

**Work Plan Addendum
Indoor Air and Sub-Slab Vapor Sampling
Round 15
August 2013
Lockheed Martin Middle River Complex
2323 Eastern Boulevard
Middle River, Maryland**

Prepared for:

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ACRONYMS

COC	contaminant(s) of concern
IA	indoor air
IAQ	indoor air quality
Lockheed Martin	Lockheed Martin Corporation
MPL	mechanical prototype lab
MRC	Middle River Complex
MST	Mission Systems and Training
SV	sub-slab vapor
VLS	vertical-launch system
VMP	vapor monitoring point
VOC	volatile organic compound

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Section 1

Introduction and Scope

This technical memorandum proposes field activities to support the August 2013 indoor air-quality (IAQ) and sub-slab-vapor (SV) sampling round at the Lockheed Martin Corporation (Lockheed Martin) Middle River Complex (MRC) in Middle River, Maryland. This memorandum is an addendum to the *Indoor-Air Quality Assessment Work Plan for Buildings A, B, C, and Vertical-Launch System (VLS), Lockheed Martin Middle River Complex* (Tetra Tech, 2006). The proposed August 2013 sampling of indoor air (IA) and SV will be the fifteenth sampling round for possible SV intrusion of volatile organic compounds (VOCs) from contaminated soil, groundwater, and soil gas beneath the MRC into interior spaces of the facility.

Figures 1-1, 1-2, and 1-3 show the MRC monitoring locations that have been sampled to date in Buildings A, B, and C, respectively, along with the proposed August 2013 sampling locations, shown circled on the figures. Figure 1-4 provides a facility-wide view of the locations sampled to date and those proposed for sampling in August 2013. Figure 1-5 illustrates the background locations to be sampled.

The scope of work associated with the proposed field investigation and addressed by this memorandum includes identifying proposed SV sampling locations; identifying proposed IAQ sampling locations; and collecting and analyzing IAQ and SV samples. Sampling is proposed in areas previously identified as having higher SV and/or indoor air concentrations (i.e., concentrations above screening values). The proposed sampling locations were chosen to evaluate the effectiveness of the operating sub-slab-depressurization systems at the facility, including the recent expansion of the Building C system.

1.1 PROPOSED SUB-SLAB-VAPOR MONITORING-POINT LOCATIONS

No new vapor-monitoring points (VMPs) will be installed for the August 2013 sampling round. Results from Round 14 (February 2013) indicate that the VMP locations proposed for Round 15 are appropriate, except for the following changes:

- Two additional IA samples (128-C, 144-C) will be collected in the Mission Systems and Training (MST) mechanical prototype lab (MPL) machine shop on the northeastern side of the Building C basement.
- A visual inspection of the MST MPL machine Shop will be performed during the pre-sampling inspection of VMPs. The objective of this inspection will be to identify any cracks or other penetrations of the building envelope that might facilitate sub-slab vapor intrusion at this location.
- Two VMPs in the western part of Building B (033-B and 101-B) will be sampled in this round to evaluate contamination east and northeast of 121-B and 136-A. Elevated levels of TCE were identified at 136-A in the eastern part of Building A in February 2013 (Round 14).

As stated earlier, VMPs sampled in Round 15 will be the same as those sampled during the previous round (Round 14); the rationale for using the same locations includes the following:

- VMPs installed during Round 14 have only been sampled once
- contaminants of concern (COC), including naphthalene and chlorinated compounds, were detected at multiple locations that were sampled during Round 14

Thirty-six VMPs will be sampled during Round 15; proposed SV sampling locations in each building are shown in Figures 1-1 through 1-3. Figure 1-4 provides an overview of the same information showing all buildings.

