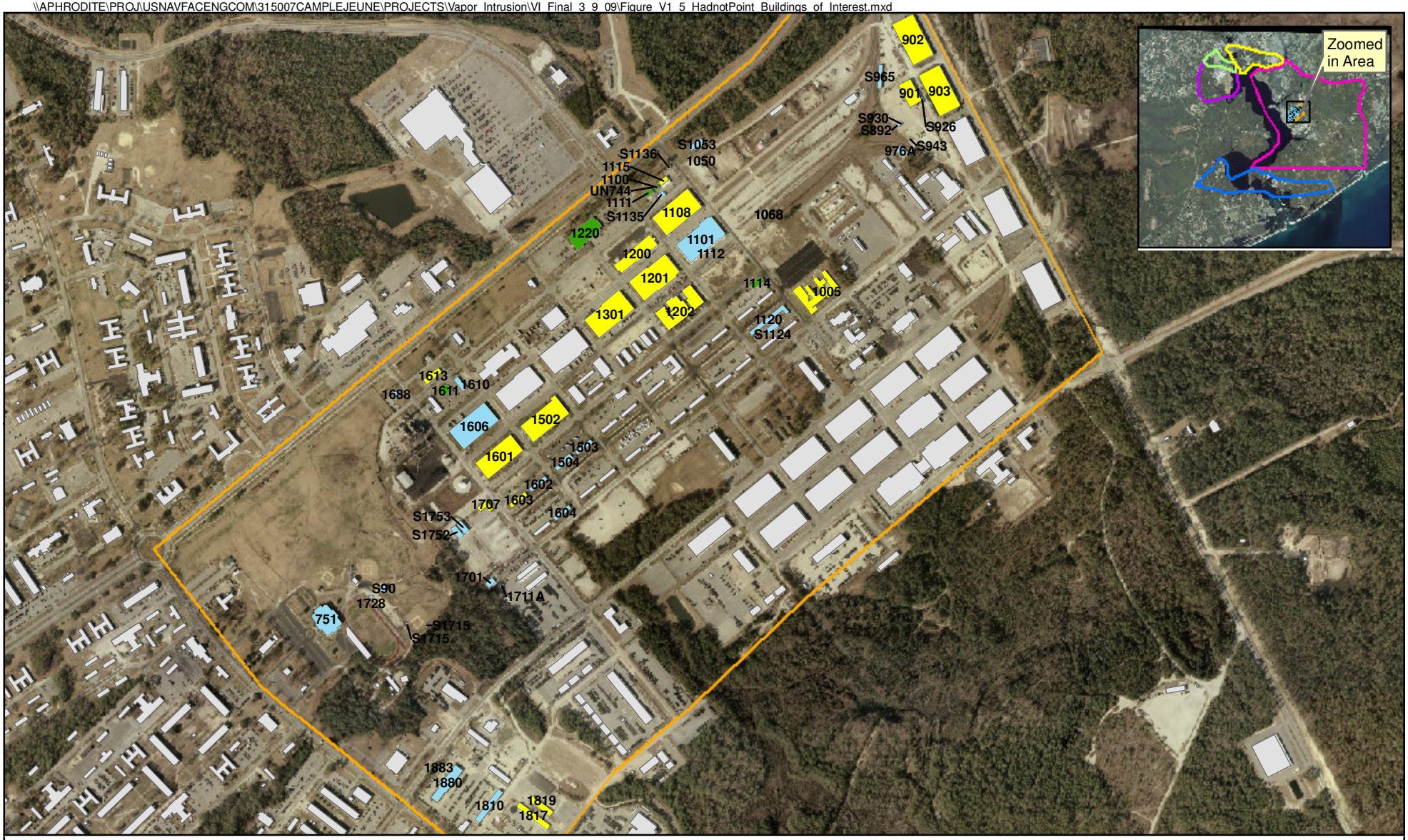
0 1,500 3,000 6,000 Feet

1 inch = 3,000 feet

Figure V1-4
Mainside Buildings of Interest
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIQ CH2M HILL

\\APHRODITE\PROJ\USNAVFACENGCOM\315007CAMPLEJEUNE\PROJECTS\Vapor_Intrusion\VI_Final_3_9_09\Figure_V1_5_HadnotPoint_Buildings_of_Interest.mxd



Legend

- Buildings Investigation - Initial Screening
- Buildings Investigated - Phase I
- Buildings Investigated - Phase II
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarrawa Terrace

N

0 550 1,100 2,200 Feet

Figure V1-5
Hadnot Point Buildings of Interest
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

