PHASE I/II
REMEDIAL INVESTIGATION
WORK PLAN

Avery Dennison Facility
950 German Street NW
Lenoir, North Carolina

Site ID No. NONCD0001597

Prepared for:
Avery Dennison Corporation
8080 Norton Parkway
Mentor, Ohio 44060

Project No.: 1-0145-16

January 2015

The Johnson Company

ENVIRONMENTAL SCIENCE AND ENGINEERING SOLUTIONS

PARTNERS FOR SMART THINKING AND CREATIVE STRATEGIES

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Project No.: 1-0145-16
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1/13/15

REC PROGRAM DOCUMENT CERTIFICATION FORM - PAGE 1 OF 2
IHSB SITE NAME Avery Dennison (Fmr Paxar Corp)
DATE & NAME OF DOCUMENT Phase I/II Remedial Investigation Work Plan
TYPE OF SUBMITTAL (circle all that apply): Report, Work plan, Work Phase Comp. Statement, Schedule Change

REMEDIATING PARTY DOCUMENT CERTIFICATION STATEMENT (.0306(B)(2))

"I certify under penalty of law that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certification, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information."

Bruce Martin, Mgr. Remediation, Avery Dennison Corp.
Name of Remediating Party

Bruce Martin
Signature of Remediating Party

1-7-15
Date

NOTARIZATION

mass (Enter State)

Worcester COUNTY

I, Linda Kuindersma, a Notary Public of said County and State, do hereby certify that Bruce Martin did personally appear and sign before me this day, produced proper identification in the form of ma dr. license was duly sworn or affirmed, and declared that, to the best of his or her knowledge and belief, after thorough investigation, the information contained in the above certification is true and accurate, and he or she then signed this Certification in my presence.

WITNESS my hand and official seal this 7 day of Jan, 2015

Linda Kuindersma
Notary Public (signature)

(OFFICIAL SEAL)

My commission expires: _____.

Notary Public
Linda Kuindersma
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires June 19, 2020

Document Certification Form No. DC - I
(Revised 8/11)

REC PROGRAM DOCUMENT CERTIFICATION FORM - PAGE 2 OF 2
IHSB SITE NAME Avery Dennison (Fmr Paxar Corp)
DATE & NAME OF DOCUMENT Phase I/II Remedial Investigation Work Plar
TYPE OF SUBMITTAL (circle all that apply): Report, Work plan, Work Phase Comp. Statement, Schedule Change

REGISTERED SITE MANAGER CERTIFICATION OF SIGNATURES

As the Registered Environmental Consultant for the Site for which this filing is made, I certify that the signatures included herewith are genuine and authentic original handwritten signatures and/or true, accurate, and complete copies of the genuine and authentic original handwritten signatures of the persons who purport to sign for this filing. I further certify that I have collected through reliable means the originals and/or copies of said signatures from the persons authorized to sign for this filing who, in fact, signed the originals thereof. Those persons and I understand and agree that any copies of signatures have the same legally binding effect as original handwritten signatures, and I certify that any person for whom I am submitting a copy of their signature has provided me with their express consent to submit said copy. Additionally, I certify that I am authorized to attest to the genuineness and authenticity of the signatures, both originals and any copies, being submitted herewith and that by signing below, I do in fact attest to the genuineness and authenticity of all the signatures, both originals and copies, being submitted for this filing.

Robert L. Martin
Name of Registered Site Manager

Robert L Mart
Signature of Registered Site Manager

1/13/15
Date

REGISTERED SITE MANAGER DOCUMENT CERTIFICATION STATEMENT (.0306(b)(1))

"I certify under penalty of law that I am personally familiar with the information contained in this submittal, including any and all supporting documents accompanying this certification, and that the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete and complies with the Inactive Hazardous Sites Response Act N.C.G.S. 130A-310, et seq, and the remedial action program Rules 15A NCAC 13C .0300. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information."

Robert L. Martin
Name of Registered Site Manager

Robert L Mart
Signature of Registered Site Manager

1/13/15
Date

NOTARIZATION

North Carolina (Enter State)

Buncombe COUNTY

I, Tiffany Melissa Ward, a Notary Public of said County and State, do hereby certify that Robert L Martin did personally appear and sign before me this day, produced proper identification in the form of NC DL, was duly sworn or affirmed, and declared that, he or she is the duly authorized environmental consultant of the remediating party of the property referenced above and that, to the best of his or her knowledge and belief, after thorough investigation, the information contained in the above certifications is true and accurate, and he or she then signed these Certifications in my presence.

WITNESS my hand and official seal this 13th day of January 2015.

Tiffany Melissa Ward
Notary Public (Signature)

(OFFICIAL SEAL)

TIFFANY MELISSA WOOD NOTARY PUBLIC MCDOWELL COUNTY, NC

My commission expires: 10/22/19.

Document Certification Form No. DC - II
(Revised 8/11)

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1.0 INTRODUCTION

Avery Dennison Corporation (ADC) presently owns and operates a 140,000 square-foot garment label manufacturing facility (the Facility) that is located on approximately 34 acres of land at 950 on German Street Northwest in Lenoir, Caldwell County (the Property, also defined as the Site; see Figures 1-1 and 1-2). The history of Property ownership is described in Section 2. ADC acquired the Site from Paxar Corporation in 2007.

In November 2014, ADC entered into an Administrative Agreement with the Registered Environmental Consultant (REC) Program, Inactive Hazardous Sites Branch (IHSB), and North Carolina Department of Environment and Natural Resources (NCDENR) to conduct an REC-directed assessment and remediation of the Site pursuant to North Carolina General Statute (N.C.G.S.) 130A-310.9(c) (the Inactive Hazardous Sites Response Act) and 15A NCAC 13C .0300 (the REC Rules). The Administrative Agreement was executed by NCDENR on December 2, 2014; therefore, a final Remedial Investigation Report must be submitted before December 2, 2017.

This Phase I/II Remedial Investigation Work Plan (RIWP) provides: a summary of the known Site background and history, as reported in previous submittals to IHSB and as summarized in Section 2; a summary of results from the ongoing investigation of the Site – see Section 3; and a description of the next phase of Remedial Investigation (RI) activities to commence at the Site in 2015 – see Section 4. The RIWP has been prepared in accordance with the Inactive Hazardous Sites Response Act and the REC Rules.

Martin and Slagle GeoSciences, P.A. is the Registered Environmental Consultant of record. Robert L. Martin. L.G., R.S.M. is the Registered Site Manager for this project.

2.0 SITE DESCRIPTION AND BACKGROUND

2.1 SITE LOCATION

Street Address: 950 German Street Northwest
Lenoir, North Carolina 28645

Longitude: 81º33'33.12" W

Latitude: 35º55'11.16" N

2.2 SITE DESCRIPTION AND CURRENT OPERATIONS

The Site presently consists of an approximately 140,000 square-foot manufacturing building (the Facility) of slab-on-grade construction located on approximately 34 acres of land in a sparsely-developed mixed-use area of Lenoir. The Site layout is shown on Figure 1-2 and includes two adjacent parcels: an approximately 27 acre parcel that contains the Facility (Caldwell County Register of Deeds Book 970, Page 770) and an approximately 6.7 acre parcel that contains a 1,500 square-foot unoccupied residential structure northwest of the Facility (Caldwell County Register of Deeds Book 1143, Page 1830). Collectively, these two parcels are the Property. The Facility houses office space, warehouse space, and production facilities. The portion of the Property adjacent to the Facility to the northeast, east and south contains asphalt parking areas, asphalt driveways, a gravel parking area, and grass-covered areas. The Facility is connected to the municipal water supply and sanitary sewage systems. The remaining portions of the Property are mostly wooded and undeveloped with steep grades sloping to the southeast. Survey plats for both parcels are provided in Appendix A. Topographic maps showing the Property and surrounding area are included in the Background Summary Report (MSGA, 2011; see Appendix B).

Since approximately 1973, the Facility has been used for the manufacture of apparel labels (MSGA, 2011). Current operations at the Facility include: weaving polyester-based yarns into narrow fabrics; dyeing, bleaching and finishing of fabrics; screen printing; offset printing; thermal coating; hot stamping; cutting and folding; and packaging of labels. Chemical usage at

the Facility includes, or has included: urethane-based inks, toluene, methyl ethyl ketone (MEK), isopropyl acetate, isopropyl alcohol, N-methylpyrrolidone (NMP), glycol ether, heat transfer adhesives, chiller and boiler water treatment chemicals (anticorrosive/ anti-fungal), and diesel fuel (for boilers) (ERM, 2008a). Waste generation at the Facility includes, or has included: MEK, toluene, isopropyl alcohol, isopropyl acetate, and N-methylpyrrolidone; and ink blends containing toluene, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane (ERM, 2008a).

2.2 SURROUNDING LAND USE

The area surrounding the Property is shown on Figure 1-2. The Property is bordered by a small cemetery, wooded and undeveloped land, and residential properties to the north; a mix of residential development and wooded undeveloped land to the south and east; and a mix of wooded undeveloped land, residential development, and a church to the west. Commercial development is present approximately 4,600 feet southeast of the Property along Creekway Drive (ERM, 2008a).

2.3 PROPERTY OWNERSHIP AND OPERATIONAL HISTORY

Prior to 1964, the Property was mostly wooded and undeveloped. In 1964, Stylecraft Packaging, Inc. (Stylecraft) purchased the Property and built the original 50,000 square-foot portion of the Facility – see Figure 2-1. Stylecraft may have used the Facility for manufacturing of plastic packaging materials. The size of the Facility was approximately doubled in 1967 (MSGA, 2011) – see Figure 2-1.

Ownership of the Property transferred to Rospatch Lenoir, Inc. (Rospatch) in 1973. Beginning in 1973 and continuing to the present day, the Facility has been used for the manufacture of apparel labels (MSGA, 2011). Approximately 30,000 square feet of additional manufacturing space was added in 1988 when Paxar Lenoir, Inc. (Paxar) acquired the Property – see Figure 2-1. A mezzanine area of approximately 10,000 square feet was added internally to the Facility in 2003 for office space (MSGA, 2011). In 2009, a 5,000 square feet addition was

constructed at the southwestern corner of the Facility – see Figure 2-1. ADC has owned the Property and operated the Facility since its acquisition of Paxar Corporation in approximately June 2007. Additional information regarding the ownership and operational history is provided in the Background Summary Report (MSGA, 2011; see Appendix B).

In July 2013, two underground storage tanks (USTs) that were reportedly formerly used to store diesel fuel oil were excavated and removed from the Site. The USTs were 10,000 gallons and 12,000 gallons in capacity. A Tank Closure and Initial Abatement Action Report (MSGA, 2014) was submitted to NCDENR UST Section, Division of Waste Management, Asheville Regional Office (UST Section) in March 2014. The UST Section concluded that, after soil excavation, soil and groundwater quality meet the applicable standards and issued a Notice of No Further Action to ADC on April 14, 2014.

2.4 REGULATORY HISTORY

Voluntary environmental investigation activities began at the Site in 2007, corresponding with ADC's acquisition of the Property. ADC submitted investigation results to IHSB in 2011, 2012, and 2013. A summary of pertinent results from the historical documents and previous submittals is presented in Section 3 of this Work Plan, along with the most recent results from the ongoing groundwater investigation. The majority of previous investigation documents referenced in this report are presently available for download from the online "Site File" URL (https://edm.nc.gov/DENR-Portal/) NCDENR provided in its September 8, 2014 Notice of Administrative Agreement for the Site (NCDENR, 2014c). Documents referenced in this RIWP that are not currently available in the NCDENR "Site File" will be submitted to the REC Program under separate cover.

In its February 18, 2014 letter to ADC, IHSB determined the Site was eligible for the REC Program. In November 2014, ADC entered into an Administrative Agreement with the REC Program. The Administrative Agreement was executed by NCDENR on December 2, 2014.

2.4 LOCAL GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

The Property is located in the Inner Piedmont physiographic province near its boundary with the Blue Ridge Mountain province. According to the Geologic Map of North Carolina, the Property is underlain by intrusive migmatitic granitic gneiss in which biotite gneiss and amphibolite metamorphic rocks are common (NCGS, 1985). Soil cores collected from the Property show residuum and saprolite to depths ranging from approximately 70 to 115 feet below ground surface, underlain by weathered and competent rock. Depth to groundwater ranges from approximately 7 to 25 feet below ground surface in monitoring wells at the Property and groundwater hydraulic gradients are oriented southeast, approximately parallel to the slope of the surface topography. Vertical hydraulic gradients in saprolite at the Property vary by location and season, but are generally oriented upward. Figures depicting geology and potentiometric contours are included in Section 3 of this Work Plan.

There are two small streams on the Property, located along or near the southwest and eastern property boundaries (see Figure 1-2). The two small streams converge and flow southeastward into Spainhour Creek (identified as Blair Fork on some maps), which is located approximately 700 feet southeast of the Property. Spainhour Creek is part of the Catawba River drainage basin and is classified as a Class C surface water body, protected for secondary recreational use, fishing, and wildlife. According to Ms. Melanie Williams of NCDENR, Spainhour Creek is not on the Impaired Waters List, but has high levels of toxicity, fecal coliform bacteria, copper, turbidity, and nutrients (MSGA, 2011). Approximately two miles south from the Property, Spainhour Creek flows into Lower Creek. The portion of Lower Creek extending from its source to Caldwell County SR 1143 (approximately five miles southwest from the Property) is also classified as a Class C surface water body (NCDENR, 2014d) and is on the Impaired Waters List (MSGA, 2011).

2.5 SOURCES OF POTABLE WATER

Potable water is provided to the Facility and surrounding area by a public water supply managed by the City of Lenoir or Caldwell County. The source of the City of Lenoir and most of Caldwell County's public water is Rhodhiss Lake, located approximately 10 miles southeast of the Property, near Granite Falls, North Carolina.

The Background Summary Report (MSGA, 2011; see Appendix B) includes an "Inventory of All Wells, Springs, and Surface Water Intakes" used as sources of potable water within a one-half mile (2,640-feet) radius of the Property. MSGA performed a visual survey of the area and identified eight structures on private properties that appeared to be well covers. The approximate locations of those structures are shown on Figure 3 in the Background Summary Report. At that time, MSGA contacted Mack Edmisten, Director of Public Works for the City of Lenoir, to obtain a map showing the distribution of public water supply in the area surrounding the Property. According to Mr. Edmisten, all of the properties surrounding the Property have either city or county-supplied water (MSGA, 2011).

In July 2012, MSGA identified the postal addresses for the eight properties where well covers were observed in 2011, provided that list of addresses to the City of Lenoir, and requested confirmation that all eight properties currently have water service provided by the City of Lenoir. The City of Lenoir confirmed that all eight properties are connected to public water service. The water use survey was deemed complete on the basis that no groundwater receptors were identified within a one-half mile radius of the Property. Correspondence from the City of Lenoir that includes the list of addresses was submitted to IHSB in September 2012 (JCO, 2012), and was included in the documents available for download in the NCDENR "Site File" in September 2014.

2.6 ADDITIONAL SITE BACKGROUND INFORMATION

Additional Site background information is provided in the Background Summary Report (MSGA, 2011; see Appendix B) including:

- Hazardous Waste Management Practices
- Topographic Maps
- Environmentally Sensitive Areas
- Hazardous Substance List
- Environmental Permit History

3.0 SUMMARY OF PREVIOUS AND ONGOING ENVIRONMENTAL INVESTIGATIONS

3.1 PHASE I ENVIRONMENTAL ISSUES - FINDINGS & CONCLUSIONS REPORT: 2008

A Phase I environmental site assessment report was prepared for the Site by ERM (2008a) and identified four Areas of Potential Concern (APCs). The APCs are shown on Figure 3-1 and are summarized below:

- APC-1: Two 10,000-gallon diesel fuel oil USTs located on the northeast side of the Facility. These USTs were formerly used to store heating fuel for the Facility, and were removed in 2013. In April 2014, NCDENR UST Section issued a Notice of No Further Action pertaining to these USTs.
- APC-2: A former 1,500-gallon spill recovery vault, formerly located outside the southeastern exterior wall of the Facility. The vault was reportedly formerly connected to a spill recovery system, but was removed in fall 2009 as part of a Facility expansion project (MSGA, 2009).
- APC-3: A former bulk solvent unloading and storage area near the southern corner of the Facility. This area was formerly used to unload bulk solvents into above ground storage tanks (ASTs), which were located in the southern corner of the Facility until their removal in fall 2009 (MSGA, 2009).
- General APC: ERM (2008a) reported process water discharge into the sanitary sewer system via floor trench drains and subgrade piping. The discharge is assigned status as a General APC. Trench drains exist in the south-central portion of the Facility and subsurface connections to the sanitary sewer system are presumed to be located outside the southern exterior wall of the Facility.

3.2 LIMITED ENVIRONMENTAL INVESTIGATION REPORT: 2008

ERM collected 13 soil samples from seven borings and installed and sampled four shallow groundwater monitoring wells at the Property as part of a voluntary Limited Environmental Investigation conducted on behalf of ADC in October 2007. Results from ERM's 2007 investigation are presented and discussed in the Environmental Investigation Report (JCO, 2011). Environmental sampling locations from this and subsequent investigations are shown on Figure 3-2. Monitoring well construction and survey data are presented in Table 3-1.

Soil samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH) and/or metals. Soil analytical results are summarized on Figure

3-3. No VOC or SVOC analytes were detected in soil samples. Eight metals, including antimony, arsenic, beryllium, total chromium, copper, lead, nickel, and zinc, were detected in at least one soil sample. The detected metals are common naturally-occurring constituents in Piedmont soils, and their reported concentrations are within the range of background concentrations for Piedmont soils (Canova, 1999).

Groundwater samples collected by ERM in October 2007 were analyzed for TPH, SVOCs, and/or VOCs. Results are presented in Table 3-2. TPH were not detected. One SVOC, bis(2-Ethylhexyl)phthalate, was detected in a groundwater sample from monitoring well MW-4 at a concentration of 4.7 micrograms per liter (µg/L), above its current North Carolina 2L (NC 2L) groundwater quality standard of 3 µg/L. Later investigations eliminated bis(2-Ethylhexyl)phthalate as a constituent of concern at the Site; see Section 3.4. Two VOCs, acetone and toluene, were detected in groundwater at concentrations below their respective NC 2L standards.

3.3 TANK CLOSURE REPORTS

3.3.1 Tank Site Closure Report (MSGA, 2009)

In 2009, four steel above ground storage tanks (ASTs) and one concrete underground spill–control vault at the Property were decommissioned and removed. The ASTs had previously been used for storage of solvents including methyl ethyl ketone, toluene, isopropyl acetate, isopropyl alcohol, and 1,1,1-trichloroethane. Following removal of the tanks and supporting equipment (e.g., pipes, pumps, valves, etc.), soil and concrete samples were collected from beneath the former tanks and analyzed for VOCs. VOC concentrations in those samples are below IHSB Preliminary Soil Remediation Goals (PSRG). Decommissioning and removal of the ASTs and underground vault are described in Tank Site Closure Report (MSGA, 2009), which is located in the REC Program Site File as Appendix C to the Background Summary Report (MSGA, 2011). A more detailed summary of these activities and additional information regarding the

ownership and operational history is provided in the Background Summary Report (see Appendix B).

3.3.2 Tank Closure and Initial Abatement Report (MSGA, 2014)

In July 2013, two 10,000 gallon underground storage tanks (USTs) that were reportedly formerly used to store diesel fuel oil were excavated and removed from the Site. A UST Closure and Initial Abatement Action Report (MSGA, 2014) was submitted to NCDENR UST Section, Division of Waste Management, Asheville Regional Office (UST Section) in March 2014. The UST Section concluded that, after soil excavation, soil and groundwater quality meet the applicable standards and issued a Notice of No Further Action to ADC on April 14, 2014. The Tank Closure and Initial Abatement Report is on file with the UST Section.

3.4 ENVIRONMENTAL INVESTIGATION REPORT: 2011

JCO performed a Site reconnaissance and subsurface investigation in 2009 and 2010 to further characterize the subsurface and identify potential risk evaluation pathways. The Environmental Investigation Report (JCO, 2011) also summarized the findings from the Phase I report (ERM, 2008a) and incorporated results from the Limited Environmental Investigation Report (ERM, 2008b). The JCO report was submitted to IHSB in June, 2011.

3.4.1 Soil Gas Investigation

JCO installed and sampled 20 shallow and 5 deep soil gas probes beneath the Facility floor slab. All samples were analyzed for VOCs. Soil gas results are presented in Table 3-3. Twenty-three VOCs were detected in soil gas samples; only PCE exceeded NCDENR Division of Waste Management (DWM) Sub Slab and Exterior Soil Gas Screening Levels (SGSL)[1]. PCE concentrations in soil gas samples, which are presented in Figure 3-4, exceeded the applicable SGSL of 3,500 micrograms per cubic meter

[1] At the time soil gas sampling was performed at the Site, NCDENR did not have published soil gas screening levels. In this document, the 2009 soil gas results are compared to DWM SGSLs published in June 2014.

($\mu g/m^3$) in five samples, including three shallow (sub-slab) samples and two deeper soil gas samples. At the time the soil gas investigation was performed, PCE was used inside the Facility; therefore, its concentration in indoor air was regulated by OSHA. Indoor air sampling was performed in 2013, as described in Section 3.6.

3.4.2 Groundwater Investigation

JCO installed 12 groundwater monitoring wells in 2009 (MW5 S/D through MW7-S/D, MW8-1, MW8-3, MW9-1, MW9-3, MW10-1, and MW10-3; see Figure 3-2). The wells were installed in shallow/deep well cluster configurations at six locations adjacent to the eastern and southern exterior walls of the Facility. Shallow wells were installed with screens positioned in saprolite at or near the water table position. The deeper wells were installed in saprolite with screens positioned between approximately 65 and 70 feet depth below ground surface. In addition, five temporary monitoring wells (TMW-1 through TMW-5; see Figure 3-2) were installed near the southwestern exterior corner of the Facility to further investigate a one-time exceedance of the NC 2L groundwater standard for the SVOC bis(2-Ethylhexyl)phthalate at well MW-4, and to characterize shallow groundwater quality prior to construction of a Facility expansion in that area. Well installation and construction methods are described in the Environmental Investigation Report (JCO, 2011).

JCO collected groundwater samples from the temporary wells in March 2009, and from the permanent wells in September 2009 and April 2010. Bis(2-Ethylhexyl)phthalate was not detected in the samples from MW-4 or nearby temporary wells and was not detected in soil samples collected from the MW-4 soil boring or other nearby soil borings by ERM in 2007; therefore, bis(2-Ethylhexyl)phthalate was eliminated as a constituent of concern. PCE was the only compound detected in groundwater above NC 2L standards[2],

[2] Approximate concentrations of bromodichloromethane and 1,2-dichloroethane were reported in one groundwater sample collected in 2009 at levels that exceeded NC 2L standards, but were below the laboratory practical quantitation limits for those analytes. Neither analyte was detected above NC 2L standards in subsequent samples from that well or other locations at the Site.

in the sample from one shallow well (MW10-1) at a maximum of 3.4 micrograms per liter (µg/L), relative to the NC 2L standard of 0.7 µg/L (see Table 3-2).