1.2 PROPOSED IAQ SAMPLING LOCATIONS

Except for the samples proposed in the MST MPL machine shop, all IAQ sampling locations will be co-located with proposed VMP sampling locations to evaluate possible relationships between sub-slab and IAQ results. IAQ sampling locations are also used to further evaluate areas where elevated results and chemical markers of vapor intrusion (e.g., *cis*-1,2-dichloroethene and *trans*-1,2-dichloroethene) have been previously reported. Proposed IAQ monitoring locations are shown in Figures 1-1, 1-2, 1-3, and 1-4. As previously stated, sampling locations are the same as

those sampled during the previous round (Round 14) with a few exceptions (see Section 1.1). IAQ samples proposed for the MST MPL machine shop are being collected because workers have expressed concern regarding IAQ in that area.

Thirty-eight IAQ samples are proposed for analysis: 36 samples will be collected at the VMP locations to be sampled for SV in Round 15, plus two additional IA samples in the MST MPL machine shop. Outdoor ambient air samples will also be collected from four background locations. Background samples will be collected from locations used in previous sampling rounds. Figure 1-5 shows the proposed background sampling locations.

1.3 IAQ AND SUB-SLAB VAPOR SAMPLING

All proposed SV sampling locations (i.e., VMPs) will be inspected within one month before the proposed sampling round. The objective of this inspection will be to identify any VMPs that are obstructed or need repair. These locations will be identified on site plans and in tabular format in a summary memorandum. IAQ sampling will be performed in accordance with the IAQ assessment work plan (Tetra Tech, 2006). During VMP inspection, a visual inspection of the MST MPL machine shop will also be performed to identify any penetrations in the building envelope (e.g., floor cracks, pipes and utility chases) that might enhance possible SV intrusion. Observations will be recorded and used to identify the final placement of the two IA samples proposed for this area.

IAQ samples will be collected over approximately eight hours using pre-conditioned Summa[®] canisters; air sampling will be performed in accordance with United States Environmental Protection Agency Toxic Organic Method 15 (EPA TO-15). Up to 38 IAQ samples plus four duplicate samples will be collected during Round 15. Background samples from four previously established locations will also be collected (Figure 1-5); no duplicate background samples will be collected.