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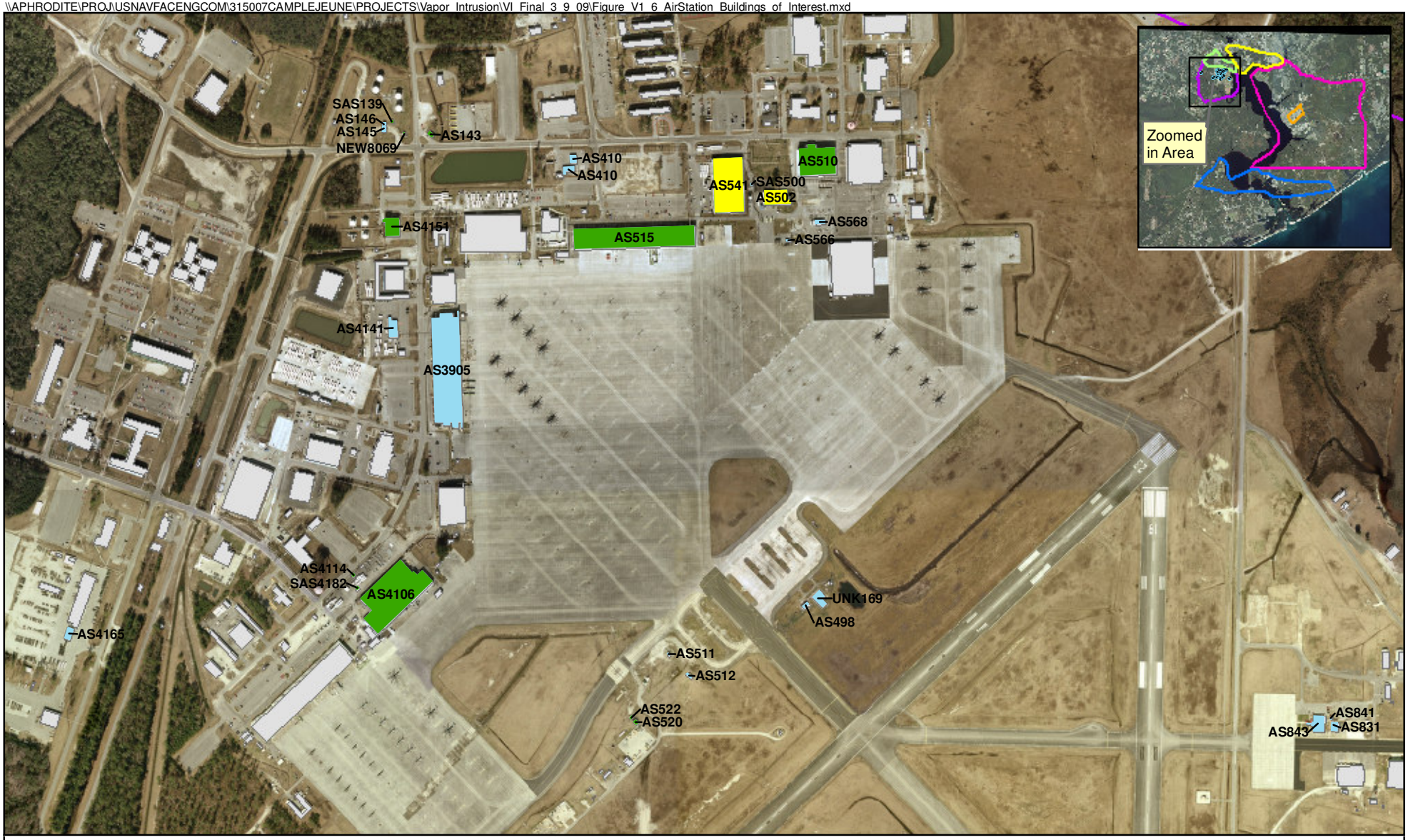
\\APHRODITE\PROJ\USNAVFACENGCOM\315007CAMPLEJEUNE\PROJECTS\Vapor_Intrusion\VI_Final_3_9_09\Figure_V1_6_AirStation_Buildings_of_Interest.mxd



Legend

- Buildings Investigation - Initial Screening
- Buildings Investigated - Phase I
- Buildings Investigated - Phase II
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

N

0 400 800 1,600 Feet

Figure V1-6
MCAS, New River Buildings of Interest
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