Analysis of groundwater level data from September 2009 and April 2010 showed horizontal hydraulic gradients oriented south/southeast across the Site, indicating groundwater flow approximately paralleled the general slope of the Site.

3.5 BACKGROUND SUMMARY REPORT: 2011

Martin & Slagle GeoEnvironmental Associates performed a reconnaissance investigation and compiled available information about the Property and surrounding area in the Background Summary Report (MSGA, 2011). The information contained within the Background Summary Report satisfies most of the requirements for background information specified in Section 0.306(g) of the REC Rules. The Background Summary Report is available for download from REC Program "Site File" URL provided by NCDENR in its September 8, 2014 Notice of Administrative Agreement for the Site, and is also included as Appendix B to this document.

3.6 RECENT AND ONGOING INVESTIGATION ACTIVITIES

After submitting the Environmental Investigation Report to IHSB in June 2011, ADC continued voluntary groundwater and soil vapor intrusion investigations at the Site until the Site was admitted into the REC Program on December 2, 2014. During that period, ADC responded to requests for additional Site information and groundwater monitoring data from IHSB. Submittals to IHSB during that timeframe included a Site Cleanup Questionnaire (ADC, 2012); results from groundwater monitoring and a water supply usage survey in September 2012 (JCO, 2012); and results from groundwater monitoring and indoor air sampling performed in February 2013 (JCO, 2013). Results from the water supply usage survey are described in Section 2.5. A summary of other Site investigation activities, and results from activities performed during June 2011 to present, are presented herein.

3.6.1 Indoor Air Sampling

JCO performed indoor and outdoor air sampling in February 2013 as a component of the soil vapor intrusion assessment process described in the then-current IHSB Supplemental Guidelines for the Evaluation of Structural Vapor Intrusion Potential (NCDENR, 2011) and screening table (NCDENR, 2012). Nine indoor and two outdoor air samples were collected in February 2013 and were analyzed for five VOCs selected as described in the IHSB Supplemental Guidelines: 1,2,4-trimethylbenzene (1,2,4-TMB), chloroform, dichlorodifluoromethane (Freon-12), PCE, and trichloroethene (TCE).

Indoor and outdoor air sampling results are compared to current NCDENR DWM Indoor Air and Crawlspace Screening Levels (IASLs) in Table 3-4, and are shown on Figure 3-5. Only one of the five analytes (1,2,4-TMB) exceeded the applicable IASL, and was attributed to the presence of that compound in two products used within the Facility. 1,2,4-TMB concentrations in indoor air were more than three orders of magnitude below the federal workplace Recommended Exposure Limit (REL). PCE was detected in each of the indoor and outdoor air samples at concentrations ranging from 0.462 to 14.3 $\mu g/m^3$, which are below the current IASL of 35 $\mu g/m^3$.

3.6.2 Ongoing Groundwater Investigation

In February 2013, JCO installed shallow monitoring wells MW11-1 and MW12-1 (see Figure 3-2) to provide additional characterization of PCE in groundwater. Both wells are constructed of 2-inch diameter PVC with 10-feet of 0.010-inch slotted PVC well screen positioned across the approximate water table positions at their respective locations. The wells were installed inside hollow stem augers advanced using a Geoprobe all-terrain drill rig operated by a North Carolina-licensed driller in accordance with 15A NCAC 2C .0108. The location and elevation of each well was surveyed by a North Carolina-licensed land surveyor. Well construction and survey data are provided in Table 3-1.

In January 2014, JCO installed 21 additional saprolite monitoring wells at eight (8) well cluster locations. The wells installed in January 2014 were spaced vertically between and below existing well screens at cluster locations MW8, MW9, MW10, MW11, and MW12, and new monitoring well clusters were installed at locations MW13, MW14, and MW15 with up to four vertically depth-discrete wells each to form two transects downgradient from the Facility (see Table 3-1 and Figure 3-2). The wells were constructed of 1-inch diameter PVC with 10-feet of 0.010-inch slotted PVC well screen. Up to two depth-discrete wells were installed per boring, inside of nominal 6-inch-diameter temporary steel drill casing advanced using a Rotasonic drill rig. Soil borings advanced for the deep well installations at locations MW8 through MW14 were advanced through the saprolite using the 6-inch steel drill casing and terminated when competent rock was encountered, as indicated by the rate of drill bit advancement. The wells were installed by a North Carolina-licensed driller in accordance with 15A NCAC 2C .0108 and the location and elevation of each well was surveyed by a North Carolina-licensed land surveyor.

Groundwater monitoring was performed at the Site in July 2012, February and May 2013, and quarterly throughout 2014. Potentiometric data from quarterly monitoring events in 2014 are provided in Table 3-5, and Figure 3-6 depicts interpreted water table potentiometric contours for the most recent monitoring event, performed in November 2014.

The groundwater hydraulic gradient (and, by extension, the presumed groundwater flow direction) at the Site is oriented southeast, as indicated by the water table potentiometric contours shown on Figure 3-6. Groundwater flows southeast from beneath the facility, across the monitoring well transect comprised of wells MW8 through MW15, and toward a downgradient transect comprised of well clusters MW12 and MW13. The hydraulic gradient orientation has remained similar across multiple

monitoring events, and is approximately parallel to the general topographic slope of the Site.

A summary of groundwater VOC analytical results from all sampling events performed at the Site, which began in 2007, is provided in Table 3-2; and Figure 3-7 shows PCE concentrations in groundwater for the four most recent and comprehensive quarterly monitoring events performed in 2014. Cross-section orientations are depicted on Figure 3-8. Cross-section diagrams on Figure 3-9 show PCE concentrations in groundwater from the most recent sampling event, performed in November 2014.

Throughout the period from 2011 through 2014, PCE remained the only compound that exceeded NC 2L standards in groundwater. PCE exceeded the NC 2L groundwater standard at four of fourteen well cluster locations - MW10, MW11, MW13 and MW14 (see Figure 3-7) – but was not detected in well clusters MW9 and MW12 to the east, or MW15 to the west. PCE concentrations in groundwater at the downgradient MW13 cluster slightly exceeded NC 2L standards at intermediate depths within the saprolite unit (0.79 and 1.1 µg/L compared to the NC 2L standard of 0.7 µg/L); however, PCE was not detected in the water table well or deep saprolite well at MW13.

The highest PCE concentrations in groundwater were observed in intermediate-depth wells. PCE was detected in only one deep saprolite well (MW10-4), and at a concentration of 1.5 µg/L, slightly above the 0.7 µg/L NC 2L standard. At intermediate-depth well MW11-2, PCE concentrations were found to range from 190 µg/L in February 2014 to 1,300 µg/L in November 2014 (see Figure 3-7), exhibiting an increasing trend that will be evaluated in additional detail by the investigation activities prescribed herein.

4.0 REMEDIAL INVESTIGATION SCOPE OF WORK

The RI Scope of Work (SOW) presented in this document includes Phase I and Phase II RI activities. Phase I RI activities are associated with assessing the location and identity of hazardous substances, if any; and investigating areas known, suspected, or having a reasonable probability of being affected by hazardous constituents. Phase II RI activities are those which investigate the specific nature and extent of each constituent of concern. The previous and ongoing Site investigation work described in Section 3 includes Phase I and Phase II investigation activities already performed, and results from those investigations led to the identification of VOCs generally, and PCE specifically, as constituents of concern (COC) at the Site. Phase I and Phase II SOW are summarized briefly below, and described in detail in the following sections of this document.

4.1 PHASE I SOW OBJECTIVES AND SUMMARY

Phase I RI Objectives for this SOW are as follows:

- **Additionally assess VOC distribution below the Facility floor slab.** The MIP investigation will provide semi-quantitative data to assess the distribution and relative concentrations of shallow VOCs beneath the facility floor slab. Those results will inform the design of subsequent RI activities, if any.

- **Improve estimates for hydraulic gradient and shallow groundwater flow directions.** One upgradient monitoring well and one or more stream stage gauging stations will be installed. The addition of these points to the existing monitoring well network will improve the Site conceptual model for shallow groundwater flow and hydraulic gradient.

- **Gather data in support of establishing background concentrations of naturally occurring metals in soil and groundwater.** Metals occur naturally in soil and bedrock, and are often naturally dissolved in groundwater at concentrations greater than remediation guidelines. Site specific concentrations will be established using data to be collected and, if greater than the established guidelines, used to establish remedial goals.

A reconnaissance investigation will be performed utilizing Membrane Interface Probe (MIP) technology to assess the distribution of VOCs in shallow saprolite beneath the Facility floor slab. The MIP investigation area is shown on Figure 4-1; the MIP area encompasses PCE screening level exceedances in soil gas samples collected in 2009, and is located upgradient of observed PCE in groundwater. The MIP investigation will be performed in an adaptive manner based on real-time data obtained in the field.

A background monitoring well will be installed upgradient from the active portion of the Site (see MW18 on Figure 4-2). Soil and groundwater samples will be collected from this location for analysis of metals, as part of an assessment of background metals concentrations at the Site. Additional background sampling needed to complete the assessment of background metals concentrations will be described in a subsequent Work Plan.

A surface water stage gauge will be installed in the small tributary stream located south and southwest from the Facility. The gauge will consist of a metal staff driven into the stream bank immediately adjacent to the stream channel. The top of the staff will be surveyed and serve as a reference point for measuring surface water elevations. Surface water level data may be used in conjunction with shallow groundwater level data to evaluate groundwater flow patterns at the Site.

4.2 PHASE II SOW OBJECTIVES AND SUMMARY

Phase II RI Objectives for this SOW are as follows:

- **Delineate PCE in groundwater to NC 2L groundwater standards.** Five additional saprolite monitoring well clusters will be installed at the Site downgradient and cross-gradient from existing wells with PCE concentrations above NC 2L standards in groundwater. The addition of these monitoring wells to the existing network of monitoring wells will provide additional horizontal and vertical delineation of PCE.

- **Support temporal trend evaluation for VOC concentrations in groundwater.** Continued quarterly groundwater monitoring will add to the existing data set and will be used to evaluate the seasonal and longer-term stability of PCE distribution in groundwater.

- **Characterize hydrogeologic properties of saprolite.** Slug test results will be analyzed to estimate saprolite hydraulic conductivity in saprolite. Comparison of hydraulic conductivity estimates from multiple slug tests locations and depths may be used to evaluate potential spatial variation in the hydrogeologic characteristics of the saprolite.

Phase II SOW activities include the installation of monitoring wells at five locations (see MW16, MW17, MW19, MW20, and MW21 on Figure 4-2), performance of hydraulic response (slug tests), and groundwater monitoring. Comprehensive groundwater monitoring events will be performed quarterly throughout 2015. For each monitoring event, groundwater levels will be measured and groundwater samples collected from all existing monitoring wells at the Site. Groundwater samples will be analyzed for VOCs.

5.0 SAMPLING PLAN

5.1 SOIL

Approximately three soil samples will be collected from the soil boring advanced at location MW18 (see Figure 4-2) and submitted for laboratory analysis of metals. Analytical samples will be selected to represent distinct hydrogeologic units observed in the continuous soil core at that location. Three samples are anticipated: one each from 1) the upper residuum soil interval, 2) saprolite in the unsaturated zone above the seasonal high water table, and 3) saprolite below the water table. Additional samples may be collected if more than three distinct geological units are encountered between ground surface and the total depth of the soil boring. Collection of additional samples needed to complete an assessment of background metals concentrations in soil will be described in a subsequent Work Plan.

5.1.1 Soil Quality Assurance / Quality Control Field Samples

One blind duplicate soil sample will be collected and submitted for laboratory analysis of metals.

5.1.2 Analytical Parameters and Methods for Soil

Soil samples will be analyzed by a North Carolina-certified laboratory for hazardous substance list metals (totals analysis) including antimony, arsenic, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, thallium and zinc. Analyses will be performed using USEPA Methods.

5.2 GROUNDWATER

Groundwater samples will be collected from all existing monitoring wells on the Site once per quarter (i.e., at approximately three-month intervals) for laboratory analysis of VOCs, with the exception of background well MW18. MW18 will be sampled once for metals and VOCs as part of a larger program to establish background concentrations of those constituents at the Site. All groundwater samples collected for VOC analysis will be collected directly into sample containers without mixing.

5.2.1 Groundwater Quality Assurance / Quality Control Field Samples

One blind duplicate groundwater sample, one matrix spike sample, and one matrix spike duplicate sample will be collected per 20 primary groundwater samples collected from the Site. In addition, one equipment rinsate blank sample will be collected from each non-dedicated piece of equipment that comes into contact with groundwater samples per Site-wide monitoring event. A laboratory-supplied trip blank sample will be placed in each cooler and accompany field samples from the time they are collected until they are received by the laboratory for analysis. Groundwater QA/QC field samples will be analyzed for the VOC analyte list used for primary groundwater samples (see Appendix C).

5.2.2 Analytical Parameters and Methods for Groundwater

Groundwater samples will be analyzed by a North Carolina certified laboratory for the list of VOC analytes provided in Appendix C. Analyses will be performed using SW-846 EPA Method 8260.

6.0 PROCEDURES AND METHODS

Field activities performed during the remedial investigations will follow the applicable protocols established by the current version of the US Environmental Protection Agency Region IV Science and Ecosystem Support Division (SESD) *Field Branches Quality System and Technical Procedures*, unless specified otherwise in this Section of the RIWP**.** Applicable sections of the *Field Branches Quality System and Technical Procedures* are included in Appendix D of this document and will remain onsite at all times during performance of field activities. These include:

- SESD Operating Procedure Soil Sampling SESDPROC-300-R3
  Effective Date: August 21, 2014 (USEPA, 2014b)
- SESD Operating Procedure Groundwater Sampling SESDPROC-301-R3
  Effective Date: March 6, 2013 (USEPA, 2013b)
- SESD Operating Procedure Field Equipment Cleaning and Decontamination SESDPROC-205-R2
  Effective Date: December 20, 2011 (USEPA, 2011b)
- SESD Operating Procedure Management of Investigation Derived Waste SESDPROC-202-R3 Effective Date: July 3, 2014 (USEPA, 2014a)
- SESD Operating Procedure Packing, Marking, Labeling and Shipping of Environmental and Waste Samples SESDPROC-209-R2
  Effective Date: April 20, 2011 (USEPA, 2011a)

6.1 SAMPLE COLLECTION AND CUSTODY PROCEDURES

6.1.1 Soil Sample Collection Procedures

Soil samples will be collected using the procedures described in SESD Operating Procedure SESDPROC-300-R3 for Soil Sampling (USEPA, 2014b). Samples will immediately be placed on ice and transported under chain of custody protocol to the laboratory via courier as described in the SESD Operating Procedure SESDPROC-209-R2 for Packing, Marking, Labeling and Shipping of Environmental and Waste Samples (USEPA, 2011a).

6.1.2 Groundwater Sample Collection Procedures

Groundwater samples will be collected using low-flow "Tubing in Screened Interval" sampling methods as described in the SESD Operating Procedure for Groundwater Sampling, SESDPROC-301-R3 (USEPA, 2013b). The specific procedures to be used for RI groundwater sample collection are described below, and are the same as those used to perform groundwater sampling at the Site from 2009 through 2014, prior to Site participation in the REC Program.

Peristaltic pumps with dedicated disposable pump head tubing will be used for purging and sampling monitoring wells where the stabilized water level is within the suction limit of the pump (i.e., less than approximately 25 feet below the top of the well). Where the depth to water is greater than the suction limit, groundwater samples will be collected using a bladder pump. Groundwater sampling and purging will be performed using dedicated polyethylene tubing installed in each monitoring well. The sample tubing or pump intake will be positioned at the approximate midpoint of the wetted portion of the monitoring well screen.

Prior to sample collection, each monitoring well will be purged until at least one static well volume has been removed and stabilization of water quality parameters has been achieved as defined below. Water quality parameters will be measured using a multi-function meter installed in a flow-through cell connected to the groundwater pump discharge[3]. Meters used to measure water quality parameters will be calibrated at the beginning of each day, and at least one calibration check will be performed on each instrument per day. Water quality stabilization criteria will be as follows:

- Temperature ± 3%
- pH ± 0.1 unit
- Specific Conductance ± 5%

[3] Turbidity may be measured using a separate meter not connected to the flow-through cell equipment

- ORP ± 10 millivolts
- dissolved oxygen ± 10% or less than 0.5 mg/L
- turbidity ± 10 NTU or less than 10 NTU

The above-listed parameters plus depth to water, flow rate, and total purge volume will be recorded at regular time intervals as each well is purged. If field conditions necessitate deviations from the stability criteria specified above, those deviations will be recorded on the groundwater sample collection record (see Appendix D). The time interval between successive parameter readings will be approximately 3 to 5 minutes for typical wells, but may be longer for wells where particularly long purge times are required due to low rates of groundwater yield and/or large static well volumes.

Immediately prior to sampling, the flow-through cell used for measurement of water quality parameters and the associated tubing will be disconnected and the water sample will be collected directly from the pump discharge tubing at the surface. If a peristaltic pump is used, the sample will be collected from the discharge end of the dedicated disposable pump head tubing.

After collection, samples will be placed on ice and transported under chain of custody protocol to the laboratory via courier as described in the SESD Operating Procedure SESDPROC-209-R2 for Packing, Marking, Labeling and Shipping of Environmental and Waste Samples (USEPA, 2011a).

6.2 ANALYTICAL LABORATORY PROCEDURES

All field samples submitted for chemical analyses will be analyzed by a laboratory certified to perform those analyses in the State of North Carolina. The laboratory will use standard methods and adhere to QA/QC protocols established by those standard methods. The laboratory shall provide documentation of current certification and copies of QA/QC manuals and protocols upon request. The reporting package shall contain required documentation of

QA/QC activities. Laboratory reports submitted with RI reports will include the items listed below.

1. The laboratory report should state that the laboratory is either certified for applicable parameters under 15A NCAC Subchapter 2H .0800 and provide its certification number, or that it is a contract laboratory under EPA's Contract Laboratory Program.

2. A statement from the laboratory that the samples were received in good condition, at the required temperature and that analysis of the samples complied with all procedures outlined in the analytical method, unless otherwise specified. Any deviation from the methods, additional sample preparation, sample dilution and unrectified analytical problems, should be justified in a narrative with the laboratory report.

3. Laboratory sheets for all analytical results, including sample identification, sampling dates, date samples were received by laboratory, extraction dates, analysis dates, analytical methods used, dilution factors and sample quantitation limits.

   Note: The laboratory should provide written explanation for any sample having sample quantitation limits that exceed 10 times the USEPA method detection limits.

4. Laboratory sheets for all laboratory quality control samples, including results for bias and precision and control limits used. The following minimum laboratory quality control sample reporting is typical industry practice: (a) at least one matrix spike and one matrix spike duplicate per sample delivery group or 14-day period, whichever is more frequent (control limits should be specified); (b) at least one method blank per sample delivery group or 12-hour period, whichever is less; and (c) system monitoring compounds, surrogate recovery required by the method and laboratory control sample analysis (acceptance criteria should be specified). All samples which exceed control limits or acceptance criteria must be flagged in the laboratory report.

5. All constituents detected must be reported even if they were not definitively quantified. All estimated concentrations with data qualifiers must be reported.

6. Completed chain-of-custody with associated air bill (if applicable) attached.

7. The laboratory report should include the names of the individuals performing each analysis, the quality assurance officer reviewing the data and the laboratory manager.

8. The submitted data should include the laboratory summary sheet, laboratory results,

QA/QC results, and chain of custody documentation.

6.3 UNDERGROUND UTILITY CLEARANCE

JCO will coordinate underground utility clearance in the vicinity of the MIP investigation area and planned monitoring well installations prior to using subsurface drilling or probing equipment. Demarcation of underground utilities exterior to the Facility, including electrical, gas, sewer, water, and communication lines, will be coordinated through the North Carolina 811 public utility locating service. A private utility locating service will utilize electromagnetic induction, ground penetrating radar (GPR) and/or other methods as appropriate to locate and mark utilities below the concrete floor slab inside the Facility, and non-public utilities (i.e., storm water drainage infrastructure, sanitary sewer pipes, and buried electrical lines) exterior to the Facility. Prior to drilling, monitoring well locations MW16, MW17, MW19, MW20, and MW21 will be pre-excavated to a depth of approximately seven (7) feet using non-destructive vacuum methods.

6.4 MEMBRANE INTERFACE PROBE INVESTIGATION

A reconnaissance investigation will be performed in the approximate area shown on Figure 4-1 using Membrane Interface Probe (MIP) technology, a direct sensing system manufactured by Geoprobe Systems ® (Geoprobe) and operated by Geoprobe-certified contractors. The MIP system provides real-time semi-quantitative measurement of total VOC concentrations in the subsurface. The MIP system consists of a stainless steel probe containing a semi-permeable membrane located near its advancing tip. As the probe is advanced using direct-push drilling methods, VOCs present in soil, soil gas, and, when applicable, groundwater, penetrate the membrane and are detected using multiple instruments: typically, a photo-ionization detector (PID), and a flame ionization detector (FID), an electron capture detector (ECD), and a halogen-specific detector (XSD). A soil conductivity sensor, also located on the advancing tip of the MIP tool, provides a continuous log of soil conductivity with depth. Under some geologic conditions, these soil conductivity profiles can be used to identify the position of the water table and changes in lithology with depth. The response of each detector is recorded

electronically to produce continuous logs of detector response vs. depth below ground surface. The detector response logs are displayed almost instantaneously in the field allowing the user to identify the relative concentration of VOCs in the subsurface and select future probe locations in an adaptive manner based on those real-time results.

Figure 4-1 shows the approximate MIP investigation area at the Site. The MIP investigation will be performed in an adaptive manner; that is, real-time results will be reviewed as the investigation proceeds to identify optimal locations for subsequent exploration locations. Approximately 30 to 50 MIP locations may be investigated, depending on the actual contaminant distribution and physical access limitations that are encountered.

A concrete floor-coring tool will be used to cut an approximately 4-inch diameter hole through the Facility floor slab prior to advancing MIP equipment. MIP explorations generally will be advanced to refusal depth, but may be terminated at shallower depths at some locations if, for example, obstructions or other subsurface conditions are encountered that may damage the MIP equipment. Based on JCO's experience at sites with similar soil characteristics, a typical refusal depth of approximately 20 to 40 feet below ground surface is anticipated at the Site.

Once the targeted depth has been achieved at each MIP location, the MIP tool will be removed from the ground, and the probe hole sealed with granular bentonite or grout to ground surface. Bentonite or grout will be introduced from ground surface into each probe hole and added until the bentonite or grout level reaches the bottom elevation of the surrounding Facility floor slab. Bentonite, if used, will be hydrated with potable water. The hole through the Facility floor slab will be patched using concrete to a level flush with the surrounding floor surface.

MIP does not provide direct measurements of concentrations of VOCs in soil and groundwater, but rather provides a relative detector response to VOCs that are transported through the heated membrane at the tip of the MIP tool. Therefore, the intended use of the tool is to identify, on a relative basis, zones of high concentrations of VOCs. The results from the

MIP reconnaissance investigation will be used to design future efforts to characterize and/or remediate VOCs beneath the Facility floor slab, as applicable.