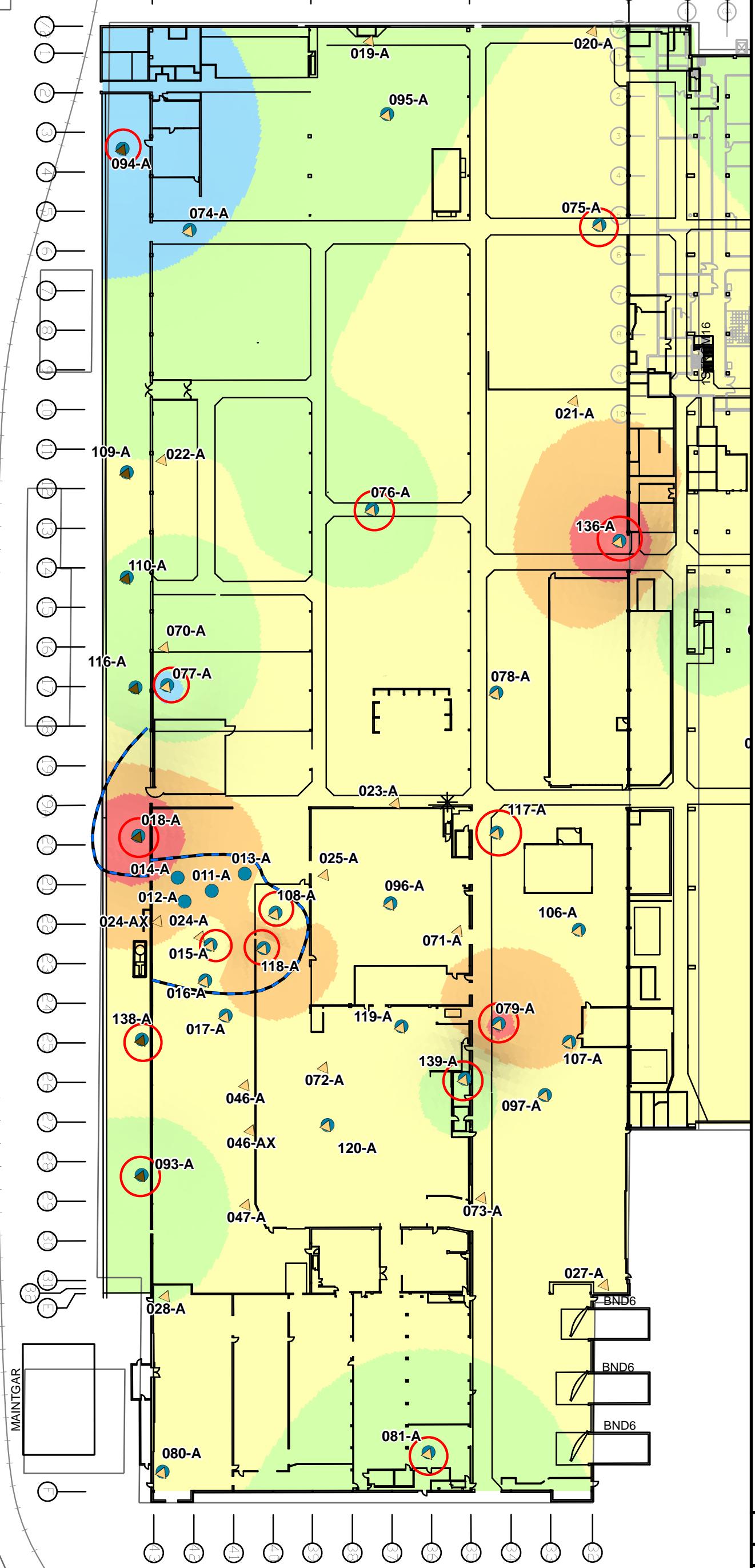
SV samples will be collected at the same time IAQ samples are collected. Up to 36 SV samples and four duplicate samples will be collected from MRC Buildings A, B, and C during Round 15. Each sub-slab vapor sample will be collected over a one-hour period. Sub-slab sampling will be performed in accordance with the *Phase II Investigation Work Plan Block I* (Tetra Tech, 2008).

Co-located IAQ and SV sampling locations will share the same numerical identifier (based on when the location was first sampled), a building identifier (i.e., A, B, C, or Z for outlying buildings), the type of sample (IA for indoor air, SV for sub-slab vapor), and the sampling round (i.e., R15 for Round 15). For example, a sub-slab sample collected during Round 15 at the ninth sub-slab sampling location installed in the Building C Basement (during the 2006 site characterization study) would be 009-C-SV-R15. The co-located indoor air sample for this SV location would be 009-C-IA-R15. Final sampling locations will be determined based on conditions at the time of sampling.

After sampling is complete, each canister will be closed and sent to an off-site laboratory under proper chain of custody procedures. Each sample will be submitted for analysis by USEPA Method TO-15. The current analytical parameter list used for indoor-air, sub-slab vapor, and background monitoring was agreed upon by the team in late 2011, and includes the following:

- benzene
- carbon tetrachloride
- chlorodifluoromethane (Freon 22)
- chloroform
- dichlorodifluoromethane
- 1,1-dichloroethane (1,1-DCA)
- 1,2-dichloroethane (1,2-DCA)
- 1,1-dichloroethene (1,1-DCE)
- cis-1,2-dichloroethene (cis-1,2-DCE)
- trans-1,2-dichloroethene (trans-1,2-DCE)
- ethylbenzene
- methyl-tertiary-butyl ether (MTBE)
- methylene chloride
- naphthalene
- tetrachloroethene (PCE)
- toluene
- 1,2,4-trichlorobenzene
- 1,1,1-trichloroethane (1,1,1-TCA)
- 1,2,3-trimethylbenzene (1,2,3-TMB)
- 1,2,4-trimethylbenzene (1,2,4-TMB)
- 1,3,5-trimethylbenzene (1,3,5-TMB)
- trichloroethene (TCE)
- 1,1,2-trichloroethane (1,1,2-TCA)
- vinyl chloride (VC)
- xylenes (total)