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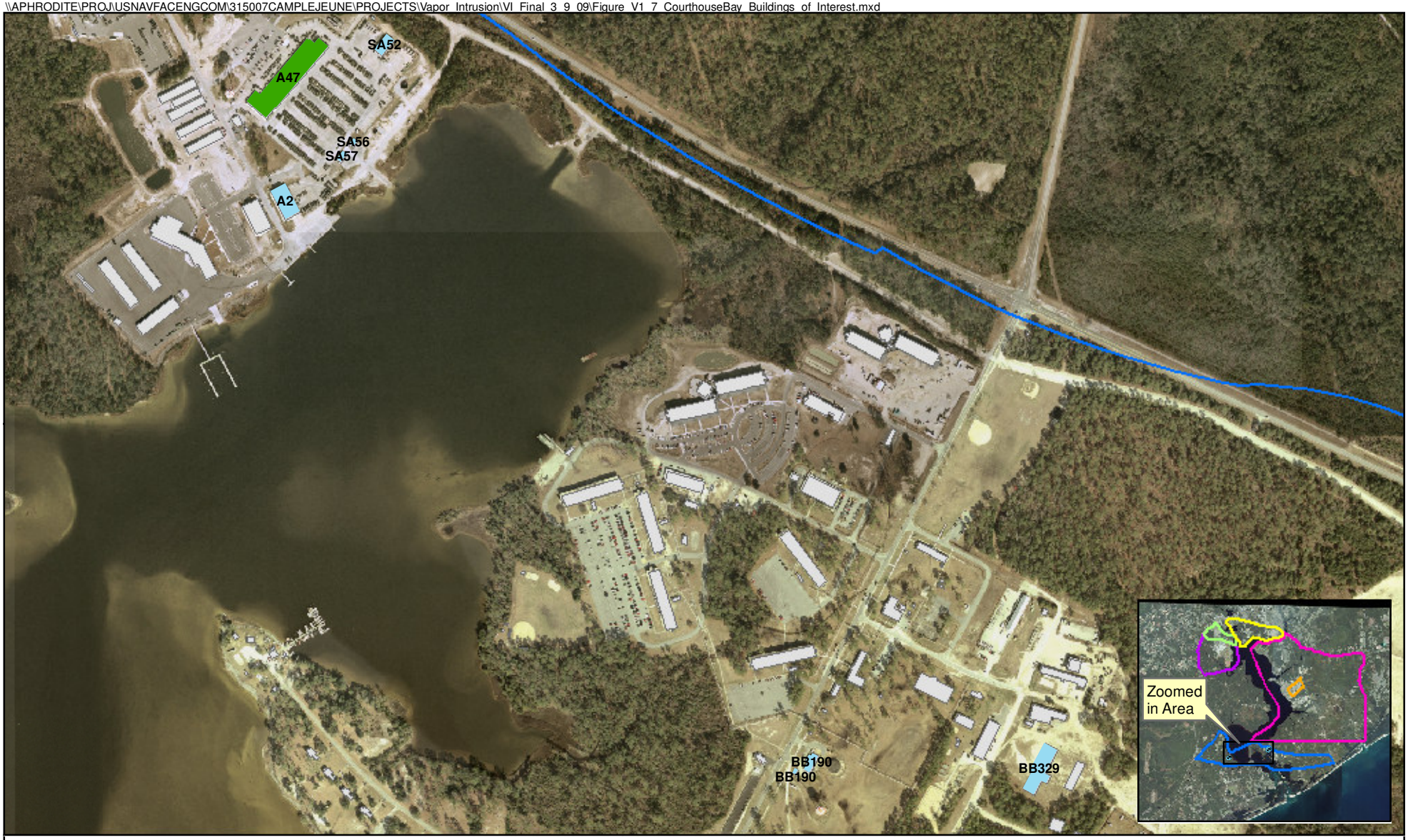
\\APHRODITE\PROJ\USNAVFACENGCOM\315007CAMPLEJEUNE\PROJECTS\Vapor_Intrusion\VI_Final_3_9_09\Figure_V1_7_CourthouseBay_Buildings_of_Interest.mxd



Legend

- Buildings Investigation - Initial Screening
- Buildings Investigated - Phase I
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarrawa Terrace

N

0 350 700 1,400 Feet

Figure V1-7
Courthouse Bay Buildings of Interest
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIQ CH2M HILL

\\APHRODITE\PROJ\USNAVFACENGCOM\315007CAMPLEJEUNE\PROJECTS\Vapor_Intrusion\VI_Final_3_9_09\Figure_V1_8_CampGeiger_Buildings_of_Interest.mxd

Legend

- Buildings Investigation - Initial Screening
- Buildings Investigated - Phase I
- Buildings Investigated - Phase II
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarrawa Terrace

N

0 350 700 1,400 Feet

Figure V1-8
Camp Geiger Buildings of Interest
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