Geoprobe has developed a Standard Operating Procedure (SOP) for use with Geoprobe MIP tools and analytical equipment. Vironex, Inc. of Wilmington, Delaware (Vironex) will perform the MIP investigation field work. Vironex is a Geoprobe-trained and certified operator of the MIP equipment and will utilize the current Geoprobe SOP. The Geoprobe SOP is provided in Appendix D.

6.5 BOREHOLE DRILLING AND PHYSICAL CHARACTERIZATION

Drilling activities will be performed by a driller licensed in the State of North Carolina. JCO will record the following information during drilling activities:

- Drilling company;
- Date and time drilling activities are conducted;
- Weather conditions;
- Boring number and location;
- Type of drilling equipment;
- Sampling methods;
- Sample intervals;
- Photoionization detector (PID) soil screening results; and
- Geologic descriptions and changes in lithology.

One borehole will be drilled to the apparent top of competent bedrock at each proposed monitoring well cluster location (locations MW16, MW17, MW19, MW20, and MW21; see Figure 4-2) using Rotasonic drilling methods. Rotasonic drilling equipment utilizes ultrasonic vibrations to advance a nominal 4-inch–diameter core barrel and nominal 6-inch diameter steel casing to the target depth, typically in five to ten foot intervals. Upon reaching the desired depth with the core barrel, an outer casing is advanced to the same depth. The inner core barrel is then removed. At the surface, the core sample is extracted into clear polyethylene sleeves by vibrating the drill head.

Collection of continuous soil cores will be attempted from each soil boring. Lithologic classification of soils will be conducted in the field and recorded on Test Boring Reports, examples of which are provided in Appendix D. Soil descriptions will include the following: apparent moisture content, color, grain size, and other pertinent textural or mineralogical properties.

A photo-ionization detector (PID) will be used to screen soil cores for the presence of VOCs. At each one-foot depth interval along the retrieved soil core, the PID intake will be inserted into holes punctured through the polyethylene core sleeves and into the soil core material within approximately 5 minutes of core retrieval. The maximum PID reading at each screening depth will be recorded in the field.

6.6 MONITORING WELL INSTALLATION AND DEVELOPMENT

Five monitoring well clusters (MW16, MW17, MW19, MW20 and MW21; see Figure 4-2) will be installed south and approximately downgradient from the Facility, and one water-table monitoring well (MW18) will be installed north and upgradient from the Facility using rotasonic drilling methods. Drilling and well installation activities will be performed by a North Carolina-licensed driller and in accordance with 15A NCAC 2C .0108. The location and elevation of each monitoring well will be surveyed by a North Carolina-licensed land surveyor. The surveyor will provide horizontal coordinates for each well relative to the State Plane coordinate system, and reference elevations for water level measurements (e.g., top of PVC riser) will be accurate to within 0.01 feet.

Monitoring wells will be constructed of 1-inch diameter schedule 40 PVC well materials with 10-feet of machine-slotted 0.010-inch aperture well screen. A maximum of two wells will be installed in each nominal 6-inch diameter borehole. Annular space surrounding the well screens will be backfilled with clean filter sand to a height approximately 2 feet above the top of the slotted pipe. Above the filter sand, a bentonite seal that is a minimum of 2 feet in vertical

thickness will be installed and allowed to hydrate in place before grout is placed above the bentonite seal. Potable water will be applied to the borehole, if necessary, to hydrate the bentonite. The remaining annular space above the bentonite seal will be backfilled with neat cement or cement-bentonite grout in accordance with 15A NCAC 2C .0108. Annular space between shallow and deep well screens in the same borehole will be backfilled with bentonite chips. Monitoring wells will be completed at the surface with traffic-rated road boxes installed flush with the surrounding pavement. Well MW18 may alternately be installed with an above-ground protective cover equipped with a locking cap. A mechanical expansion plug secured with a padlock will be installed inside the top of each well riser.

After completion, monitoring wells will be developed by simultaneously surging and pumping the wells using inertial valve pumps (e.g., WaTerra pumps) with mechanized actuators. The volume of water removed and a description of the water clarity at each well will be recorded in the field. Well development will be deemed complete when water extracted from the wells using low-flow/low-stress pumping methods is visibly clear of sediment, and a minimum of five well volumes has been removed.

6.7 HYDRAULIC RESPONSE (SLUG) TESTS

Single well hydraulic response tests (slug tests) will be performed in approximately 10 to 15 monitoring wells at the Site using the procedures described in SOP-JCO-004 (see Appendix D). Results will be analyzed to obtain estimates of hydraulic conductivity for saprolite at the Site.

6.8 EQUIPMENT DECONTAMINATION PROCEDURES

Equipment decontamination procedures are described in SESD Operating Procedure SESDPROC-205-R2 for Field Equipment Cleaning and Decontamination (USEPA, 2011b). The drill rig, excavation equipment, and support vehicles will be inspected upon arrival to the Site to ensure that the vehicles do not leak oil, grease, or hydraulic fluid. Decontamination of downhole equipment will be performed prior to conducting Site activities, between sample locations, and at

the completion of the Site activities. Equipment will be cleaned with high-pressure potable water and scrubbed with a solution of detergent and potable water to remove all particulate matter, then rinsed with potable water. If necessary, the equipment will be steam cleaned. The equipment will be allowed to air dry.

6.9 INVESTIGATION-DERIVED WASTE

Management of Investigation Derived Waste (IDW) will be performed as described in SESD Operating Procedure SESDPROC-202-R3 for Management of Investigation Derived Waste (USEPA, 2014a). The RI activities described in this Work Plan are expected to produce the following types IDW:

- Soil cuttings from soil borings/monitoring well installations;
- Groundwater from monitoring well development and sampling;
- Equipment decontamination fluids;
- Packaging waste from monitoring well construction materials;
- Discarded tubing used for monitoring well development and sampling; and
- Personal protective equipment (PPE).

Soil and aqueous IDW will be segregated and securely contained on Site in DOT-approved 55-gallon drums or in bulk containers prior to characterization and transportation to an appropriate off-Site disposal facility. Other solid waste including used PPE, packing waste from monitoring well construction materials, discarded tubing used for monitoring well development and other miscellaneous refuse will be consolidated in garbage bags at the end of each day, sealed and added to the Facility's solid waste for off-Site disposal.

7.0 QUALITY ASSURANCE / QUALITY CONTROL

Quality assurance and quality control (QA/QC) protocols will follow standard operating procedures described in SESD Operating Procedure SESDPROC-011-R4 for Field Sampling Quality Control (USEPA, 2013a).

Field QA/QC samples associated with groundwater sampling will include a target of one blind duplicate, one matrix spike, and one matrix spike duplicate sample per 20 primary samples collected. Each blind duplicate sample will be assigned a unique identification such that its relationship to the associated primary sample is not apparent to the analytical laboratory. In addition, one equipment blank sample will be collected from each non-dedicated piece of equipment that comes into contact with groundwater samples per Site-wide monitoring event to verify the effectiveness of field decontamination procedures. Equipment rinsate blanks will be collected after the equipment has been decontaminated and will be accomplished by passing laboratory-provided analyte-free water over or through the piece equipment and collecting the rinsate for analysis. Finally, a laboratory-supplied trip blank sample will be placed in each cooler and accompany field samples from the time they are collected until they are received by the laboratory for analysis. Field QA/QC samples will be analyzed for the VOC analyte list used for primary field samples (see Appendix C).

Field QA/QC samples associated with background soil sampling will include one blind duplicate soil sample collected and submitted for laboratory analysis of metals. The blind duplicate sample will be assigned a unique identification such that its relationship to the associated primary sample is not apparent to the analytical laboratory.

8.0 REFERENCES

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TABLES

Table 3-1
Monitoring Well Construction Data
Former Paxar Facility
950 German Street
Lenoir, North Carolina

Well ID	Date of Installation	Easting	Northing	Measuring Point Elevation	Ground Elevation	Top of Screen (ft BGS)	Bottom of Screen (ft BGS)	Top of Sandpack (ft BGS)	Bottom of Sandpack (ft BGS)	Top of Screen Elevation (ft AMSL)	Bottom of Screen Elevation (ft AMSL)	Top of Sandpack Elevation (ft AMSL)	Bottom of Sandpack Elevation (ft AMSL)
MW-1	10/25/2007	1242433.16	799661.52	1143.51	1143.63	11.25	21.25	9.00	21.50	1132.38	1122.38	1134.63	1122.13
MW-2	10/25/2007	1242465.34	799609.38	1143.35	1143.54	13.50	23.50	11.50	23.50	1130.04	1120.04	1132.04	1120.04
MW-3	10/25/2007	1242468.77	799662.88	1142.93	1143.21	9.50	19.50	7.50	19.60	1133.71	1123.71	1135.71	1123.61
MW-5S	8/28/2009	1242509.20	799589.42	1142.69	1142.95	20.20	24.90	17.00	26.00	1122.75	1118.05	1125.95	1116.95
MW-5D	8/27/2009	1242511.41	799585.78	1142.72	1142.92	65.10	69.80	62.00	70.50	1077.82	1073.12	1080.92	1072.42
MW-6S	8/30/2009	1242555.64	799537.29	1142.55	1142.74	25.00	29.70	22.00	31.00	1117.74	1113.04	1120.74	1111.74
MW-6D	8/29/2009	1242558.51	799534.43	1142.52	1142.75	65.10	69.80	63.00	70.50	1077.65	1072.95	1079.75	1072.25
MW-7S	9/11/2009	1242550.22	799479.86	1141.94	1142.04	27.00	31.70	24.00	32.50	1115.04	1110.34	1118.04	1109.54
MW-7D	9/11/2009	1242560.98	799473.22	1141.64	1141.81	65.00	69.70	62.50	70.50	1076.81	1072.11	1079.31	1071.31
MW8-1	8/31/2009	1242534.46	799417.40	1141.32	1141.23	29.00	33.70	26.00	35.00	1112.23	1107.53	1115.23	1106.23
MW8-2	1/11/2014	1242532.45	799429.11	1142.52	1142.79	45.25	54.75	42.00	56.00	1097.54	1088.04	1100.79	1086.79
MW8-3	8/31/2009	1242538.94	799420.16	1140.73	1140.78	64.90	69.60	62.00	70.50	1075.88	1071.18	1078.78	1070.28
MW8-4	1/11/2014	1242532.42	799428.95	1142.61	1142.79	75.10	77.75	71.00	79.00	1067.69	1065.04	1071.79	1063.79
MW9-1	9/9/2009	1242491.93	799350.36	1136.16	1136.48	24.00	28.70	21.20	30.00	1112.48	1107.78	1115.28	1106.48
MW9-2	1/15/2014	1242493.76	799353.95	1136.75	1137.00	40.00	49.60	38.00	51.00	1097.00	1087.40	1099.00	1086.00
MW9-3	9/9/2009	1242497.57	799353.55	1136.08	1136.49	65.00	69.70	61.60	70.50	1071.49	1066.79	1074.89	1065.99
MW9-4	1/15/2014	1242493.47	799353.70	1136.67	1137.00	74.00	78.60	72.00	80.00	1063.00	1058.40	1065.00	1057.00
MW10-1	9/1/2009	1242419.12	799337.97	1143.45	1143.67	28.00	32.70	25.30	34.00	1115.67	1110.97	1118.37	1109.67
MW10-2	1/17/2014	1242424.14	799336.16	1142.18	1142.48	40.35	49.70	38.00	51.00	1102.13	1092.78	1104.48	1091.48
MW10-3	1/18/2014	1242416.97	799331.83	1142.17	1142.37	60.00	69.60	58.00	71.00	1082.37	1072.77	1084.37	1071.37
MW10-4	1/17/2014	1242424.15	799336.01	1142.16	1142.48	74.00	83.60	72.00	85.00	1068.48	1058.88	1070.48	1057.48
MW11-1	2/4/2013	1242382.01	799310.55	1142.60	1142.90	20.00	30.00	18.00	30.30	1122.90	1112.90	1124.90	1112.60
MW11-2	1/13/2014	1242378.34	799308.83	1142.55	1142.77	40.00	49.75	38.00	51.00	1102.77	1093.02	1104.77	1091.77
MW11-3	1/14/2014	1242385.69	799312.79	1142.47	1142.83	59.25	68.75	57.00	70.00	1083.58	1074.08	1085.83	1072.83
MW11-4	1/13/2014	1242378.47	799309.01	1142.57	1142.77	76.25	80.75	74.00	82.00	1066.52	1062.02	1068.77	1060.77
MW12-1	2/4/2013	1242381.88	799259.00	1117.64	1118.44	4.00	13.90	2.00	18.00	1114.44	1104.54	1116.44	1100.44
MW12-2	1/19/2014	1242605.73	799238.41	1116.14	1116.23	31.00	40.60	29.00	42.00	1085.23	1075.63	1087.23	1074.23
MW12-3	1/19/2014	1242605.84	799238.32	1116.21	1116.23	60.00	69.60	58.00	71.00	1056.23	1046.63	1058.23	1045.23
MW13-1	1/10/2014	1242500.45	799233.22	1125.69	1125.90	13.00	22.60	8.00	24.00	1112.90	1103.30	1117.90	1101.90
MW13-2	1/10/2014	1242500.32	799233.03	1125.61	1125.90	42.00	51.60	40.00	53.00	1083.90	1074.30	1085.90	1072.90
MW13-3	1/9/2014	1242505.26	799236.62	1125.58	1125.92	71.00	81.00	69.00	82.00	1054.92	1044.92	1056.92	1043.92
MW13-4	1/9/2014	1242505.12	799236.46	1125.56	1125.92	105.25	114.60	103.00	116.00	1020.67	1011.32	1022.92	1009.92
MW14-1	1/12/2014	1242325.86	799249.08	1142.29	1142.70	19.00	28.75	16.00	30.00	1123.70	1113.95	1126.70	1112.70
MW14-2	1/12/2014	1242321.20	799246.01	1142.39	1142.70	40.00	48.75	38.00	51.00	1102.70	1093.95	1104.70	1091.70
MW14-3	1/12/2014	1242326.03	799248.97	1142.31	1142.70	59.00	68.75	57.00	70.00	1083.70	1073.95	1085.70	1072.70
MW15-1	1/13/2014	1242171.64	799289.15	1145.93	1146.08	20.00	29.75	17.00	31.00	1126.08	1116.33	1129.08	1115.08
MW15-2	1/13/2014	1242171.43	799289.38	1145.92	1146.08	40.00	49.75	38.00	51.00	1106.08	1096.33	1108.08	1095.08

Notes:
1) "NA" = Not Applicable.
2) "ft BGS" = Feet Below Ground Surface.
3) "ft AMSL" = Feet Above Mean Sea Level.
4) Horizontal Survey Datum = NGVD88 (feet); Vertical Survey Datum = North Carolina State Plane NAD83 (feet).
5) State Plane Coordinates and Elevations obtained from Western Carolina Surveyors, P.A.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-2	MW-2
	Sample Date:	9/16/2009	4/7/2010	7/18/2012	2/26/2014	6/3/2014	8/19/2014	11/19/2014	9/16/2009	9/16/2009 Duplicate
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18	ND < 2.18
Benzene	1	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	**J 0.13**	**J 0.14**
Bromodichloromethane	0.6	ND < 0.076	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.076	ND < 0.076
2-Butanone (MEK)	4,000	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.544
Chloroform	70	ND < 0.079	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.079	ND < 0.079
Dibromochloromethane	0.4	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.09
1,1-Dichloroethane	6	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.074
1,2-Dichloroethane	0.4	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.079
cis-1,2-Dichloroethene	70	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	**J 0.64**	**J 0.77**
trans-1,2-Dichloroethene	100	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.089
Dichloromethane (Methylene chloride)	5	**J 0.22**	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	**J 0.46**	**J 0.36**
Methyl iodide	--	ND < 0.042	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042	ND < 0.042
p-Isopropyltoluene	--	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.048
Methyl tert-butyl ether (MTBE)	20	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.067
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	**J 0.15**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	**J 0.24**	**J 0.29**
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	**J 0.21**	**J 0.21**
1,2,4-Trimethylbenzene	400	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.065
m&p-Xylene	500	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.098

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3
	Sample Date:	4/7/2010	7/18/2012	2/25/2014	6/6/2014	8/21/2014	11/21/2014	9/16/2009	4/7/2010	7/18/2012
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	**0.55**	**0.8**	**0.58**	ND < 0.065	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.076	ND < 0.063	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.079	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	**J 0.64**	ND < 0.076	**0.53**	ND < 0.076	ND < 0.076	ND < 0.076	**3.5**	**3.9**	**3.8**
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089	**J 0.97**	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.098	ND < 0.45	ND < 0.44
Methyl iodide	--	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042	--	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	**0.54**	**1.6**	**2.5**	**3.5**	ND < 0.067	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	**J 0.2**	ND < 0.042	ND < 0.042
Trichloroethene	3	**J 0.73**	ND < 0.054	**0.77**	**0.72**	**0.75**	**0.61**	**1.05**	**J 1.3**	**1.5**
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW-3	MW-3	MW-3	MW-3	MW-4	MW-5D	MW-5D	MW-5D	MW-5D
	Sample Date:	2/28/2014	6/4/2014	8/20/2014	11/19/2014	3/16/2009	9/16/2009	4/6/2010	7/18/2012	2/25/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.065	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.076	ND < 0.076	ND < 0.063	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.079	**J 0.22**	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	**1.3**	**1.7**	**2.2**	**2.9**	ND < 0.065	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	**0.61**	ND < 0.089	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.098	ND < 0.098	ND < 0.45	ND < 0.44	ND < 0.44
Methyl iodide	--	**J 4.4**	ND < 0.45	**J 0.77**	ND < 0.45	ND < 0.042	ND < 0.042	--	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.076	**J 0.11**	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	**0.55**	**0.68**	**0.81**	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	**J 0.12**	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW-5D	MW-5D	MW-5D	MW-5S	MW-5S	MW-5S	MW-5S	MW-5S	MW-5S
	Sample Date:	6/3/2014	8/19/2014	11/18/2014	9/16/2009	4/6/2010	7/18/2012	2/25/2014	6/3/2014	8/19/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	**J 0.12**	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.076	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.079	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	**1.22**	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.098	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	**J 0.17**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW-5S	MW-6D	MW-6D	MW-6D	MW-6D	MW-6D	MW-6D	MW-6D	MW-6S
	Sample Date:	11/18/2014	9/16/2009	4/5/2010	7/17/2012	2/26/2014	6/4/2014	8/20/2014	11/19/2014	9/15/2009
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18
Benzene	1	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.065
Bromodichloromethane	0.6	ND < 0.062	ND < 0.076	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.076
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544
Chloroform	70	ND < 0.089	**J 0.19**	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.079
Dibromochloromethane	0.4	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09
1,1-Dichloroethane	6	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	**J 0.32**
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.098	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	**J 0.45**
Methyl iodide	--	ND < 0.45	ND < 0.042	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042
p-Isopropyltoluene	--	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	**J 0.16**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	**J 0.23**
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	**J 0.21**
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065
m&p-Xylene	500	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW-6S	MW-6S	MW-6S	MW-6S	MW-6S	MW-6S	MW-7D	MW-7D	MW-7D
	Sample Date:	4/5/2010	7/17/2012	2/26/2014	6/4/2014	8/20/2014	11/19/2014	9/17/2009	4/5/2010	7/17/2012
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	**J 0.11**	ND < 0.063	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	**1.01**	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.065	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	**J 0.34**	ND < 0.45	ND < 0.44
Methyl iodide	--	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042	--	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	**J 0.2**	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW-7D	MW-7D	MW-7D	MW-7D	MW-7S	MW-7S	MW-7S	MW-7S	MW-7S
	Sample Date:	2/25/2014	6/3/2014	8/19/2014	11/20/2014	9/17/2009	4/5/2010	7/17/2012	2/25/2014	6/3/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.076	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.079	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.098	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042	--	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	**J 0.2**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
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4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW-7S	MW-7S	MW8-1	MW8-1	MW8-1	MW8-1	MW8-1	MW8-1	MW8-1
	Sample Date:	8/19/2014	11/20/2014	9/15/2009	4/6/2010	7/17/2012	2/26/2014	6/4/2014	8/20/2014	11/20/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	**J 2.85**	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.076	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.079	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	**J 0.37**	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	**J 0.07**	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	**J 0.53**	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.042	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	**J 0.3**	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	**J 0.26**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW8-2	MW8-2	MW8-2	MW8-2	MW8-3	MW8-3	MW8-3	MW8-3	MW8-3
	Sample Date:	2/27/2014	6/3/2014	8/19/2014	11/18/2014	9/17/2009	4/6/2010	7/17/2012	2/26/2014	2/26/2014 Duplicate
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	**J 0.38**	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	**2.4**	ND < 0.089	ND < 0.089	ND < 0.089	**2.58**	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	**J 0.18**	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042	--	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	**0.54**	ND < 0.042	ND < 0.042	**J 0.21**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW8-3	MW8-3	MW8-3	MW8-3	MW8-3	MW8-3	MW8-4	MW8-4	MW8-4
	Sample Date:	6/4/2014	6/4/2014 Duplicate	8/20/2014	8/20/2014 Duplicate	11/20/2014	11/20/2014 Duplicate	2/27/2014	6/3/2014	8/19/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW8-4	MW9-1	MW9-1	MW9-1	MW9-1	MW9-1	MW9-1	MW9-1	MW9-2
	Sample Date:	11/18/2014	9/15/2009	4/6/2010	7/18/2012	2/28/2014	6/5/2014	8/19/2014	11/19/2014	2/26/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.076	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.079	ND < 0.089	ND < 0.089	**2.9**	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	**J 0.11**	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.098	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.042	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	**J 0.21**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW9-2	MW9-2	MW9-2	MW9-3	MW9-3	MW9-3	MW9-3	MW9-3	MW9-3
	Sample Date:	6/3/2014	8/19/2014	11/19/2014	9/17/2009	4/7/2010	7/18/2012	2/27/2014	6/5/2014	8/19/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	**J 2.23**	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	**J 0.78**	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	**J 2.5**	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	**7**	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	**J 0.18**	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	**J 0.72**	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	**J 0.28**	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	**J 0.23**	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	**J 0.82**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	**J 0.17**	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW9-3	MW9-4	MW9-4	MW9-4	MW9-4	MW10-1	MW10-1	MW10-1	MW10-1
	Sample Date:	11/19/2014	2/27/2014	6/5/2014	8/19/2014	11/18/2014	9/15/2009	4/6/2010	7/17/2012	2/6/2013
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.076	ND < 0.063	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.079	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.098	ND < 0.45	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.042	--	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	**1.74**	**3.4**	**9.8**	**12**
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	**J 0.4**	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW10-1	MW10-1	MW10-1	MW10-1	MW10-1	MW10-1	MW10-1	MW10-2	MW10-2
	Sample Date:	2/6/2013	5/22/2013	5/22/2013	2/26/2014	6/4/2014	8/20/2014	11/19/2014	2/26/2014	6/5/2014
		Duplicate		Duplicate						
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	**1.1**	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	**12**	**15**	**14**	**24**	**32**	**41**	**48**	**24**	**32**
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW10-2	MW10-2	MW10-3	MW10-3	MW10-3	MW10-3	MW10-3	MW10-3	MW10-3
	Sample Date:	8/20/2014	11/19/2014	9/15/2009	4/6/2010	4/6/2010 Duplicate	7/17/2012	7/17/2012 Duplicate	2/6/2013	5/22/2013
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 2.18	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.065	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.076	ND < 0.063	ND < 0.063	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.544	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	**0.54**	**1.44**	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.09	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.074	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.079	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.065	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.089	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.098	ND < 0.45	ND < 0.45	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.042	--	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.048	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.067	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	**38**	**45**	**J 0.67**	ND < 0.069	ND < 0.069	**5**	**5.2**	**5.3**	**6**
Toluene	600	ND < 0.042	ND < 0.042	**J 0.21**	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.065	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.098	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW10-3	MW10-3	MW10-3	MW10-3	MW10-4	MW10-4	MW10-4	MW10-4	MW11-1
	Sample Date:	2/26/2014	6/4/2014	8/20/2014	11/19/2014	2/26/2014	6/5/2014	8/20/2014	11/19/2014	2/6/2013
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	**0.56**
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	**5.2**	**6.9**	**6**	**6.4**	**0.68**	**1.3**	**1.2**	**1.5**	**0.86**
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW11-1	MW11-1	MW11-1	MW11-1	MW11-1	MW11-2	MW11-2	MW11-2	MW11-2
	Sample Date:	5/22/2013	2/25/2014	6/4/2014	8/20/2014	11/20/2014	2/25/2014	6/4/2014	8/20/2014	11/20/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	**0.57**	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	**0.6**	**1.1**	**1.1**	**1**	ND < 0.089	**6.5**	**0.74**	**0.75**	**0.89**
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	**1.2**	**1**	**1.3**	**1.5**	**1.4**	**190**	**440**	**660**	**1300**
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW11-3	MW11-3	MW11-3	MW11-3	MW11-3	MW11-3	MW11-3	MW11-3	MW11-4
	Sample Date:	2/25/2014	2/25/2014 Duplicate	6/4/2014	6/4/2014 Duplicate	8/21/2014	8/21/2014 Duplicate	11/20/2014	11/20/2014 Duplicate	2/25/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	**0.88**
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	**92**	**97**	**93**	**94**	**99**	**100**	**110**	**110**	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	**0.75**
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW11-4	MW11-4	MW11-4	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1
	Sample Date:	6/4/2014	8/20/2014	11/20/2014	2/6/2013	5/22/2013	2/28/2014	6/5/2014	8/21/2014	11/21/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
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6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW12-2	MW12-2	MW12-2	MW12-2	MW12-3	MW12-3	MW12-3	MW12-3	MW13-1
	Sample Date:	2/27/2014	6/5/2014	8/21/2014	11/21/2014	2/27/2014	6/5/2014	8/21/2014	11/21/2014	2/27/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW13-1	MW13-1	MW13-1	MW13-2	MW13-2	MW13-2	MW13-2	MW13-3	MW13-3
	Sample Date:	6/6/2014	8/21/2014	11/21/2014	2/27/2014	6/5/2014	8/21/2014	11/21/2014	2/27/2014	6/5/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	**0.52**	**0.52**	**0.79**	**0.8**	**0.92**
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW13-3	MW13-3	MW13-4	MW13-4	MW13-4	MW13-4	MW14-1	MW14-1	MW14-1
	Sample Date:	8/21/2014	11/21/2014	2/27/2014	6/5/2014	8/21/2014	11/21/2014	2/25/2014	6/3/2014	8/21/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	**5.8**	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	**0.94**	**1.1**	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	**1.3**	**2.4**	**1.2**
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
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8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW14-1	MW14-2	MW14-2	MW14-2	MW14-2	MW14-3	MW14-3	MW14-3	MW14-3
	Sample Date:	11/20/2014	2/25/2014	6/3/2014	8/21/2014	11/20/2014	2/26/2014	6/3/2014	8/21/2014	11/20/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**									
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	**1.4**	**1.3**	**2.3**	**1.4**	**2.5**	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-2
Groundwater Analytical Results – Volatile Organic Compounds (VOCs):
2007-2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