Figure 1-1
Proposed Indoor Air and
Sub-Slab Vapor Monitoring
Locations for Building A
Round 15 August 2013



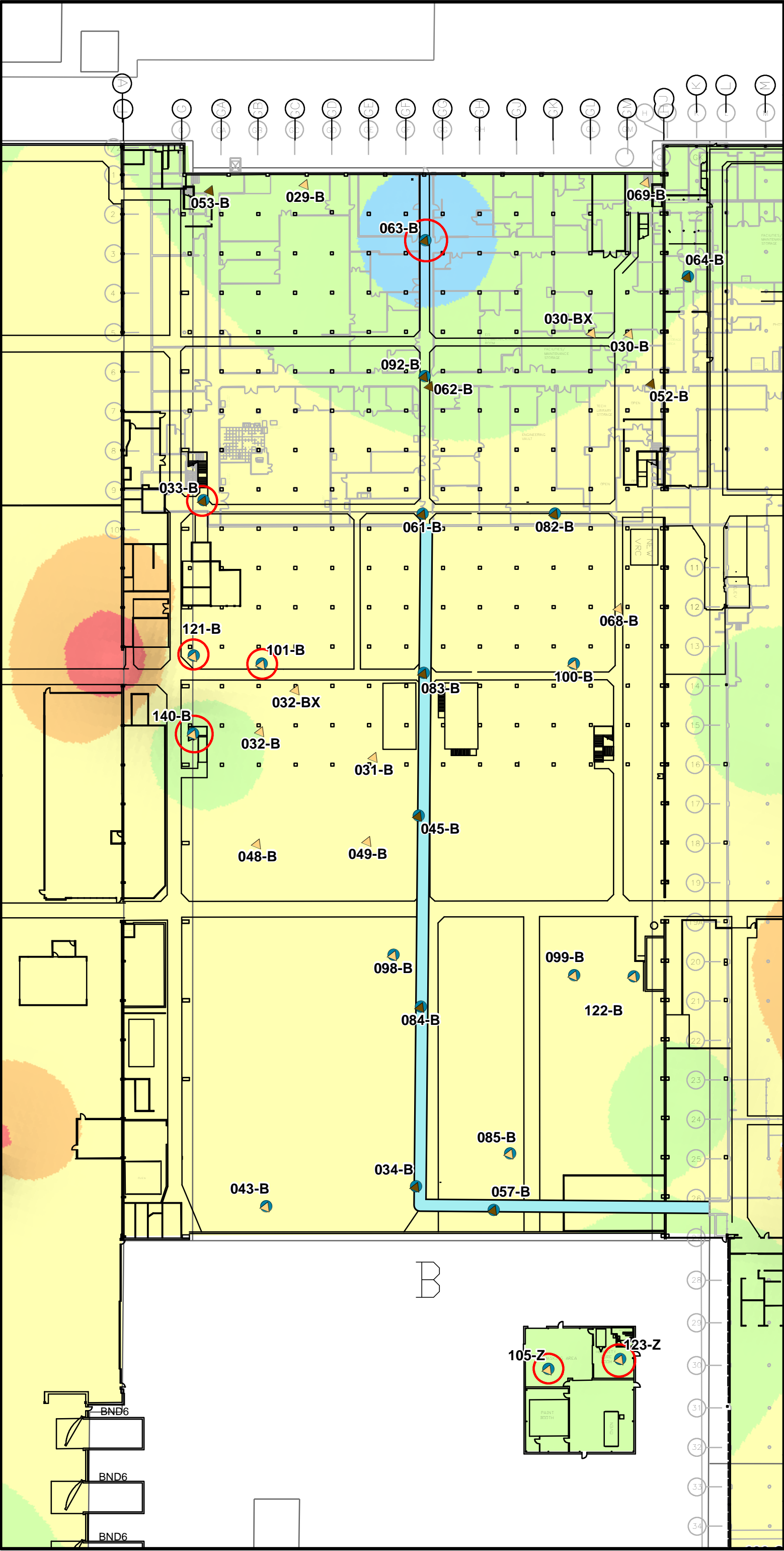
Legend

- IAQ, Basement
- IAQ, 1st Floor
- SV
- SSD Radius of Influence
- Buildings A, B, and C
- Building B and C Basement
- SSD Treatment Unit
- Proposed Round 15 Sample Locations

February 2013 Sub-Slab Vapor
TCE Concentration

10000 ug/m3
1000 ug/m3
100 ug/m3