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\\APHRODITE\PROJ\USNAVFACENGCOM\315007CAMPLEJEUNE\PROJECTS\Vapor_Intrusion\VI_Final_3_9_09\Figure_V1_9_TarawaTerrace_Buildings_of_Interest.mxd

Legend

- Buildings Investigation - Initial Screening
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarrawa Terrace

N

0 50 100 200 Feet

Figure V1-9
Tarawa Terrace Buildings of Interest
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

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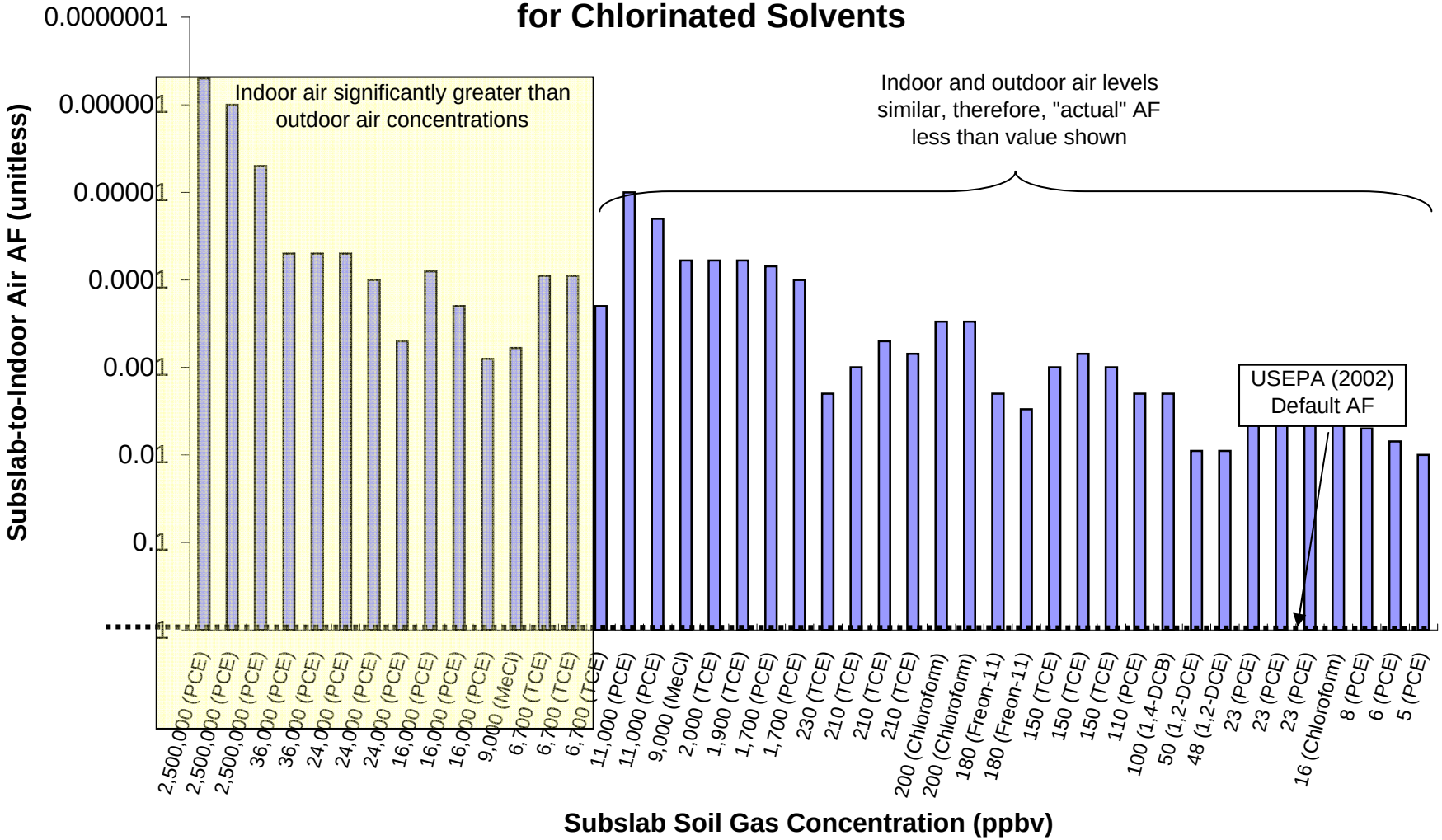
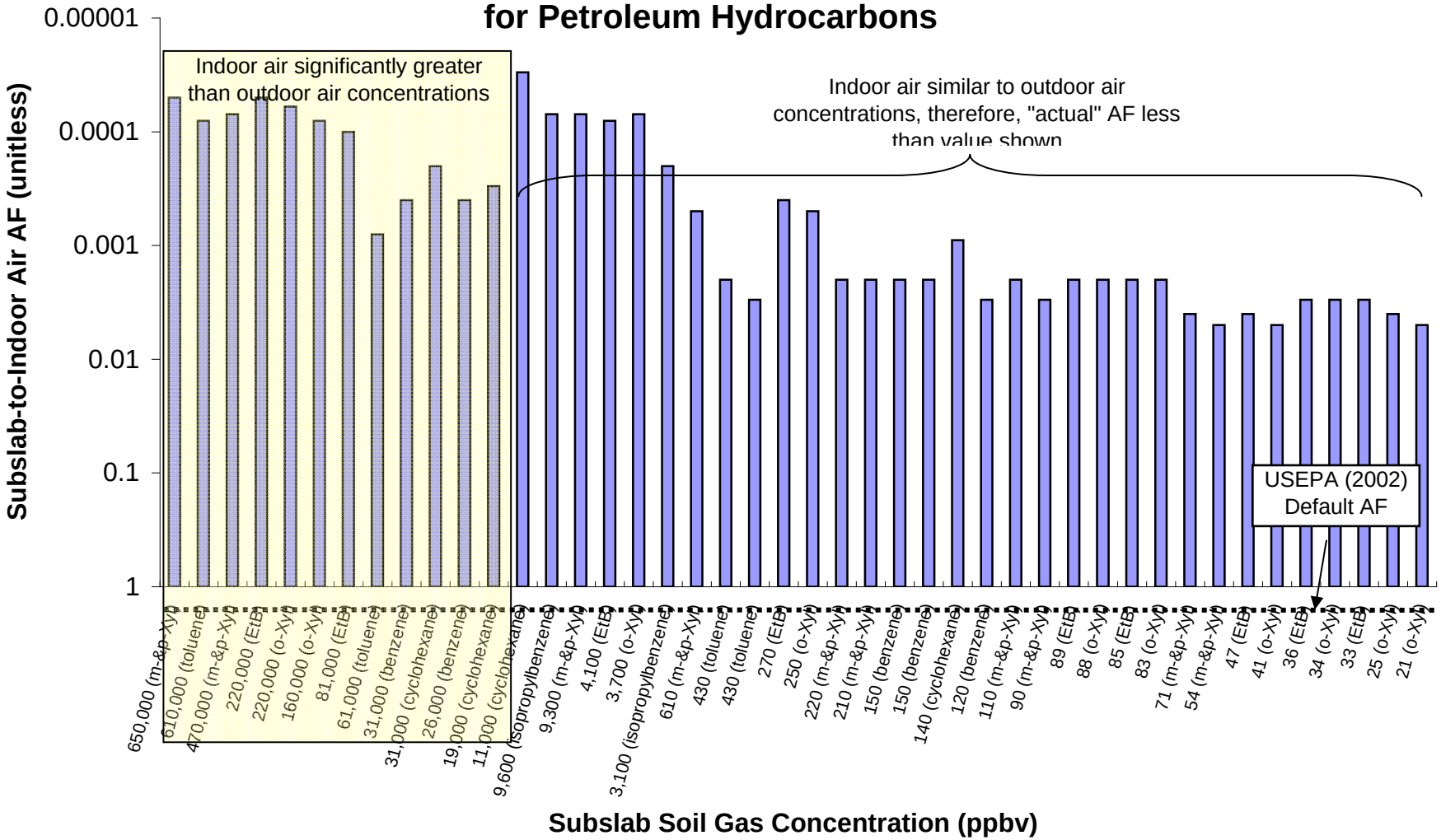
Figure V1-10: Empirical Subslab-to-Indoor Attenuation Factors (AFs) for Chlorinated Solvents



NOTE: Analysis based on paired indoor/subslab Camp Lejeune Phase 1 & 2 data where subslab levels ~100-times or greater than indoor air levels (tetrachloroethene [PCE], trichloroethene [TCE], trans-1,2-dichloroethylene [trans-1,2-DCE], methylene chloride [MeCl], chloroform, 1,4-dichlorobenzene [1,4-DCB], and trichlorofluoromethane [Freon-11])

Figure V1-11: Empirical Subslab-to-Indoor Attenuation Factors (AFs) for Petroleum Hydrocarbons



NOTE: Analysis based on paired indoor and subslab Camp Lejeune Phase 1 and 2 data for VOCs where subslab concentrations ~100-times or greater than indoor air (benzene, ethylbenzene [EtB], toluene, m-&p- and o- Xylenes [Xyl], cyclohexane, and isopropylbenzene