	Sample Location:	MW15-1	MW15-1	MW15-1	MW15-1	MW15-2	MW15-2	MW15-2	MW15-2
	Sample Date:	2/27/2014	6/5/2014	8/21/2014	11/19/2014	2/27/2014	6/5/2014	8/21/2014	11/20/2014
Volatile Organic Compound (VOC)	**North Carolina 2L GW Standards**								
Acetone	6,000	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62	ND < 0.62
Benzene	1	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072	ND < 0.072
Bromodichloromethane	0.6	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062	ND < 0.062
2-Butanone (MEK)	4,000	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9	ND < 0.9
Chloroform	70	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089	ND < 0.089
Dibromochloromethane	0.4	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3	ND < 0.3
1,1-Dichloroethane	6	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096	ND < 0.096
1,2-Dichloroethane	0.4	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14	ND < 0.14
cis-1,2-Dichloroethene	70	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076	ND < 0.076
trans-1,2-Dichloroethene	100	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12	ND < 0.12
Dichloromethane (Methylene chloride)	5	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44	ND < 0.44
Methyl iodide	--	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45	ND < 0.45
p-Isopropyltoluene	--	**0.61**	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065	ND < 0.065
Methyl tert-butyl ether (MTBE)	20	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07	ND < 0.07
Tetrachloroethene	0.7	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
Toluene	600	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042	ND < 0.042
Trichloroethene	3	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054	ND < 0.054
1,2,4-Trimethylbenzene	400	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048	ND < 0.048
m&p-Xylene	500	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081	ND < 0.081

Notes:
1) All concentrations are expressed in micrograms per liter (µg/L).
2) Only compounds detected in groundwater are included in this table.
3) Detected concentrations shown in **BOLD** type.
4) Exceedances of the NC 2L GW Standards are shaded yellow.
5) Results with bold outlines may exceed NC 2L GW Standards; these results are approximate concentrations below the laboratory Practical Quantitation Limit (PQL).
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
8) North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.
9) Results for m&p xylene are compared to North Carolina 2L GW Standard for m-, p- and o-xylene.
10) "--" = No applicable standard, or not analzyed.

Table 3-3
Soil Gas Analytical Results – VOCs: March 2009
Former Paxar Facility
950 German Street
Lenoir, North Carolina

Analyte	Sample Location ID: / Sample Date: / Sub Slab and Exterior Soil Gas Screening Level (SGSL) (ug/m3)	SV-1S 3/26/2009	SV-2S 3/26/2009	SV-3S 3/26/2009	SV-4S 3/26/2009	SV-5S 3/26/2009	SV-6S 3/26/2009	SV-6D 3/26/2009	SV-7S 3/26/2009	SV-7D 3/26/2009
Acetone	2,720,000	**59**	ND < 81	**18**	**17**	ND < 14	ND < 17	**180**	ND < 8.5	ND < 17
2-Butanone (MEK)	438,000	ND < 12	ND < 25	**13 J**	**16 J**	ND < 4.3	**20 J**	**3,500 J**	ND < 2.6	ND < 5.4
Carbon Disulfide	61,300	**62**	ND < 110	**34**	**52**	ND < 18	**32**	ND < 200	**27**	ND < 23
Chloroform	533	ND < 20	ND < 42	ND < 4.4	**23**	ND < 7.1	ND < 8.9	ND < 79	**13**	**22**
Chloromethane	7,880	ND < 8.5	ND < 18	ND < 1.8	ND < 2	ND < 3	ND < 3.8	ND < 33	ND < 1.8	ND < 3.8
trans-1,2-Dichloroethene	--	ND < 16	ND < 34	ND < 3.5	ND < 3.9	ND < 5.8	ND < 7.2	ND < 64	ND < 3.5	ND < 7.2
Ethanol	--	ND < 31	ND < 64	ND < 6.7	ND < 7.4	ND < 11	ND < 14	ND < 120	ND < 6.7	ND < 14
Ethylbenzene	4,910	ND < 18	ND < 37	ND < 3.9	ND < 4.2	ND < 6.3	ND < 7.9	ND < 70	ND < 3.9	ND < 7.9
4-Ethyltoluene	--	ND < 20	ND < 42	ND < 4.4	**9.5**	ND < 7.2	ND < 9	ND < 79	ND < 4.4	ND < 9
Freon-11 (Trichlorofluoromethane)	61,300	ND < 23	ND < 48	ND < 5	ND < 5.5	ND < 8.2	ND < 10	ND < 90	ND < 5	ND < 10
Freon-12 (Dichlorodifluoromethane)	8,760	ND < 20	ND < 42	ND < 4.4	ND < 4.8	**520**	**600**	ND < 80	ND < 4.4	ND < 9
Freon-113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	2,630,000	ND < 31	ND < 66	ND < 6.8	ND < 7.5	ND < 11	ND < 14	ND < 120	ND < 6.8	ND < 14
Isopropyl Alcohol	--	ND < 40	ND < 84	ND < 8.8	ND < 9.6	ND < 14	**49**	**2,000**	ND < 8.8	ND < 18
Methylene Chloride	52,600	**26**	ND < 30	**8.5**	**11**	ND < 5.1	ND < 6.4	ND < 56	**12**	ND < 6.4
Tetrachloroethene	3,500	ND < 28	ND < 58	**19**	**100**	**180**	**120**	ND < 110	**260**	**980**
Tetrahydrofuran	175,000	ND < 48	**110**	ND < 10	110	ND < 17	ND < 22	ND < 190	ND < 10	ND < 22
Toluene	438,000	ND < 15	ND < 32	**9.4**	**19**	ND < 5.5	ND < 6.9	**280**	**6.5**	ND < 6.9
1,1,1-Trichloroethane	438,000	ND < 22	ND < 47	**5**	**22**	**12**	**17**	ND < 88	**7.4**	ND < 10
Trichloroethene	175	ND < 0.88	ND < 1.8	**0.43**	**0.87**	ND < 0.31	ND < 0.39	ND < 3.5	ND < 0.19	**0.93**
1,2,4-Trimethylbenzene	613	ND < 20	ND < 42	**7.2**	**10**	ND < 7.2	ND < 9	ND < 79	**16**	ND < 9
1,3,5-Trimethylbenzene	--	ND < 20	ND < 42	ND < 4.4	**6.5**	ND < 7.2	ND < 9	ND < 79	ND < 4.4	ND < 9
m,p-Xylene	8,760*	ND < 18	ND < 37	**6.9**	**8.4**	ND < 6.3	ND < 7.9	ND < 70	**8.9**	ND < 7.9
o-Xylene	8,760	ND < 18	ND < 37	ND < 3.9	**9.4**	ND < 6.3	ND < 7.9	ND < 70	ND < 3.9	ND < 7.9

Notes:
1) All values expressed in micrograms per cubic meter ($\mu g/m^3$).
2) NCDENR DWM Non-Residential Sub Slab and Exterior Soil Gas Screening Levels Updated June 2014.
3) Only compounds detected in Soil Gas are included in this table.
4) Volatile organic compounds analyzed by Air Toxics Ltd. of Folsom, CA per modified EPA Method TO-15.
5) "--" = SGSL not established for this compound.
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) Detected concentrations shown in **BOLD** type.
8) Shaded values exceed SGSL.
9) Sub-slab (shallow) samples are designated with an "S" suffix. Deeper soil gas samples (10'-14' below grade) are designated with a "D" suffix.
10) Results flagged with a 'J' qualifier are estimated due to high bias of MEK in the continuing calibration verfication (CCV) sample for one sample batch.
11) "*" = SGSL screening level applies to m-Xylene and p-Xylene separately

Table 3-3
Soil Gas Analytical Results – VOCs: March 2009
Former Paxar Facility
950 German Street
Lenoir, North Carolina

Analyte	Sample Location ID: / Sample Date: / Sub Slab and Exterior Soil Gas Screening Level (SGSL) (ug/m3)	SV-8S 3/26/2009	SV-8D 3/26/2009	SV-9S 3/26/2009	SV-10S 3/26/2009	SV-11S 3/26/2009	SV-12S 3/26/2009	SV-13S 3/26/2009	SV-14S 3/26/2009	SV-14D 3/26/2009
Acetone	2,720,000	**39**	ND < 74	**19**	ND < 800	**9.7**	ND < 660	**83**	**12**	**28**
2-Butanone (MEK)	438,000	ND < 10	ND < 23	ND < 2.5	ND < 250	ND < 2.7	ND < 210	**37 J**	ND < 2.5	**4.5**
Carbon Disulfide	61,300	**57**	ND < 96	ND < 11	ND < 260	**39**	ND < 220	ND < 8.5	**45**	**48**
Chloroform	533	**18**	**52**	ND < 4.2	ND < 410	**27**	ND < 340	ND < 3.3	**17**	ND < 7
Chloromethane	7,880	ND < 7.2	ND < 16	ND < 1.8	ND < 690	ND < 1.9	ND < 580	ND < 1.4	ND < 1.8	ND < 2.9
trans-1,2-Dichloroethene	--	ND < 14	ND < 31	**11**	ND < 330	ND < 3.6	ND < 280	ND < 2.7	ND < 3.4	ND < 5.6
Ethanol	--	ND < 26	ND < 58	12	ND < 630	ND < 6.9	ND < 530	**15**	ND < 6.4	ND < 11
Ethylbenzene	4,910	ND < 15	ND < 34	ND < 3.7	ND < 360	**20**	ND < 300	ND < 3	ND < 3.7	ND < 6.2
4-Ethyltoluene	--	ND < 17	ND < 38	ND < 4.2	ND < 410	ND < 4.5	ND < 340	**13**	ND < 4.2	ND < 7
Freon-11 (Trichlorofluoromethane)	61,300	ND < 20	ND < 44	ND < 4.8	ND < 470	ND < 5.1	ND < 390	ND < 3.8	ND < 4.8	ND < 8
Freon-12 (Dichlorodifluoromethane)	8,760	ND < 17	ND < 38	ND < 4.2	ND < 420	ND < 4.5	ND < 350	ND < 3.4	ND < 4.2	ND < 7
Freon-113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	2,630,000	ND < 27	ND < 59	ND < 6.6	ND < 640	**25**	ND < 540	ND < 5.2	**7.1**	**66**
Isopropyl Alcohol	--	ND < 34	ND < 76	ND < 8.4	ND < 820	ND < 9	ND < 690	**210 E**	ND < 8.4	ND < 14
Methylene Chloride	52,600	**120**	ND < 27	ND < 3	ND < 290	**32**	ND < 240	**41**	**6.4**	ND < 5
Tetrachloroethene	3,500	**1,400**	**3,800**	**38**	**370,000**	**460**	**220,000**	**130**	**220**	**360**
Tetrahydrofuran	175,000	ND < 41	ND < 91	ND < 10	ND < 250	ND < 11	ND < 210	ND < 8	ND < 10	ND < 17
Toluene	438,000	**37**	ND < 29	**5.4**	ND < 320	**6.4**	ND < 260	**20**	**6.9**	**7.8**
1,1,1-Trichloroethane	438,000	ND < 19	ND < 42	ND < 4.7	ND < 460	**5.9**	ND < 380	ND < 3.7	ND < 4.7	ND < 7.8
Trichloroethene	175	ND < 0.75	**2.6**	ND < 0.18	ND < 450	**1.7**	ND < 380	**0.32**	**0.23**	**0.87**
1,2,4-Trimethylbenzene	613	**22**	ND < 38	**7.6**	ND < 410	**8.4**	ND < 340	**9.1**	**17**	ND < 7
1,3,5-Trimethylbenzene	--	ND < 17	ND < 38	ND < 4.2	ND < 410	ND < 4.5	ND < 340	**3.7**	ND < 4.2	ND < 7
m,p-Xylene	8,760*	ND < 15	ND < 34	**16**	ND < 360	**120**	ND < 300	**6.4**	ND < 3.7	ND < 6.2
o-Xylene	8,760	ND < 15	ND < 34	**3.7**	ND < 360	**12**	ND < 300	ND < 3	ND < 3.7	ND < 6.2

Notes:
1) All values expressed in micrograms per cubic meter ($\mu g/m^3$).
2) NCDENR DWM Non-Residential Sub Slab and Exterior Soil Gas Screening Levels Updated June 2014.
3) Only compounds detected in Soil Gas are included in this table.
4) Volatile organic compounds analyzed by Air Toxics Ltd. of Folsom, CA per modified EPA Method TO-15.
5) "--" = SGSL not established for this compound.
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) Detected concentrations shown in **BOLD** type.
8) Shaded values exceed SGSL.
9) Sub-slab (shallow) samples are designated with an "S" suffix. Deeper soil gas samples (10'-14' below grade) are designated with a "D" suffix.
10) Results flagged with a 'J' qualifier are estimated due to high bias of MEK in the continuing calibration verfication (CCV) sample for one sample batch.
11) "*" = SGSL screening level applies to m-Xylene and p-Xylene separately

Table 3-3
Soil Gas Analytical Results – VOCs: March 2009
Former Paxar Facility
950 German Street
Lenoir, North Carolina

Analyte	Sample Location ID: / Sample Date: / Sub Slab and Exterior Soil Gas Screening Level (SGSL) (ug/m3)	SV-15S 3/26/2009	SV-16S 3/26/2009	SV-17S 3/26/2009	SV-17D 3/26/2009	SV-18S 3/26/2009	SV-19S 3/26/2009	SV-20S 3/26/2009
Acetone	2,720,000	ND < 26	**7**	**57**	ND < 35	ND < 8.1	ND < 410	ND < 10
2-Butanone (MEK)	438,000	ND < 8.1	ND < 2	**4.3**	ND < 11	ND < 2.5	ND < 130	ND < 3.2
Carbon Disulfide	61,300	ND < 34	**9.3**	**14**	**44**	ND < 11	ND < 530	**25**
Chloroform	533	ND < 13	ND < 3.3	**27**	ND < 18	ND < 4.2	ND < 210	ND < 5.2
Chloromethane	7,880	ND < 5.6	ND < 1.4	**12**	ND < 30	ND < 1.8	ND < 88	ND < 2.2
trans-1,2-Dichloroethene	--	ND < 11	ND < 2.7	ND < 3.4	ND < 14	ND < 3.4	ND < 170	ND < 4.2
Ethanol	--	ND < 21	ND < 5.1	ND < 6.4	ND < 28	**12**	ND < 320	**59**
Ethylbenzene	4,910	ND < 12	ND < 3	ND < 3.7	ND < 16	**4.7**	ND < 180	ND < 4.6
4-Ethyltoluene	--	ND < 13	ND < 3.3	ND < 4.2	ND < 18	ND < 4.2	ND < 210	ND < 5.3
Freon-11 (Trichlorofluoromethane)	61,300	ND < 15	ND < 3.8	ND < 4.8	ND < 20	ND < 4.8	ND < 240	**9.1**
Freon-12 (Dichlorodifluoromethane)	8,760	ND < 14	ND < 3.4	ND < 4.2	ND < 18	ND < 4.2	ND < 210	ND < 5.3
Freon-113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	2,630,000	**40**	ND < 5.2	**17**	**140**	ND < 6.6	ND < 330	**630**
Isopropyl Alcohol	--	ND < 27	ND < 6.7	ND < 8.4	ND < 36	ND < 8.4	ND < 420	ND < 10
Methylene Chloride	52,600	ND < 9.5	ND < 2.4	**4.1**	ND < 13	ND < 3	ND < 150	ND < 3.7
Tetrachloroethene	3,500	**980**	ND < 4.6	**750**	**6,200**	**23**	**17,000**	ND < 7.2
Tetrahydrofuran	175,000	ND < 32	ND < 8	ND < 2.5	ND < 11	ND < 10	ND < 500	ND < 13
Toluene	438,000	ND < 10	ND < 2.6	**4.9**	ND < 14	**5.1**	ND < 160	**14**
1,1,1-Trichloroethane	438,000	ND < 15	ND < 3.7	ND < 4.7	ND < 20	ND < 4.7	ND < 230	ND < 5.8
Trichloroethene	175	ND < 0.59	ND < 0.15	ND < 4.6	ND < 20	**0.24**	**61**	ND < 0.23
1,2,4-Trimethylbenzene	613	ND < 13	ND < 3.3	ND < 4.2	ND < 18	ND < 4.2	ND < 210	**7.6**
1,3,5-Trimethylbenzene	--	ND < 13	ND < 3.3	ND < 4.2	ND < 18	ND < 4.2	ND < 210	ND < 5.3
m,p-Xylene	8,760*	ND < 12	ND < 3	ND < 3.7	ND < 16	**19**	ND < 180	**8.4**
o-Xylene	8,760	ND < 12	ND < 3	ND < 3.7	ND < 16	ND < 3.7	ND < 180	ND < 4.6

Notes:
1) All values expressed in micrograms per cubic meter ($\mu g/m^3$).
2) NCDENR DWM Non-Residential Sub Slab and Exterior Soil Gas Screening Levels Updated June 2014.
3) Only compounds detected in Soil Gas are included in this table.
4) Volatile organic compounds analyzed by Air Toxics Ltd. of Folsom, CA per modified EPA Method TO-15.
5) "--" = SGSL not established for this compound.
6) ND < ## = Compound not detected above laboratory Method Detection Limit (MDL), limit provided.
7) Detected concentrations shown in **BOLD** type.
8) Shaded values exceed SGSL.
9) Sub-slab (shallow) samples are designated with an "S" suffix. Deeper soil gas samples (10'-14' below grade) are designated with a "D" suffix.
10) Results flagged with a 'J' qualifier are estimated due to high bias of MEK in the continuing calibration verfication (CCV) sample for one sample batch.
11) "*" = SGSL screening level applies to m-Xylene and p-Xylene separately

Table 3-4
Indoor and Outdoor Air Analytical Results – VOCs: 2013
Former Paxar Facility
950 German Street
Lenoir, North Carolina

			Sample Location:	**IA-01**	**IA-02**	**IA-03**	**IA-04**	**IA-05**	**IA-06**	**IA-07**	**IA-07**	**IA-08**
			Sample Date:	2/6/2013	2/6/2013	2/6/2013	2/6/2013	2/6/2013	2/6/2013	2/6/2013	2/6/2013 Duplicate	2/6/2013
Volatile Organic Compound (VOC)	**Indoor Air and Crawlspace Screening Level (IASL)**											
	TCR = $1x10^{-6}$	**TCR = $1x10^{-5}$**	**TCR = $1x10^{-4}$**									
Chloroform	0.533	5.33	53.3	0.38	0.355	0.465	ND < 2.93	ND < 1.46	ND < 1.46	ND < 1.46	ND < 1.46	0.373
Freon-12 (Dichlorodifluoromethane)	87.6	87.6	87.6	3.49	2.78	2.42	3.63 J	3.37	3.49	2.99	3.37	2.71
Tetrachloroethene	35	35	35	4.9	14.3	1.35	5.29 J	2.05 J	4.51	4.23	6.27	5.44
Trichloroethene	1.75	1.75	1.75	0.361	1.28	0.182 J	ND < 2.15	ND < 1.07	1.1 J	ND < 1.07	1.98 J	0.405
1,2,4-Trimethylbenzene	6.13	6.13	6.13	38	92.4	54	121	113	68.7	67.9	87.4	60.3

			Sample Location:	**OA-01**	**OA-02**
			Sample Date:	2/6/2013	2/6/2013
Volatile Organic Compound (VOC)	**Indoor Air and Crawlspace Screening Level (IASL)**				
	TCR = $1x10^{-6}$	**TCR = $1x10^{-5}$**	**TCR = $1x10^{-4}$**		
Chloroform	0.533	5.33	53.3	ND < 0.146	ND < 0.146
Freon-12 (Dichlorodifluoromethane)	87.6	87.6	87.6	2.54	2.71
Tetrachloroethene	35	35	35	0.462	1.66
Trichloroethene	1.75	1.75	1.75	0.11 J	0.594
1,2,4-Trimethylbenzene	6.13	6.13	6.13	1.44	3.52

Notes:
1) All concentration values are expressed in mircograms per cubic meter (µg/m3).
2) Volatile Organic Compounds analyzed by Eurofins-Lancaster Laboratories of Lancaster PA per modified EPA method TO-15.
3) DWM Non-Residential Indoor Air and Crawlspace Sreening Levels updated June 2014 for Target Hazard Quotient of 0.2, and Specified Target Cancer Risk
4) Non-detected results shown as "ND < ##", where ## is the laboratory Method Detection Limit.
5) J = Compound detected below laboratory Practical Quantitation Limit (PQL), estimated concentration provided.
6) TCR = Target Cancer Risk
7) Shaded values exceed the IASL for $1x10^{-6}$ target cancer risk.
8) Results with bold outlines may exceed the IASL; these results are approximate concentrations below the laboratory PQL.