10 ug/m3
0.1 ug/m3

Figure 1-2
Proposed Indoor Air and
Sub-Slab Vapor Monitoring
Locations for Building B
Round 15 August 2013



- Legend**
- IAQ, Basement
 - IAQ, 1st Floor
 - SV
 - Tunnel
 - Buildings A, B, and C
 - Building B and C Basement
 - Proposed Round 15 Sample Locations

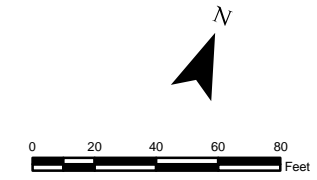
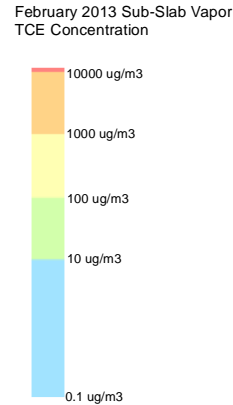
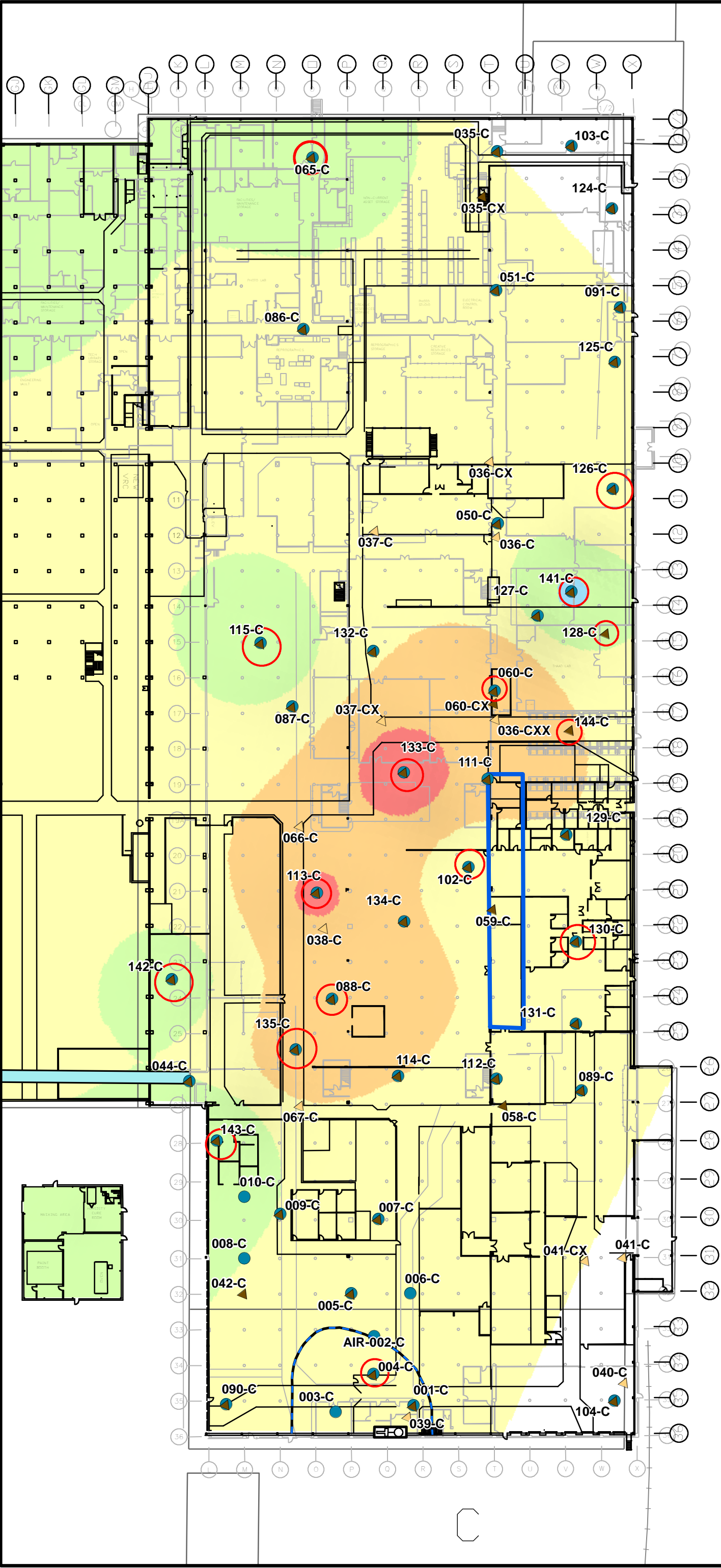