Table 3-5
Potentiometric Data: 2014
Former Paxar Facility
950 German Street
Lenoir, North Carolina

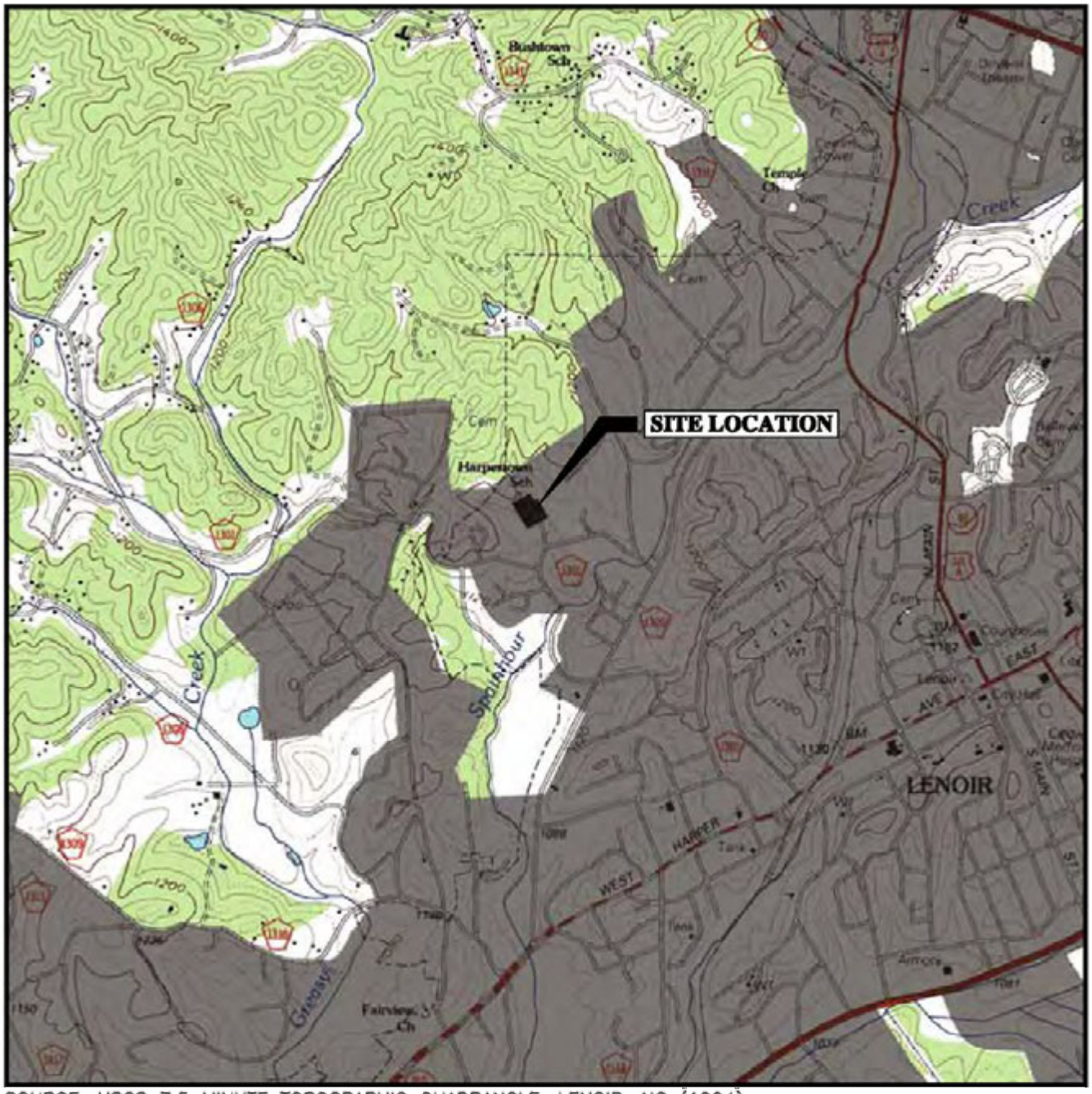
				Date:	February 24, 2014		June 2, 2014		August 18, 2014		November 18, 2014	
Well ID	**Easting**	**Northing**	**Measuring Point Elevation**	**Ground Elevation**	**Depth to Groundwater (ft BTOC)**	**Elevation of Groundwater (ft AMSL)**	**Depth to Groundwater (ft BTOC)**	**Elevation of Groundwater (ft AMSL)**	**Depth to Groundwater (ft BTOC)**	**Elevation of Groundwater (ft AMSL)**	**Depth to Groundwater (ft BTOC)**	**Elevation of Groundwater (ft AMSL)**
MW-1	1242433.16	799661.52	1143.51	1143.63	9.80	1133.71	9.89	1133.62	10.31	1133.20	10.78	1132.73
MW-2	1242465.34	799609.38	1143.35	1143.54	12.77	1130.58	12.76	1130.59	13.02	1130.33	14.02	1129.33
MW-3	1242468.77	799662.88	1142.93	1143.21	11.39	1131.54	11.40	1131.53	11.77	1131.16	12.40	1130.53
MW-5S	1242509.20	799589.42	1142.69	1142.95	15.17	1127.52	15.25	1127.44	15.70	1126.99	16.09	1126.60
MW-5D	1242511.41	799585.78	1142.72	1142.92	14.63	1128.09	14.77	1127.95	15.22	1127.50	15.60	1127.12
MW-6S	1242555.64	799537.29	1142.55	1142.74	18.50	1124.05	18.65	1123.90	19.22	1123.33	19.56	1122.99
MW-6D	1242558.51	799534.43	1142.52	1142.75	18.23	1124.29	18.40	1124.12	18.95	1123.57	19.24	1123.28
MW-7S	1242550.22	799479.86	1141.94	1142.04	20.33	1121.61	20.46	1121.48	21.19	1120.75	21.25	1120.69
MW-7D	1242560.98	799473.22	1141.64	1141.81	20.70	1120.94	20.88	1120.76	21.59	1120.05	21.86	1119.78
MW8-1	1242534.46	799417.40	1141.32	1141.23	21.99	1119.33	22.17	1119.15	22.89	1118.43	23.10	1118.22
MW8-2	1242532.45	799429.11	1142.52	1142.79	23.00	1119.52	23.10	1119.42	23.74	1118.78	24.06	1118.46
MW8-3	1242538.94	799420.16	1140.73	1140.78	21.48	1119.25	21.67	1119.06	22.38	1118.35	22.58	1118.15
MW8-4	1242532.42	799428.95	1142.61	1142.79	20.30	1122.31	20.41	1122.20	21.05	1121.56	21.34	1121.27
MW9-1	1242491.93	799350.36	1136.16	1136.48	18.41	1117.75	18.80	1117.36	19.41	1116.75	19.21	1116.95
MW9-2	1242493.76	799353.95	1136.75	1137.00	18.66	1118.09	18.85	1117.90	19.49	1117.26	19.40	1117.35
MW9-3	1242497.57	799353.55	1136.08	1136.49	17.24	1118.84	17.40	1118.68	18.06	1118.02	18.30	1117.78
MW9-4	1242493.47	799353.70	1136.67	1137.00	15.78	1120.89	15.90	1120.77	16.56	1120.11	16.90	1119.77
MW10-1	1242419.12	799337.97	1143.45	1143.67	21.88	1121.57	22.03	1121.42	22.79	1120.66	23.05	1120.40
MW10-2	1242424.14	799336.16	1142.18	1142.48	20.42	1121.76	20.43	1121.75	21.23	1120.95	21.55	1120.63
MW10-3	1242416.97	799331.83	1142.17	1142.37	20.07	1122.10	20.23	1121.94	20.94	1121.23	21.23	1120.94
MW10-4	1242424.15	799336.01	1142.16	1142.48	19.99	1122.17	20.14	1122.02	20.95	1121.21	21.18	1120.98
MW11-1	1242382.01	799310.55	1142.60	1142.90	20.72	1121.88	20.89	1121.71	21.64	1120.96	21.90	1120.70
MW11-2	1242378.34	799308.83	1142.55	1142.77	20.45	1122.10	20.66	1121.89	21.35	1121.20	21.60	1120.95
MW11-3	1242385.69	799312.79	1142.47	1142.83	20.25	1122.22	20.40	1122.07	21.23	1121.24	21.35	1121.12
MW11-4	1242378.47	799309.01	1142.57	1142.77	20.33	1122.24	20.47	1122.10	21.24	1121.33	21.24	1121.33
MW12-1	1242381.88	799259.00	1117.64	1118.44	6.46	1111.18	6.87	1110.77	7.37	1110.27	7.43	1110.21
MW12-2	1242605.73	799238.41	1116.14	1116.23	5.65	1110.49	6.09	1110.05	6.57	1109.57	6.60	1109.54
MW12-3	1242605.84	799238.32	1116.21	1116.23	7.54	1108.67	7.78	1108.43	8.46	1107.75	9.55	1106.66
MW13-1	1242500.45	799233.22	1125.69	1125.90	13.13	1112.56	13.14	1112.55	13.95	1111.74	14.37	1111.32
MW13-2	1242500.32	799233.03	1125.61	1125.90	12.80	1112.81	13.12	1112.49	13.61	1112.00	13.81	1111.80
MW13-3	1242505.26	799236.62	1125.58	1125.92	8.92	1116.66	8.95	1116.63	9.34	1116.24	9.47	1116.11
MW13-4	1242505.12	799236.46	1125.56	1125.92	8.75	1116.81	8.97	1116.59	9.30	1116.26	9.53	1116.03
MW14-1	1242325.86	799249.08	1142.29	1142.70	20.46	1121.83	21.01	1121.28	21.31	1120.98	21.89	1120.40
MW14-2	1242321.20	799246.01	1142.39	1142.70	20.61	1121.78	20.80	1121.59	21.49	1120.90	21.73	1120.66
MW14-3	1242326.03	799248.97	1142.31	1142.70	20.42	1121.89	20.61	1121.70	21.31	1121.00	21.58	1120.73
MW15-1	1242171.64	799289.15	1145.93	1146.08	15.88	1130.05	16.16	1129.77	19.23	1126.70	16.57	1129.36
MW15-2	1242171.43	799289.38	1145.92	1146.08	15.16	1130.76	15.28	1130.64	15.79	1130.13	16.00	1129.92

Notes:
1) "ft BTOC" = Feet Below Top of Casing.
2) "ft AMSL" = Feet Above Mean Sea Level.
3) Horizontal survey datum = NAVD88 (feet); Vertical survey datum = North Carolina State Plane NAD83 (feet).
4) State Plane Coordinates and Elevations obtained from Western Carolina Surveyors, P.A.

FIGURES

Source: ERM, 2008b.

CAD\LOCMAP.apr



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE: LENOIR, NC (1994).

SCALE 1:24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

NORTH CAROLINA

QUADRANGLE LOCATION

CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

FIGURE 1-1: PROPERTY LOCATION MAP
AVERY DENNISON FACILITY
950 GERMAN STREET NW, LENOIR, NORTH CAROLINA

The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: TJK	Date: 12/22/14
Chk'd by: CMT	Date: 12/22/14
Scale: As Shown	Project: 1-0145-16

Note: Approximate property boundaries provided by the City of Lenoir, N.C.; 2010 aerial photography from NC OneMap Geospatial Portal.

LEGEND

Approx. Avery Property Boundary

Approx. Property Line

AERIAL.dwg

FIGURE 1-2
PROPERTY LAYOUT
AVERY DENNISON FACILITY
950 GERMAN STREET NW, LENOIR, NORTH CAROLINA

The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602
(802) 229-4600

Drawn by: TJK Date: 12/22/14
Chk'd by: CMT Date: 12/22/14
Scale: As Shown Project: 1-0145-16

SOURCES

FACILITY CAD PLAN PROVIDED BY AVERY DENNISON.

EXTERIOR LAYOUT BASED ON AERIAL PHOTOGRAPH PROVIDED BY THE CITY OF LENOIR, N.C.; ADDITIONAL AERIAL PHOTOGRAPHY BY GOOGLE MAPS 2013.

2007 MONITORING WELL LOCATIONS FROM ERM.

MONITORING WELL LOCATIONS SURVEYED BY WESTERN CAROLINA SURVEYORS, P.A. – SEPTEMBER 2009, FEBRUARY 2013, AND FEBRUARY 2014.

PROPERTY LINE FROM TITLE INSURANCE SURVEY FOR ROSPATCH LENOIR, INC. DATED 6/10/88; AND BOUNDARY SURVEY OF HELEN L.R. WATSON & EDITH P.R. MILLWOOD PROPERTY DATED 6/30/95 BY WESTERN CAROLINA SURVEYORS, P.A.

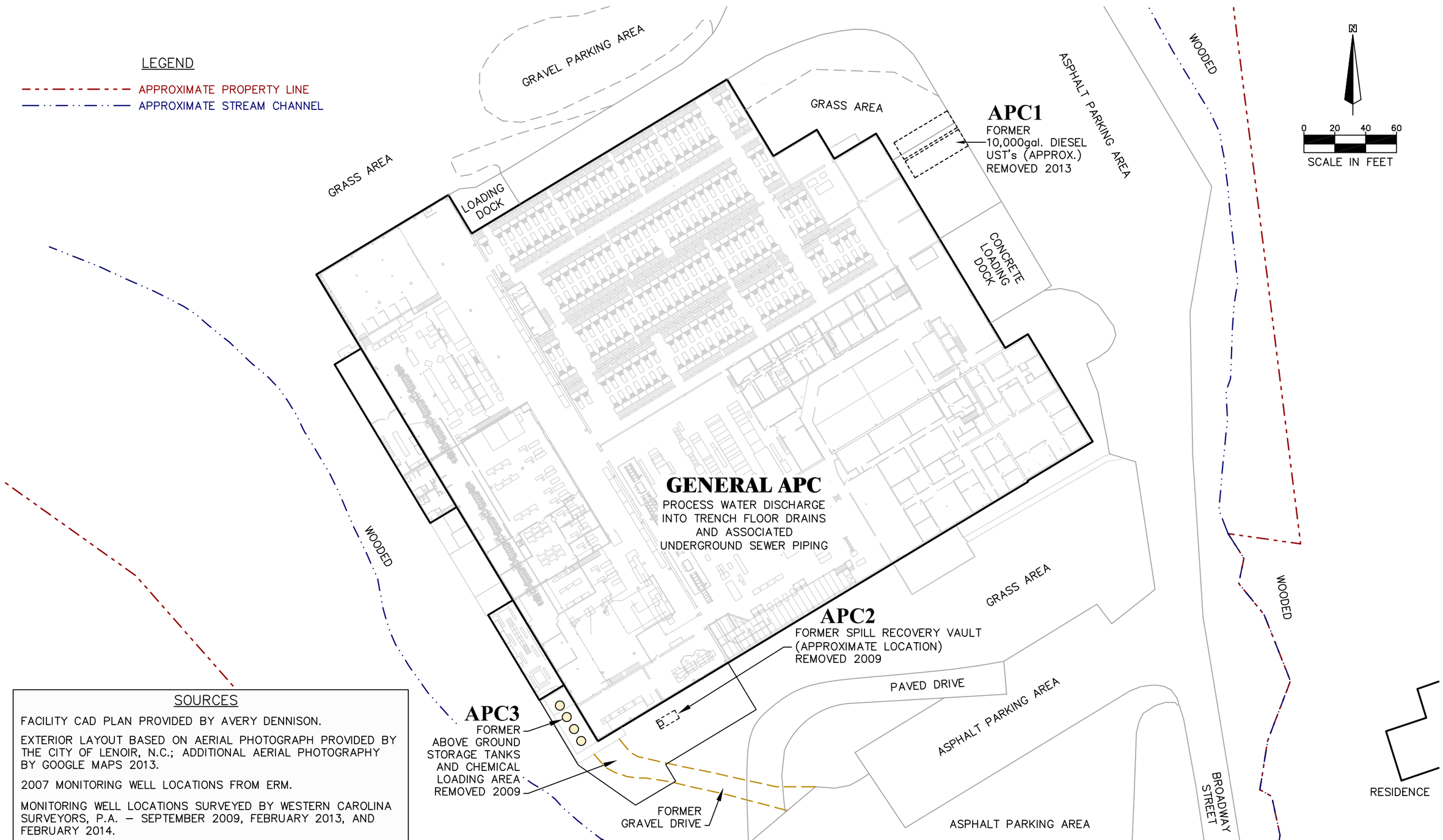
CAD\AERIAL 2014.dwg

The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602
(802) 229-4600

Drawn by: TJK Date: 12/22/14
Chk'd by: CMT Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 2-1
FACILITY EXPANSION HISTORY
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA



SOURCES

FACILITY CAD PLAN PROVIDED BY AVERY DENNISON.

EXTERIOR LAYOUT BASED ON AERIAL PHOTOGRAPH PROVIDED BY THE CITY OF LENOIR, N.C.; ADDITIONAL AERIAL PHOTOGRAPHY BY GOOGLE MAPS 2013.

2007 MONITORING WELL LOCATIONS FROM ERM.

MONITORING WELL LOCATIONS SURVEYED BY WESTERN CAROLINA SURVEYORS, P.A. – SEPTEMBER 2009, FEBRUARY 2013, AND FEBRUARY 2014.

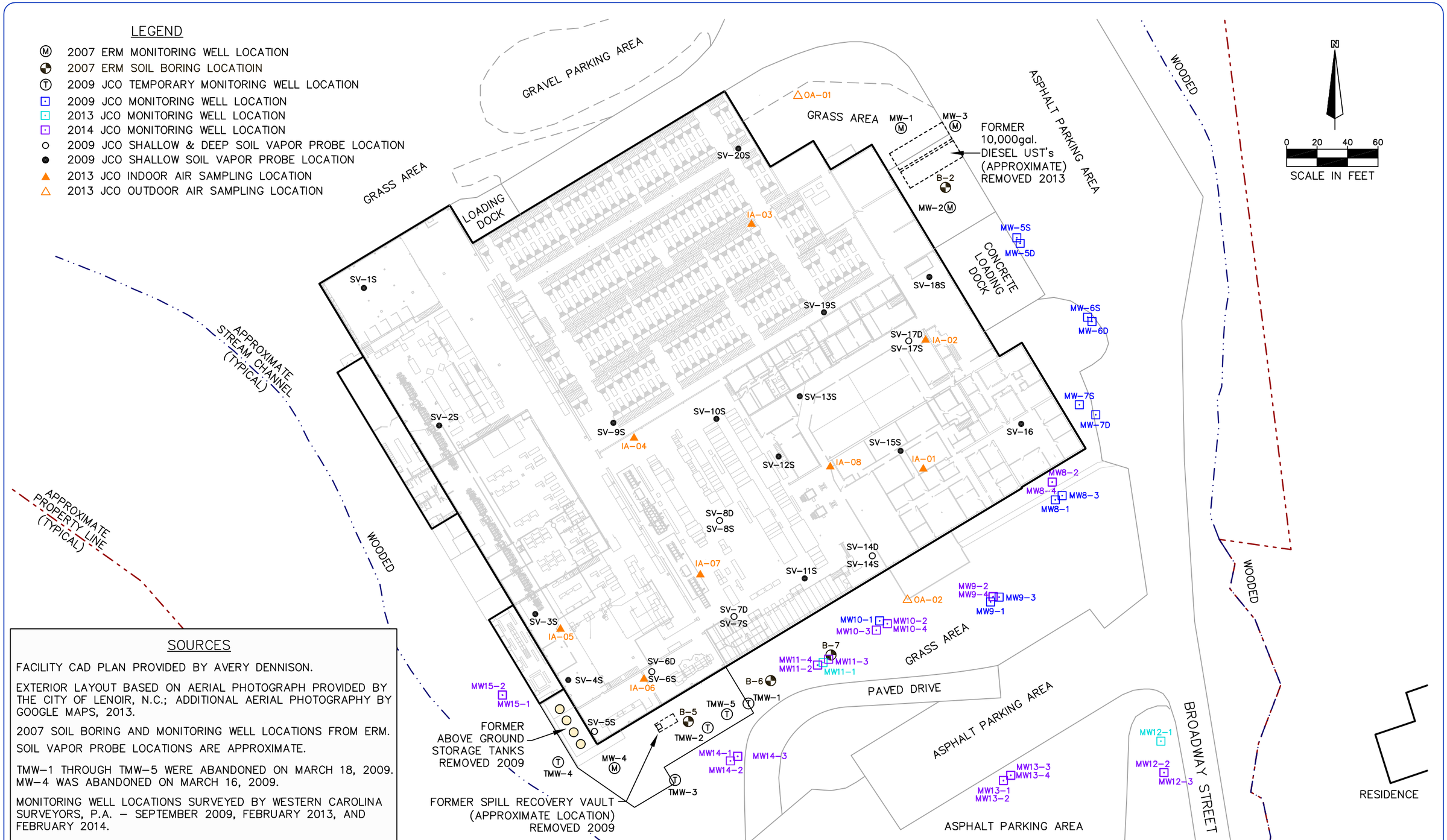
PROPERTY LINE FROM TITLE INSURANCE SURVEY FOR ROSPATCH LENOIR, INC. DATED 6/10/88; AND BOUNDARY SURVEY OF HELEN L.R. WATSON & EDITH P.R. MILLWOOD PROPERTY DATED 6/30/95 BY WESTERN CAROLINA SURVEYORS, P.A.

CAD\AERIAL 2014.dwg

The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602
(802) 229-4600

Drawn by: TJK Date: 12/22/14
Chk'd by: CMT Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 3-1
AREAS OF POTENTIAL CONCERN (ERM, 2008a)
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA



SOURCES

FACILITY CAD PLAN PROVIDED BY AVERY DENNISON.

EXTERIOR LAYOUT BASED ON AERIAL PHOTOGRAPH PROVIDED BY THE CITY OF LENOIR, N.C.; ADDITIONAL AERIAL PHOTOGRAPHY BY GOOGLE MAPS, 2013.

2007 SOIL BORING AND MONITORING WELL LOCATIONS FROM ERM.

SOIL VAPOR PROBE LOCATIONS ARE APPROXIMATE.

TMW-1 THROUGH TMW-5 WERE ABANDONED ON MARCH 18, 2009. MW-4 WAS ABANDONED ON MARCH 16, 2009.

MONITORING WELL LOCATIONS SURVEYED BY WESTERN CAROLINA SURVEYORS, P.A. – SEPTEMBER 2009, FEBRUARY 2013, AND FEBRUARY 2014.

PROPERTY LINE FROM TITLE INSURANCE SURVEY FOR ROSPATCH LENOIR, INC. DATED 6/10/88; AND BOUNDARY SURVEY OF HELEN L.R. WATSON & EDITH P.R. MILLWOOD PROPERTY DATED 6/30/95 BY WESTERN CAROLINA SURVEYORS, P.A.

CAD\AERIAL 2014.dwg

The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602
(802) 229-4600

Drawn by: TJK Date: 12/22/14
Chk'd by: CMT Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 3-2
ENVIRONMENTAL SAMPLING LOCATIONS
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA

ANALYTICAL RESULTS KEY		IHSB PSRGs	
Abbr.	Constituents	Industrial Soil	Protection of GW
TCL Volatile Organics (SW 8260B)			
VOC	TCL List of VOCs	Varies	Varies
TCL Semi-Volatile Organics (SW 8270C)			
SVOC	TCL List of SVOCs	Varies	Varies
Total Petroleum Hydrocarbons (SW 8015)			
TPH-GRO	TPH-GRO (C6-C10)	NAS	NAS
TPH-DRO	TPH-DRO (C10-C28)	NAS	NAS
TPH-ORO	TPH-ORO (>C28-C40)	NAS	NAS
Metals (SW 6010B & 7471A)			
Sb	Antimony	94	0.9
As	Arsenic	3	5.8
Be	Beryllium	460	63
Cd	Cadmium	200	3
Cr	Chromium (total)	100,000	360,000
Cu	Copper	9,400	700
Pb	Lead	800	270
Hg	Mercury	3.1	1
Ni	Nickel	4,400	130
Se	Selenium	1,200	2.1
Ag	Silver	1,200	3.4
Tl	Thallium	2.4	0.28
Zn	Zinc	70,000	1,200

NOTES

All concentrations expressed in units of milligrams per kilogram (mg/kg).
IHSB PSRGs = Inactive Hazardous Sites Branch Preliminary Soil Remediation Goals, updated September 2014.
ND (##) = Not detected above reporting limit given in parentheses.
NAS = No applicable standard.
Sample depths are reported in feet below ground surface.

LEGEND

2007 ERM SOIL BORING LOCATIOIN
APPROXIMATE PROPERTY LINE
APPROXIMATE STREAM CHANNEL

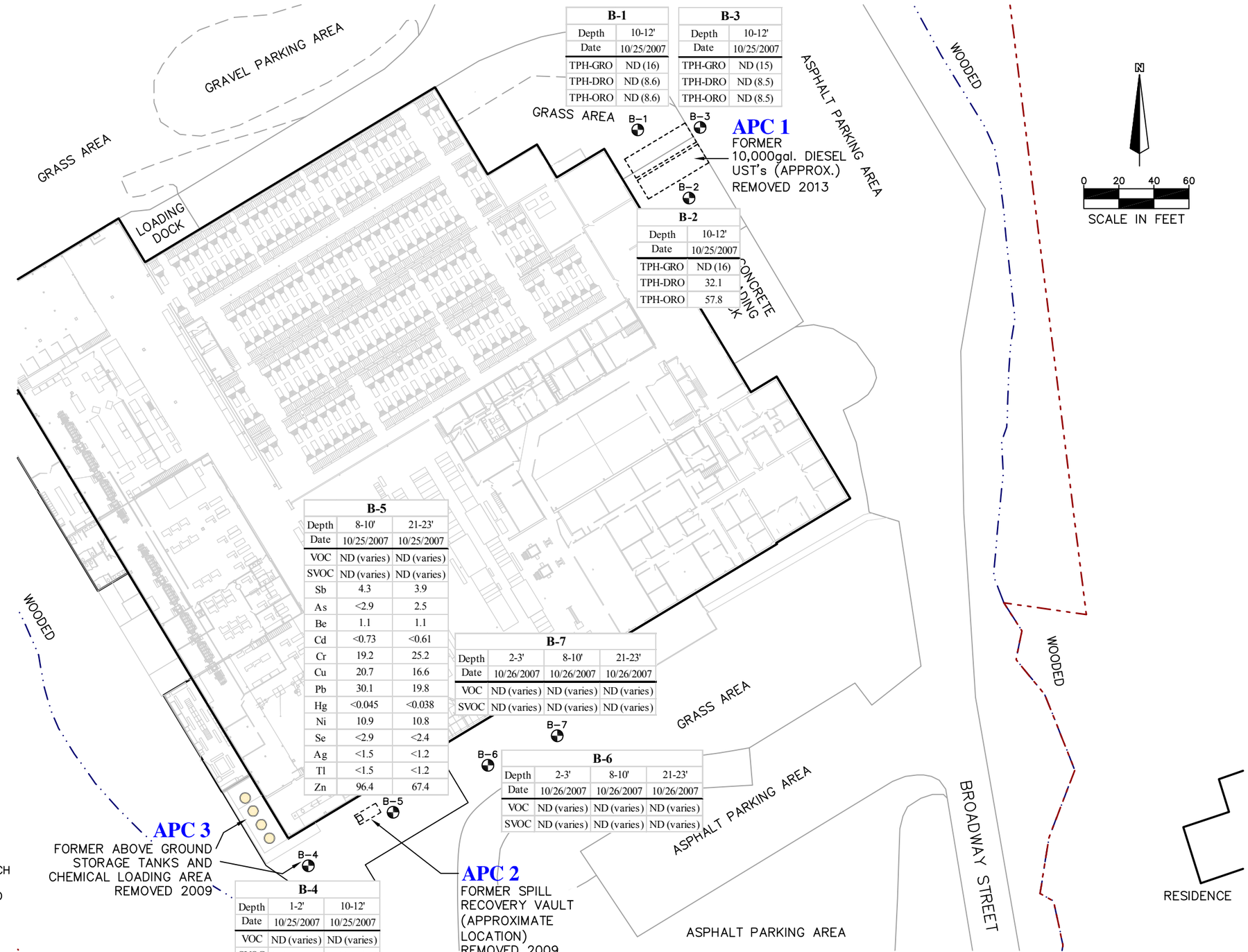
SOURCES

FACILITY CAD PLAN PROVIDED BY AVERY DENNISON.

EXTERIOR LAYOUT BASED ON AERIAL PHOTOGRAPH PROVIDED BY THE CITY OF LENOIR, N.C.

2007 SOIL BORING LOCATIONS FROM ERM.

PROPERTY LINE FROM TITLE INSURANCE SURVEY FOR ROSPATCH LENOIR, INC. DATED 6/10/88; AND BOUNDARY SURVEY OF HELEN L.R. WATSON & EDITH P.R. MILLWOOD PROPERTY DATED 6/30/95 BY WESTERN CAROLINA SURVEYORS, P.A.



B-1

Depth	10-12'
Date	10/25/2007
TPH-GRO	ND (16)
TPH-DRO	ND (8.6)
TPH-ORO	ND (8.6)

B-3

Depth	10-12'
Date	10/25/2007
TPH-GRO	ND (15)
TPH-DRO	ND (8.5)
TPH-ORO	ND (8.5)

B-2

Depth	10-12'
Date	10/25/2007
TPH-GRO	ND (16)
TPH-DRO	32.1
TPH-ORO	57.8

B-5

Depth	8-10'	21-23'
Date	10/25/2007	10/25/2007
VOC	ND (varies)	ND (varies)
SVOC	ND (varies)	ND (varies)
Sb	4.3	3.9
As	<2.9	2.5
Be	1.1	1.1
Cd	<0.73	<0.61
Cr	19.2	25.2
Cu	20.7	16.6
Pb	30.1	19.8
Hg	<0.045	<0.038
Ni	10.9	10.8
Se	<2.9	<2.4
Ag	<1.5	<1.2
Tl	<1.5	<1.2
Zn	96.4	67.4

B-7

Depth	2-3'	8-10'	21-23'
Date	10/26/2007	10/26/2007	10/26/2007
VOC	ND (varies)	ND (varies)	ND (varies)
SVOC	ND (varies)	ND (varies)	ND (varies)

B-6

Depth	2-3'	8-10'	21-23'
Date	10/26/2007	10/26/2007	10/26/2007
VOC	ND (varies)	ND (varies)	ND (varies)
SVOC	ND (varies)	ND (varies)	ND (varies)

B-4

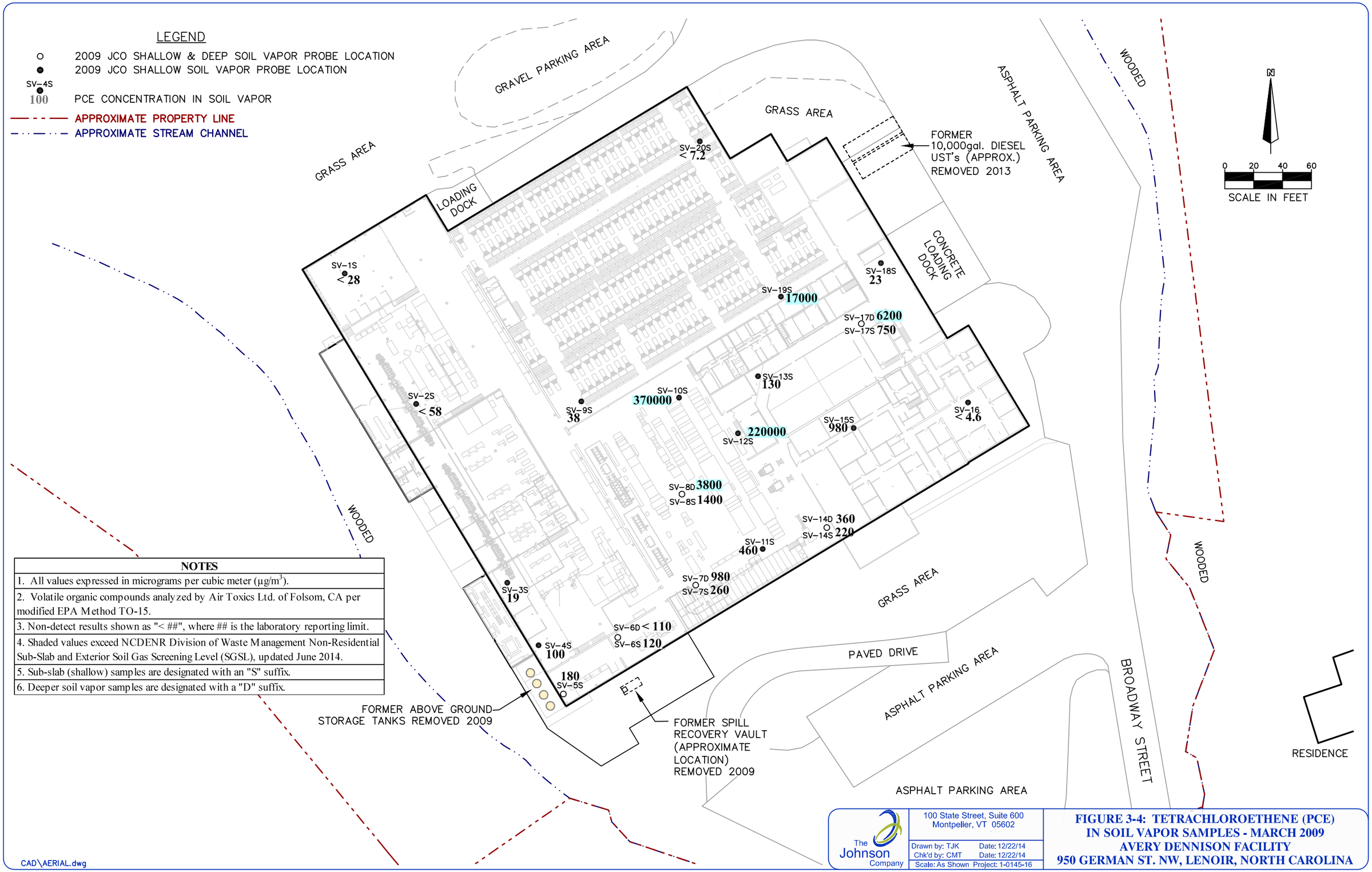
Depth	1-2'	10-12'
Date	10/25/2007	10/25/2007
VOC	ND (varies)	ND (varies)
SVOC	ND (varies)	ND (varies)

The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: TJK Date: 12/22/14
Chk'd by: PAE Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 3-3
SOILS ANALYTICAL RESULTS SUMMARY
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA

CAD\AERIAL.dwg



NOTES
1. All values expressed in micrograms per cubic meter ($\mu g/m^3$).
2. Volatile organic compounds analyzed by Air Toxics Ltd. of Folsom, CA per modified EPA Method TO-15.
3. Non-detect results shown as "< ##", where ## is the laboratory reporting limit.
4. Shaded values exceed NCDENR Division of Waste Management Non-Residential Sub-Slab and Exterior Soil Gas Screening Level (SGSL), updated June 2014.
5. Sub-slab (shallow) samples are designated with an "S" suffix.
6. Deeper soil vapor samples are designated with a "D" suffix.

The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: TJK Date: 12/22/14
Chk'd by: CMT Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 3-4: TETRACHLOROETHENE (PCE) IN SOIL VAPOR SAMPLES - MARCH 2009
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA

LEGEND

- ▲ 2013 JCO INDOOR AIR SAMPLING LOCATION
- △ 2013 JCO OUTDOOR AIR SAMPLING LOCATION
- APPROXIMATE PROPERTY LINE
- APPROXIMATE STREAM CHANNEL

SOURCES

FACILITY CAD PLAN PROVIDED BY AVERY DENNISON.

EXTERIOR LAYOUT BASED ON AERIAL PHOTOGRAPH PROVIDED BY THE CITY OF LENOIR, N.C.

AIR SAMPLING LOCATIONS ARE APPROXIMATE.

PROPERTY LINE FROM TITLE INSURANCE SURVEY FOR ROSPATCH LENOIR, INC. DATED 6/10/88; AND BOUNDARY SURVEY OF HELEN L.R. WATSON & EDITH P.R. MILLWOOD PROPERTY DATED 6/30/95 BY WESTERN CAROLINA SURVEYORS, P.A.

OA-01	
2/6/2013	
CF	ND < 0.146
Freon-12	2.54
PCE	0.462
TCE	0.11 J
1,2,4-TMB	1.44

IA-03	
2/6/2013	
CF	0.465
Freon-12	2.42
PCE	1.35
TCE	0.182 J
1,2,4-TMB	54

IA-02	
2/6/2013	
CF	0.355
Freon-12	2.78
PCE	14.3
TCE	1.28
1,2,4-TMB	92.4

IA-04	
2/6/2013	
CF	ND < 2.93
Freon-12	3.63 J
PCE	5.29 J
TCE	ND < 2.15
1,2,4-TMB	121

IA-08	
2/6/2013	
CF	0.373
Freon-12	2.71
PCE	5.44
TCE	0.405
1,2,4-TMB	60.3

IA-01	
2/6/2013	
CF	0.38
Freon-12	3.49
PCE	4.9
TCE	0.361
1,2,4-TMB	38

IA-07		
2/6/2013		
		Duplicate
CF	ND < 1.46	ND < 1.46
Freon-12	2.99	3.37
PCE	4.23	6.27
TCE	ND < 1.07	1.98 J
1,2,4-TMB	67.9	87.4

IA-05	
2/6/2013	
CF	ND < 1.46
Freon-12	3.37
PCE	2.05 J
TCE	ND < 1.07
1,2,4-TMB	113

OA-02	
2/6/2013	
CF	ND < 0.146
Freon-12	2.71
PCE	1.66
TCE	0.594
1,2,4-TMB	3.52

IA-06	
2/6/2013	
CF	ND < 1.46
Freon-12	3.49
PCE	4.51
TCE	1.1 J
1,2,4-TMB	68.7

Abbr.	Analyte	DWM Indoor Air Screening Level (µg/m3)
CF	Chloroform	0.533
Freon-12	Freon 12 (Dichlorodifluoromethane)	87.6
PCE	Tetrachloroethene	35
TCE	Trichloroethene	1.75
1,2,4-TMB	1,2,4-Trimethylbenzene	6.13

NOTES
1. All concentration values are expressed in micrograms per cubic meter (µg/m3).
2. Volatile Organic Compounds analyzed by Eurofins-Lancaster Laboratories of Lancaster PA per modified EPA method TO-15.
3. NCDENR Division of Waste Management (DWM) Non-Residential Indoor Air and Crawl Space Screening Levels (IASL) for 10E-6 Target cancer risk.
4. Non-detected results shown as "ND < ##", where ## is the laboratory method detection limit.
5. Shaded values exceed the IASLs for indoor air.

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(802) 229-4600

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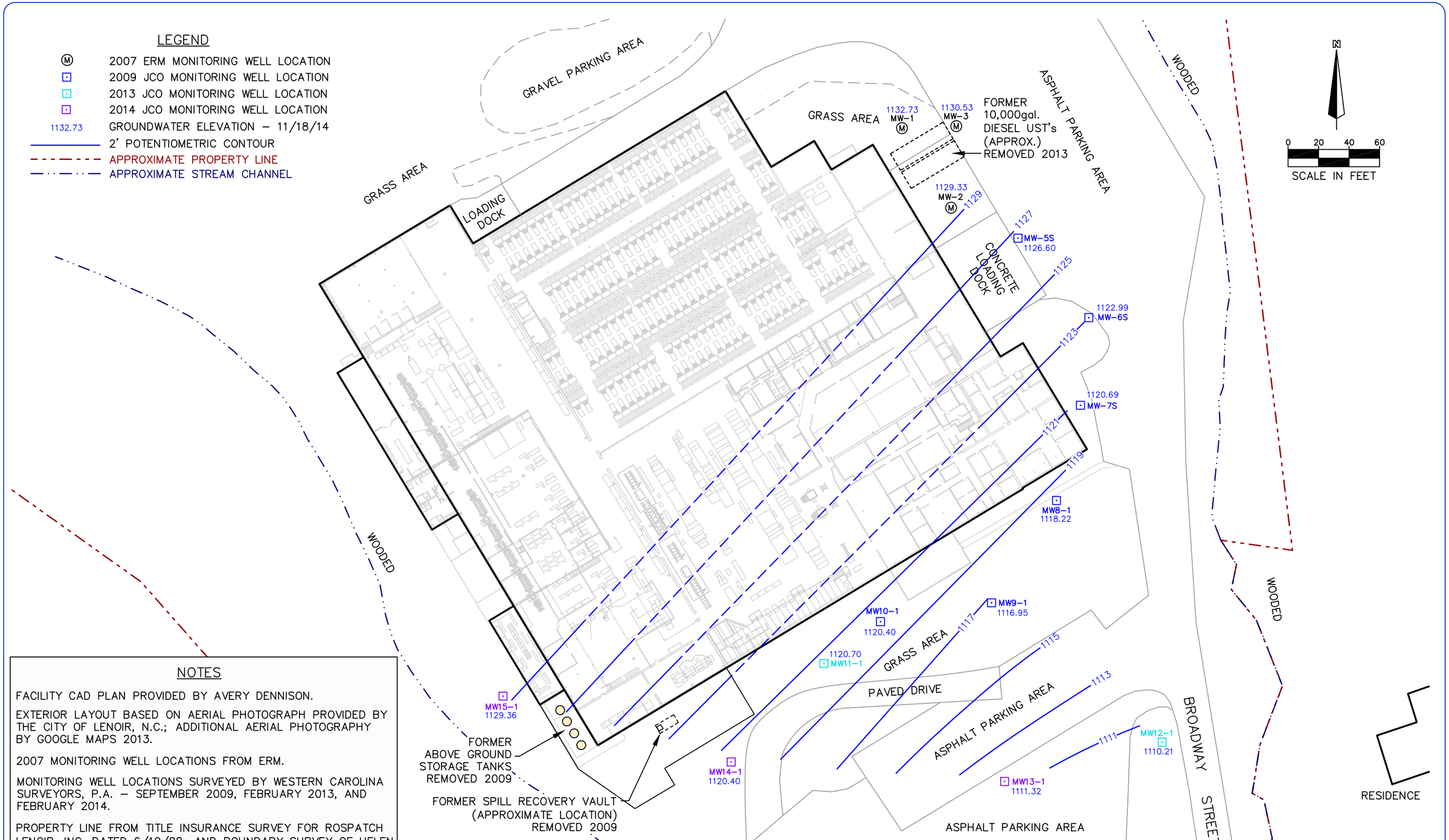
Chk'd by: PAE Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 3-5: INDOOR & OUTDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2013
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA

CAD\AERIAL 2013.dwg



NOTES

FACILITY CAD PLAN PROVIDED BY AVERY DENNISON.

EXTERIOR LAYOUT BASED ON AERIAL PHOTOGRAPH PROVIDED BY THE CITY OF LENOIR, N.C.; ADDITIONAL AERIAL PHOTOGRAPHY BY GOOGLE MAPS 2013.

2007 MONITORING WELL LOCATIONS FROM ERM.

MONITORING WELL LOCATIONS SURVEYED BY WESTERN CAROLINA SURVEYORS, P.A. – SEPTEMBER 2009, FEBRUARY 2013, AND FEBRUARY 2014.

PROPERTY LINE FROM TITLE INSURANCE SURVEY FOR ROSPATCH LENOIR, INC. DATED 6/10/88; AND BOUNDARY SURVEY OF HELEN L.R. WATSON & EDITH P.R. MILLWOOD PROPERTY DATED 6/30/95 BY WESTERN CAROLINA SURVEYORS, P.A.