Figure 1-3
Proposed Indoor Air and
Sub-Slab Vapor Monitoring
Locations for Building C
Round 15 August 2013



Legend

- SSD Radius of Influence
- IAQ, Basement
- IAQ, 1st Floor
- SV
- Tunnel
- Buildings A, B, and C
- Building B and C Basement
- Former Patriot Plating Lines
- SSD Treatment Unit
- Proposed Round 15 Sample Locations

X - moved from original location once
XX - moved from original location twice

February 2013 Sub-Slab Vapor
TCE Concentration

10000 ug/m3
1000 ug/m3
100 ug/m3
10 ug/m3
0.1 ug/m3

North Arrow

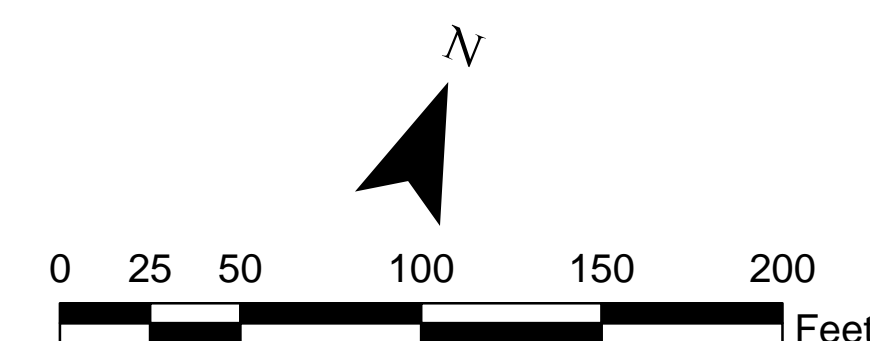
0 25 50 75 100 Feet

Lockheed Martin Middle River Complex
Middle River, Maryland

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Tetra Tech, Inc.

August 2013 Indoor Air and
Sub-Slab Vapor Sample Locations for
Buildings A, B, and C



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 Tetra Tech, Inc.



Section 2

References

1. Tetra Tech, Inc., 2006. *Indoor Air Quality Assessment Work Plan for Buildings A, B, C, and VLS, Lockheed Martin Middle River Complex*. November.
2. Tetra Tech, Inc., 2008. *Phase II Investigation Work Plan, Block I, Lockheed Martin Middle River Complex*. August.

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