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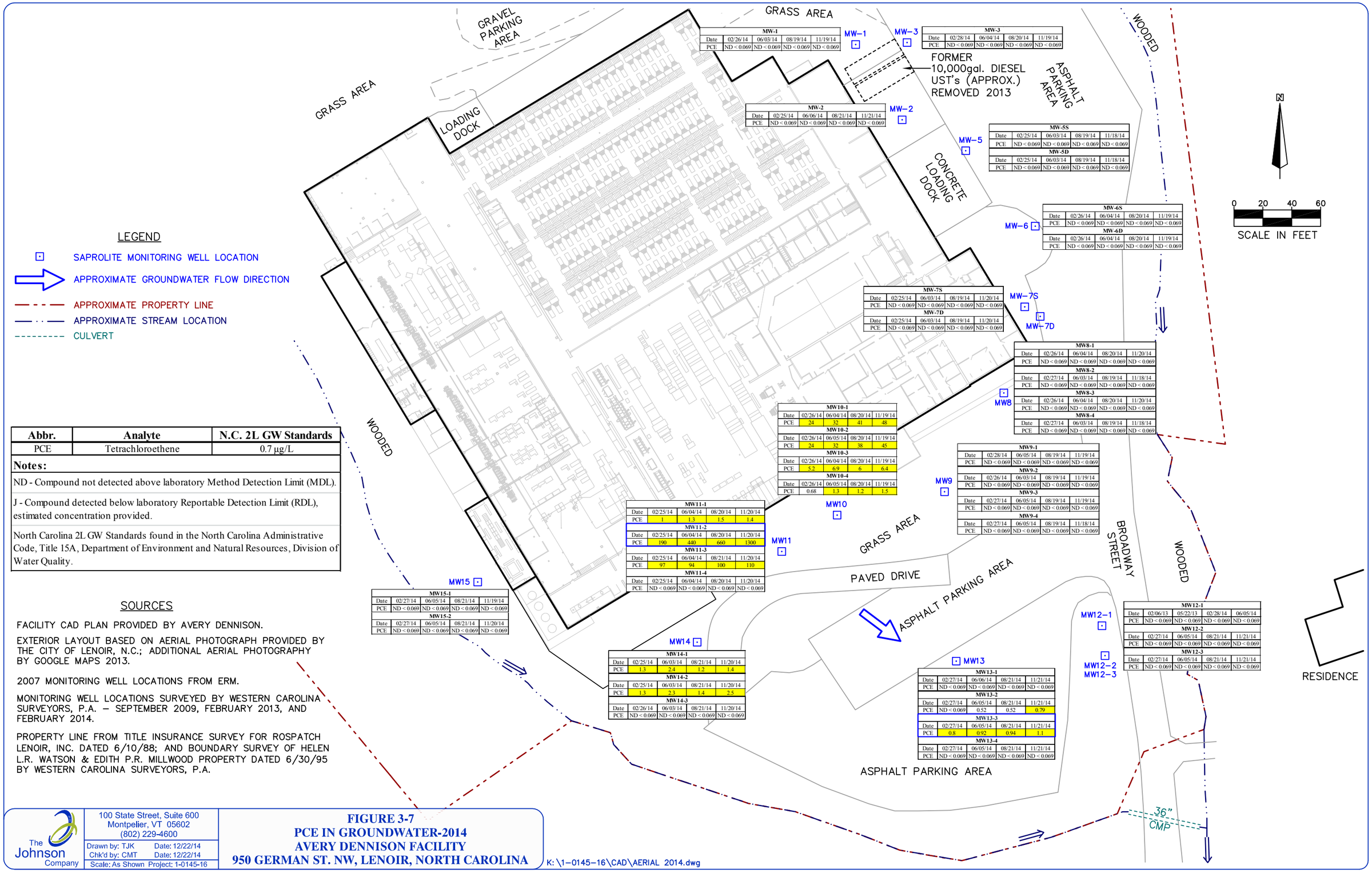
Drawn by: TJK	Date: 12/22/14
Chk'd by: CMT	Date: 12/22/14
Scale: 1"=60'	Project: 1-0145-16

FIGURE 3-6: POTENTIOMETRIC CONTOUR MAP
WATER TABLE - NOVEMBER 18, 2014
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA



Abbr.	Analyte	N.C. 2L GW Standards
PCE	Tetrachloroethene	0.7 µg/L

Notes:

ND - Compound not detected above laboratory Method Detection Limit (MDL).

J - Compound detected below laboratory Reportable Detection Limit (RDL), estimated concentration provided.

North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.

MW-1				
Date	02/26/14	06/03/14	08/19/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-3				
Date	02/28/14	06/04/14	08/20/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-2				
Date	02/25/14	06/06/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-5S				
Date	02/25/14	06/03/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW-5D				
Date	02/25/14	06/03/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-6S				
Date	02/26/14	06/04/14	08/20/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW-6D				
Date	02/26/14	06/04/14	08/20/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-7S				
Date	02/25/14	06/03/14	08/19/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW-7D				
Date	02/25/14	06/03/14	08/19/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW8-1				
Date	02/26/14	06/04/14	08/20/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW8-2				
Date	02/27/14	06/03/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW8-3				
Date	02/26/14	06/04/14	08/20/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW8-4				
Date	02/27/14	06/03/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW10-1				
Date	02/26/14	06/04/14	08/20/14	11/19/14
PCE	24	32	41	48
MW10-2				
Date	02/26/14	06/05/14	08/20/14	11/19/14
PCE	24	32	38	45
MW10-3				
Date	02/26/14	06/04/14	08/20/14	11/19/14
PCE	5.2	6.9	6	6.4
MW10-4				
Date	02/26/14	06/05/14	08/20/14	11/19/14
PCE	0.68	1.3	1.2	1.5

MW9-1				
Date	02/28/14	06/05/14	08/19/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW9-2				
Date	02/26/14	06/03/14	08/19/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW9-3				
Date	02/27/14	06/05/14	08/19/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW9-4				
Date	02/27/14	06/05/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

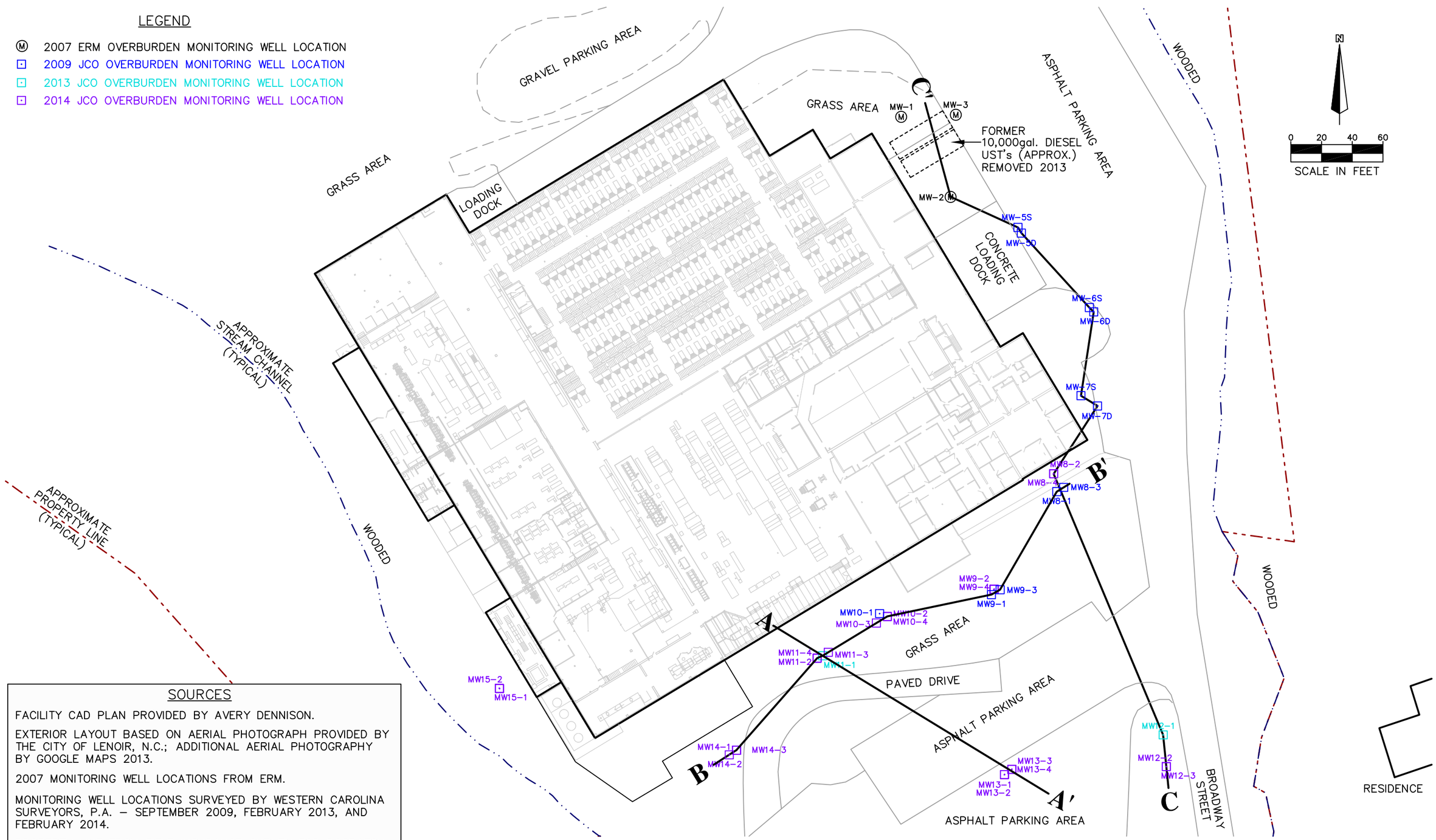
MW11-1				
Date	02/25/14	06/04/14	08/20/14	11/20/14
PCE	1	1.3	1.5	1.4
MW11-2				
Date	02/25/14	06/04/14	08/20/14	11/20/14
PCE	190	440	660	1300
MW11-3				
Date	02/25/14	06/04/14	08/21/14	11/20/14
PCE	97	94	100	110
MW11-4				
Date	02/25/14	06/04/14	08/20/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW15-1				
Date	02/27/14	06/05/14	08/21/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW15-2				
Date	02/27/14	06/05/14	08/21/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW14-1				
Date	02/25/14	06/03/14	08/21/14	11/20/14
PCE	1.3	2.4	1.2	1.4
MW14-2				
Date	02/25/14	06/03/14	08/21/14	11/20/14
PCE	1.3	2.3	1.4	2.5
MW14-3				
Date	02/26/14	06/03/14	08/21/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW13-1				
Date	02/27/14	06/06/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW13-2				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	ND < 0.069	0.52	0.52	0.79
MW13-3				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	0.8	0.92	0.94	1.1
MW13-4				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW12-1				
Date	02/06/13	05/22/13	02/28/14	06/05/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW12-2				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW12-3				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069



SOURCES

FACILITY CAD PLAN PROVIDED BY AVERY DENNISON.

EXTERIOR LAYOUT BASED ON AERIAL PHOTOGRAPH PROVIDED BY THE CITY OF LENOIR, N.C.; ADDITIONAL AERIAL PHOTOGRAPHY BY GOOGLE MAPS 2013.

2007 MONITORING WELL LOCATIONS FROM ERM.

MONITORING WELL LOCATIONS SURVEYED BY WESTERN CAROLINA SURVEYORS, P.A. – SEPTEMBER 2009, FEBRUARY 2013, AND FEBRUARY 2014.

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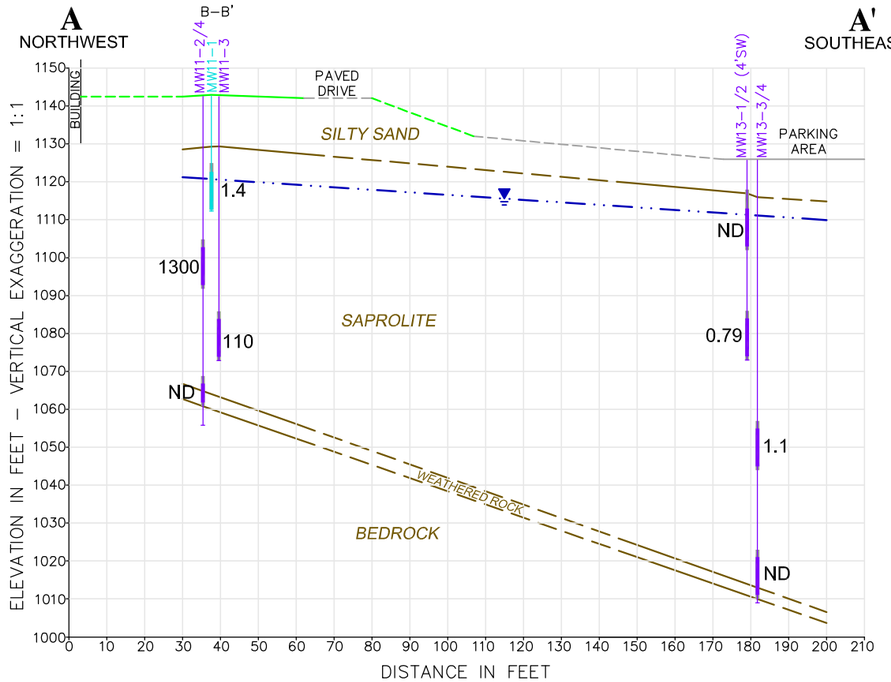
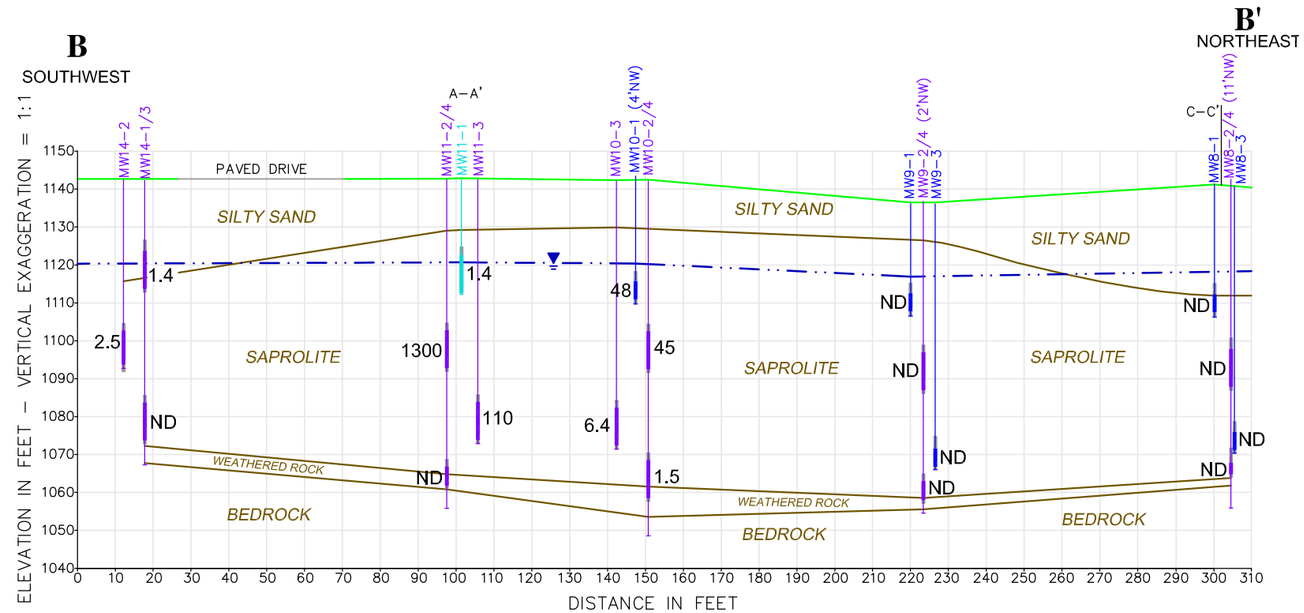
The Johnson Company

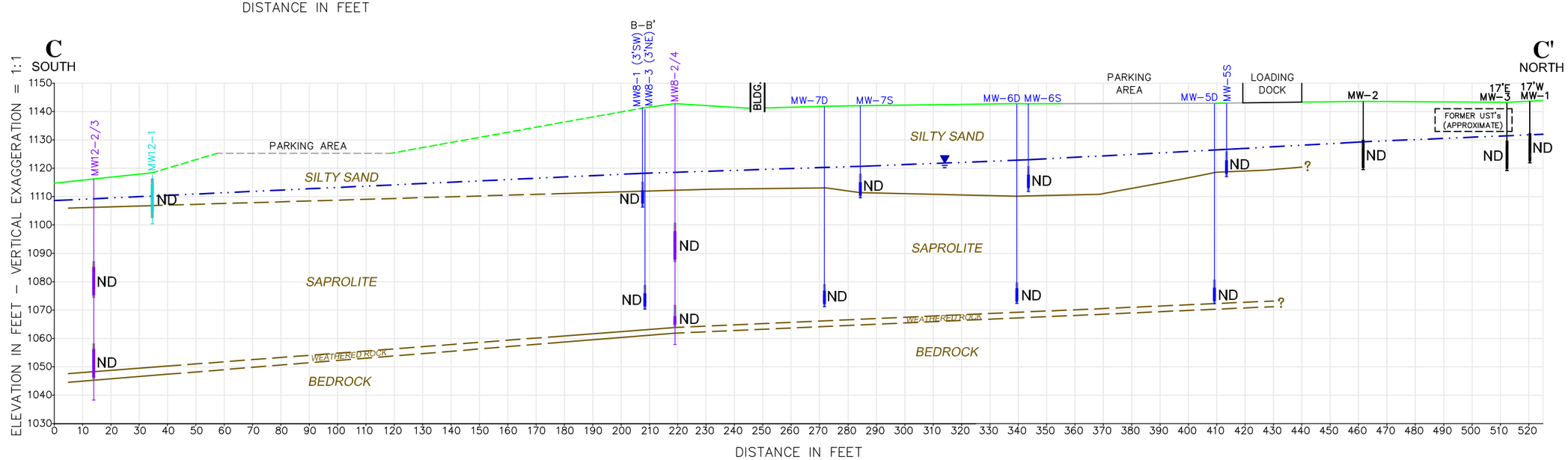
100 State Street, Suite 600
Montpelier, VT 05602
(802) 229-4600

Drawn by: TJK Date: 12/22/14
Chk'd by: CMT Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 3-8
CROSS SECTION LOCATIONS
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA



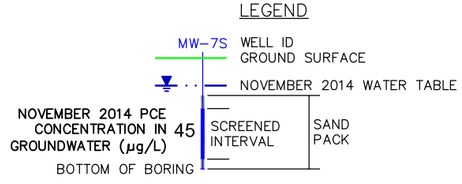




NOTES

ND	NOT DETECTED
NS	NOT SAMPLED
PCE	Tetrachloroethene

LEGEND



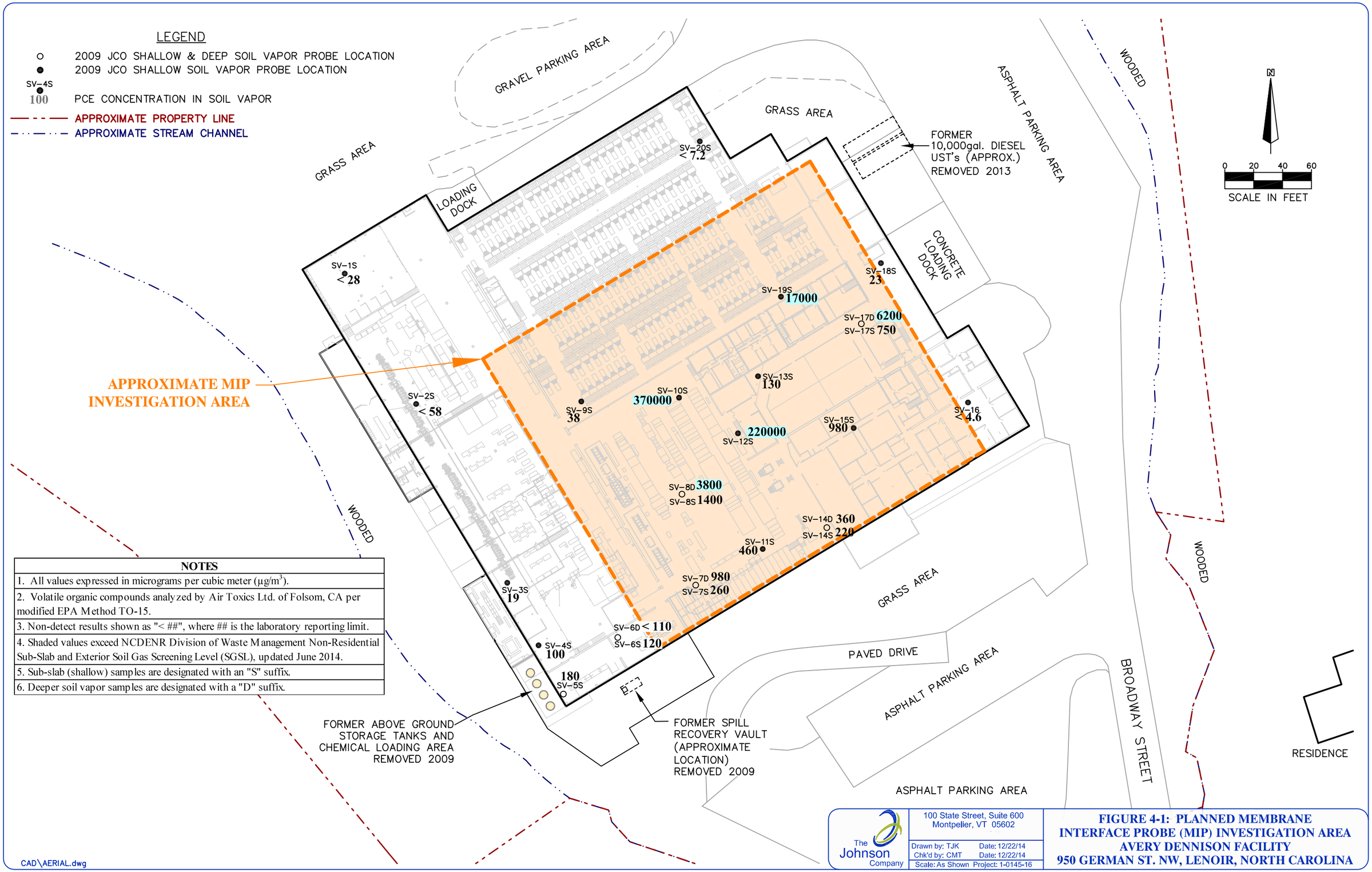
K:\1–0145–16\CAD\XSECs.dwg

The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602
(802) 229-4600

Drawn by: TJK	Date: 10/22/14
Chk'd by: CMT	Date: 10/22/14
Scale: As Shown	Project: 1-0145-16

FIGURE 3-9

CROSS-SECTION DIAGRAMS: NOVEMBER 2014 PCE CONCENTRATIONS IN GROUNDWATER
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA

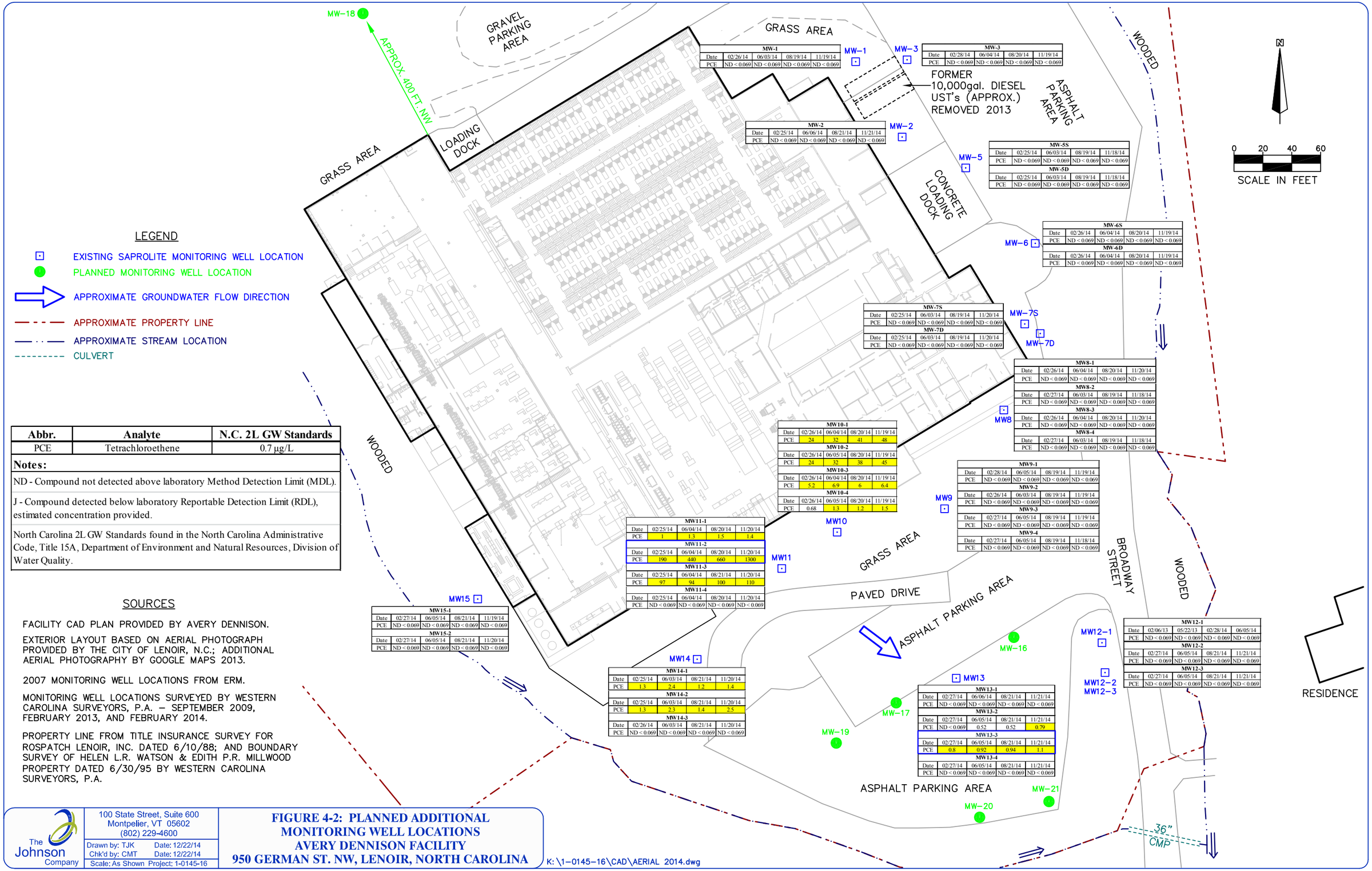


NOTES
1. All values expressed in micrograms per cubic meter (µg/m^3).
2. Volatile organic compounds analyzed by Air Toxics Ltd. of Folsom, CA per modified EPA Method TO-15.
3. Non-detect results shown as "< ##", where ## is the laboratory reporting limit.
4. Shaded values exceed NCDENR Division of Waste Management Non-Residential Sub-Slab and Exterior Soil Gas Screening Level (SGSL), updated June 2014.
5. Sub-slab (shallow) samples are designated with an "S" suffix.
6. Deeper soil vapor samples are designated with a "D" suffix.

The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: TJK Date: 12/22/14
Chk'd by: CMT Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 4-1: PLANNED MEMBRANE INTERFACE PROBE (MIP) INVESTIGATION AREA
AVERY DENNISON FACILITY
950 GERMAN ST. NW, LENOIR, NORTH CAROLINA



MW-1				
Date	02/26/14	06/03/14	08/19/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-3				
Date	02/28/14	06/04/14	08/20/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-2				
Date	02/25/14	06/06/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-5S				
Date	02/25/14	06/03/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW-5D				
Date	02/25/14	06/03/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-6S				
Date	02/26/14	06/04/14	08/20/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW-6D				
Date	02/26/14	06/04/14	08/20/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW-7S				
Date	02/25/14	06/03/14	08/19/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW-7D				
Date	02/25/14	06/03/14	08/19/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW8-1				
Date	02/26/14	06/04/14	08/20/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW8-2				
Date	02/27/14	06/03/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW8-3				
Date	02/26/14	06/04/14	08/20/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW8-4				
Date	02/27/14	06/03/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW10-1				
Date	02/26/14	06/04/14	08/20/14	11/19/14
PCE	24	32	41	48
MW10-2				
Date	02/26/14	06/05/14	08/20/14	11/19/14
PCE	24	32	38	45
MW10-3				
Date	02/26/14	06/04/14	08/20/14	11/19/14
PCE	5.2	6.9	6	6.4
MW10-4				
Date	02/26/14	06/05/14	08/20/14	11/19/14
PCE	0.68	1.3	1.2	1.5

MW9-1				
Date	02/28/14	06/05/14	08/19/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW9-2				
Date	02/26/14	06/03/14	08/19/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW9-3				
Date	02/27/14	06/05/14	08/19/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW9-4				
Date	02/27/14	06/05/14	08/19/14	11/18/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW11-1				
Date	02/25/14	06/04/14	08/20/14	11/20/14
PCE	1	1.3	1.5	1.4
MW11-2				
Date	02/25/14	06/04/14	08/20/14	11/20/14
PCE	190	440	660	1300
MW11-3				
Date	02/25/14	06/04/14	08/21/14	11/20/14
PCE	97	94	100	110
MW11-4				
Date	02/25/14	06/04/14	08/20/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW15-1				
Date	02/27/14	06/05/14	08/21/14	11/19/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW15-2				
Date	02/27/14	06/05/14	08/21/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW14-1				
Date	02/25/14	06/03/14	08/21/14	11/20/14
PCE	1.3	2.4	1.2	1.4
MW14-2				
Date	02/25/14	06/03/14	08/21/14	11/20/14
PCE	1.3	2.3	1.4	2.5
MW14-3				
Date	02/26/14	06/03/14	08/21/14	11/20/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW13-1				
Date	02/27/14	06/06/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW13-2				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	ND < 0.069	0.52	0.52	0.79
MW13-3				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	0.8	0.92	0.94	1.1
MW13-4				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

MW12-1				
Date	02/06/13	05/22/13	02/28/14	06/05/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW12-2				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069
MW12-3				
Date	02/27/14	06/05/14	08/21/14	11/21/14
PCE	ND < 0.069	ND < 0.069	ND < 0.069	ND < 0.069

LEGEND

- EXISTING SAPROLITE MONITORING WELL LOCATION
- PLANNED MONITORING WELL LOCATION
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- APPROXIMATE PROPERTY LINE
- APPROXIMATE STREAM LOCATION
- CULVERT

Abbr.	Analyte	N.C. 2L GW Standards
PCE	Tetrachloroethene	0.7 µg/L

Notes:

ND - Compound not detected above laboratory Method Detection Limit (MDL).

J - Compound detected below laboratory Reportable Detection Limit (RDL), estimated concentration provided.

North Carolina 2L GW Standards found in the North Carolina Administrative Code, Title 15A, Department of Environment and Natural Resources, Division of Water Quality.

SOURCES

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The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602
(802) 229-4600

Drawn by: TJK Date: 12/22/14
Chk'd by: CMT Date: 12/22/14
Scale: As Shown Project: 1-0145-16

FIGURE 4-2: PLANNED ADDITIONAL MONITORING WELL LOCATIONS AVERY DENNISON FACILITY 950 GERMAN ST. NW, LENOIR, NORTH CAROLINA

K:\1-0145-16\CAD\AERIAL 2014.dwg

APPENDIX

APPENDIX A

Survey Plats

Ardway King
Deed Book 218 Page 047

Charles Hartley
Deed Book 488 Page 459

Debra K. Sanders
Deed Book 938 Page 170

S 47°35'14"E 1212.44'

S 46°18'20"E 277.55'

N 47°48'06"E 49.36'

N 26°24'37"E 66.00'

N 28°01'07"E 121.99'

N 08°21'53"W 120.09'

N 21°24'39"W 131.89'

S 71°52'40"W 203.58'

S 07°08'00"E 409.12'

N 81°56'20"W 47.55'

Astronomic North by Solar Observation on 6/20/88

William R. Nelson
Deed Book 859 Page 301

(Tr. I) (Tr. II)

Harpertown Methodist Church
Deed Book 417 Page 137

Virginia Dixon
Deed Book 411 Page 608

N 60°03'58"E 351.16'

27.15 acres
Deed Book 661 Page 1478

(Tr. I) (661-1742)

(Tr. II) (661-1742)

Asphalt Pavement

Chainlink Fence

Deeds overlap in this area...

Branch

1-Story Masonry Building

Parking Lot

Louise McDade
Deed Book 328 Page 245

Mrs. F. L. German
Deed Book 315 Page 248

German Rd

R/W for the City of Lenoir
Deed Book 467 Page 162

N 81°01'40"W 198.06'

N 09°30'01"E 63.24'

N 34°04'44"W 398.10'

N 17°53'23"E 63.99'

N 26°18'22"E 45.25'

N 42°58'45"W 196.78'

S 41°13'11"W 194.68'

Harpertown Road

Ruth Mae Robbins, et al.
Deed Book 566 Page 413

Ruby P. Dula
Deed Book 289 Page 182

S 48°05'38"E 127.37'

N 33°54'22"E 326.63' Total

214.57'

N 41°24'25"W 102.15'

N 54°33'19"W 143.60'

N 39°29'23"W 211.73' Total

171.10'

40.63'

121.89'

S 53°12'03"W

Bryant Corpening
Deed Book 677 Page 143

(700-1340)

Etta Keller
Deed Book 328 Page 231
Deed Book 700 Page 1340

(328-231)

NOTES:

1) Since the south and southeast boundaries of the subject tract follow natural water courses it should be noted that water courses are subject to change and the water courses shown hereon may not represent the actual location of the limit of title.

2) Due to the 17+ feet of error within the description of Tract I of Deed Book 661, Page 1478 deed bearings and distances were not shown.

To: Rospatch Lenoir, Inc. and First Am. Title Ins. Co.

This is to certify that this map or plot and the survey upon which it is based were made accordance with "Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys," jointly established and adopted by ALTA and ACSM in 1986; and meets the accuracy requirements of a Class A Survey, as defined therein.

T. R. Bishop
Registration No. L 2427

NORTH CAROLINA PROFESSIONAL SEAL L-2427 LAND SURVEYOR T. R. BISHOP

60 30 0 60 120 180
SCALE IN FEET

LEGEND

EXISTING IRON PIPE	E.I.P.
NEW IRON PIPE	N.I.P.
P. K. NAIL	P.K.
POINT	PT.
CONCRETE MONUMENT	C.M.

I, T. R. BISHOP, RLS, CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THE RATIO OF PRECISION AS CALCULATED BY LATITUDES AND DEPARTURES IS 1: 15,000 +; (THAT THE BOUNDARIES NOT SURVEYED ARE SHOWN AS BROKEN LINES PLOTTED FROM INFORMATION FOUND IN BOOK As, PAGE Shown); THAT THIS MAP WAS PREPARED IN ACCORDANCE WITH G. S. 47-30 AS AMENDED.

WITNESS MY HAND AND SEAL THIS 10th DAY OF June A.D., 19 88.

SIGNATURE T. R. Bishop (RLS) REG. NO. L-2427

WESTERN CAROLINA SURVEYORS, P. A.
LENOIR, N. C. TELE. 758-5353

TITLE: Title Insurance Survey for:
Rospatch Lenoir, Inc.

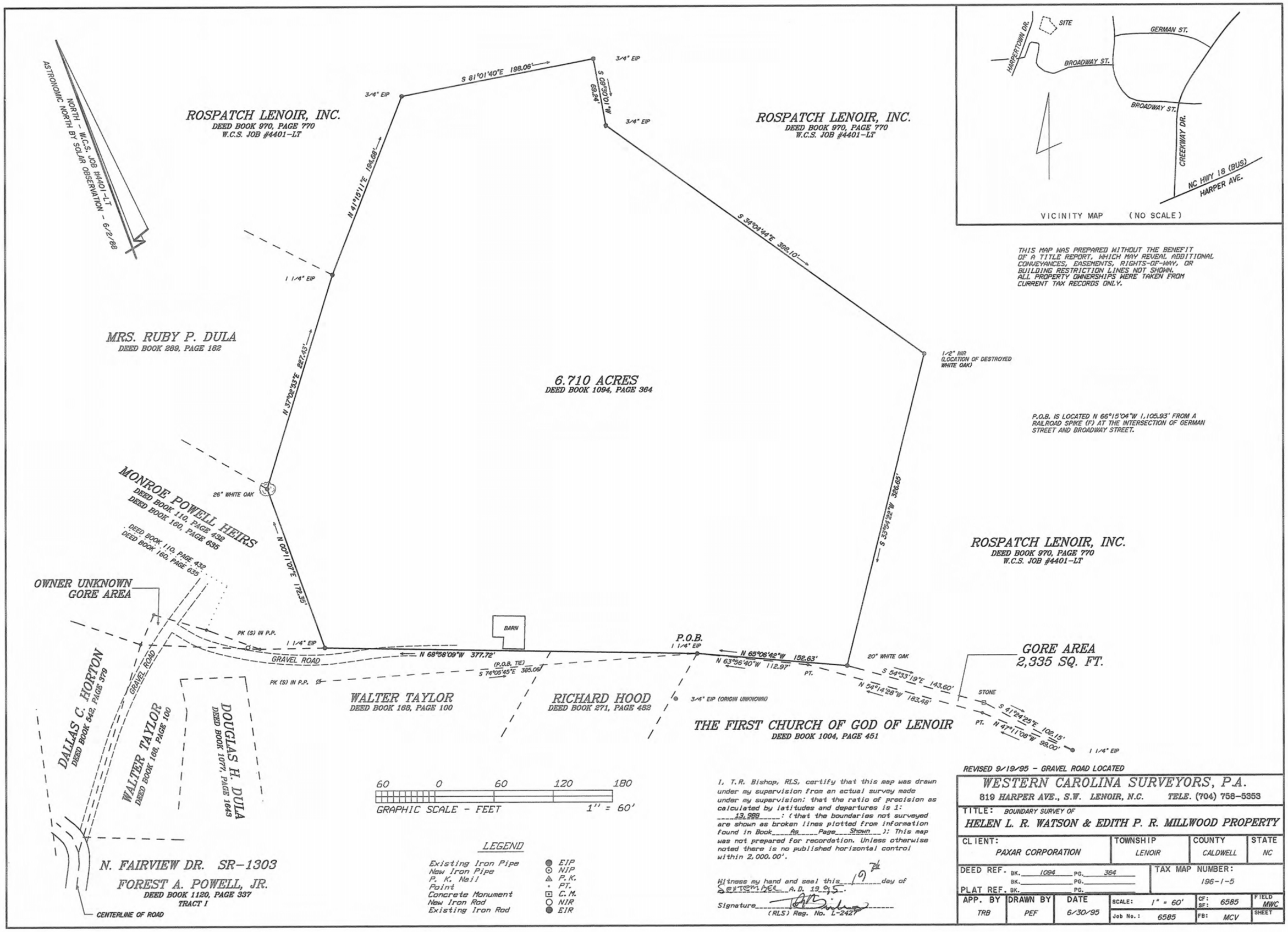
CLIENT:	TOWNSHIP	COUNTY	STATE
Rospatch Lenoir, Inc.	Lenoir	Caldwell	N.C.

DEED REF. BK. 661 PG. 1478 ; BK. PG. ; BK. PG. ; BK. PG. ; BK. PG. ; BK. PG.

APP. BY	DRAWN BY	DATE	SCALE	JOB NO.	SHEET
TRB	M. Gray	6-10-88	1" = 60'	4401-LT	1 OF 1

File # 4401 T.M. 196-1-1 DAE FB 458

SOUTHERN PHOTO • CBERNSCHO N-17503


NORTH - W.C.S. JOB #4401-LT
ASTRONOMIC NORTH BY SOLAR OBSERVATION - 6/2/88
ROSPATCH LENOIR, INC.
DEED BOOK 970, PAGE 770
W.C.S. JOB #4401-LT
3/4" EIP
S 81°01'40"E 198.06'
3/4" EIP
S 08°58'20"W 10.06'
63.24'
3/4" EIP
ROSPATCH LENOIR, INC.
DEED BOOK 970, PAGE 770
W.C.S. JOB #4401-LT
N 41°15'11"E 194.68'
S 34°04'44"E 398.10'
1 1/4" EIP
MRS. RUBY P. DULA
DEED BOOK 289, PAGE 182
N 37°02'53"E 227.43'
6.710 ACRES
DEED BOOK 1094, PAGE 364
1/2" NIR
(LOCATION OF DESTROYED WHITE OAK)
MONROE POWELL HEIRS
DEED BOOK 110, PAGE 432
DEED BOOK 160, PAGE 635
26" WHITE OAK
N 00°11'07"E 172.35'
S 33°54'22"W 326.65'
ROSPATCH LENOIR, INC.
DEED BOOK 970, PAGE 770
W.C.S. JOB #4401-LT
DEED BOOK 110, PAGE 432
DEED BOOK 160, PAGE 635
OWNER UNKNOWN
GORE AREA
PK (S) IN P.P.
1 1/4" EIP
BARN
P.O.B.
1 1/4" EIP
N 68°58'09"W 377.72'
GRAVEL ROAD
(P.O.B. TIE)
S 74°05'45"E 385.06'
N 65°06'42"W 152.63'
N 63°56'40"W 112.97'
PT.
20" WHITE OAK
GORE AREA
2,335 SQ. FT.
S 54°33'19"E 143.60'
N 54°14'28"W 183.49'
STONE
S 41°24'25"E 102.15'
PT.
N 47°11'08"W 99.00'
1 1/4" EIP
PK (S) IN P.P.
DALLAS C. HORTON
DEED BOOK 542, PAGE 379
GRAVEL ROAD
WALTER TAYLOR
DEED BOOK 168, PAGE 100
DOUGLAS H. DULA
DEED BOOK 1077, PAGE 1643
WALTER TAYLOR
DEED BOOK 168, PAGE 100
RICHARD HOOD
DEED BOOK 271, PAGE 482
3/4" EIP (ORIGIN UNKNOWN)
THE FIRST CHURCH OF GOD OF LENOIR
DEED BOOK 1004, PAGE 451
N. FAIRVIEW DR. SR-1303
FOREST A. POWELL, JR.
DEED BOOK 1120, PAGE 337
TRACT I
CENTERLINE OF ROAD
60 0 60 120 180
GRAPHIC SCALE - FEET
1" = 60'
LEGEND
Existing Iron Pipe EIP
New Iron Pipe NIP
P. K. Nail P.K.
Point PT.
Concrete Monument C.M.
New Iron Rod NIR
Existing Iron Rod EIR
SITE
HARPERTOWN DR.
GERMAN ST.
BROADWAY ST.
BROADWAY ST.
CREEKWAY DR.
NC HWY 18 (BUS)
HARPER AVE.
VICINITY MAP (NO SCALE)
THIS MAP WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT, WHICH MAY REVEAL ADDITIONAL CONVEYANCES, EASEMENTS, RIGHTS-OF-WAY, OR BUILDING RESTRICTION LINES NOT SHOWN. ALL PROPERTY OWNERSHIPS WERE TAKEN FROM CURRENT TAX RECORDS ONLY.
P.O.B. IS LOCATED N 66°15'04"W 1,105.93' FROM A RAILROAD SPIKE (F) AT THE INTERSECTION OF GERMAN STREET AND BROADWAY STREET.
I, T.R. Bishop, RLS, certify that this map was drawn under my supervision from an actual survey made under my supervision; that the ratio of precision as calculated by latitudes and departures is 1: 13,988 : (that the boundaries not surveyed are shown as broken lines plotted from information found in Book As Page Shown); This map was not prepared for recordation. Unless otherwise noted there is no published horizontal control within 2,000.00'.
Witness my hand and seal this 19th day of September A.D. 19 95.
Signature
(RLS) Reg. No. L-2427
REVISED 9/19/95 - GRAVEL ROAD LOCATED
WESTERN CAROLINA SURVEYORS, P.A.
819 HARPER AVE., S.W. LENOIR, N.C. TELE. (704) 758-5353
TITLE: BOUNDARY SURVEY OF
HELEN L. R. WATSON & EDITH P. R. MILLWOOD PROPERTY
CLIENT: PAXAR CORPORATION
TOWNSHIP LENOIR
COUNTY CALDWELL
STATE NC
DEED REF. BK. 1094 PG. 364
BK. PG.
PLAT REF. BK. PG.
TAX MAP NUMBER: 196-1-5
APP. BY TRB
DRAWN BY PEF
DATE 6/30/95
SCALE: 1" = 60'
Job No.: 6585
CF: SF: 6585
FB: MCV
FIELD MWC
SHEET

APPENDIX B

Background Summary Report (MSGA, 2011)

AVERY DENNISON
Avery Dennison Corporation
Environmental, Health & Safety
7 Bishop Street
Framingham, MA USA 01702
Office: 508 383-3010 Fax: 508/383-3011

June 30, 2011

Mr. Bruce Parris
Superfund Supervisor
North Carolina Department of Environment and Natural Resources.
Mooresville Regional Office
610 East Center Ave.
Mooresville, North Carolina 28115

Re: Environmental Investigation Report, Avery Dennison Facility, Lenoir, North Carolina

Dear Mr. Parris:

Avery Dennison (Avery) submits the attached Environmental Investigation Report and Background Summary Report for the Avery property at 950 German Street in Lenoir, North Carolina (the Property). Avery respectfully requests NCDENR issue a No Further Action (NFA) determination for the Property on the basis of the comprehensive due diligence and subsurface investigation results presented in the attached documents. Payment of the required $500 fee for NCDENR review of an NFA request is also enclosed.

Avery acquired the Property as part of its acquisition of Paxar Corporation (Paxar) in June 2007 and contracted environmental consultants ERM, The Johnson Company, and Martin & Slagle GeoSciences to perform comprehensive due diligence and subsurface environmental investigations at the Property. These investigations were completed in 2010 and included the collection of soil, soil gas, and groundwater samples for laboratory analysis of parameters including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and petroleum hydrocarbons. Soil gas analytical results showed that only one compound, tetrachloroethene (PCE), exceeded Inactive Hazardous Sites Branch (IHSB) Vapor Intrusion Screening Levels at the Property. Because PCE is actively used at the Property, its concentration in indoor air is regulated by the federal Occupational Safety and Health Administration (OSHA).

PCE was also the only contaminant to exceed its North Carolina 2L Groundwater Standard in the most recent groundwater sampling event at the Property. PCE slightly exceeded the 2L Standard at one shallow well location and was attributed to chemical partitioning from soil gas into shallow groundwater at the water table beneath the Facility. The relatively low concentration of PCE detected in groundwater does not represent an apparent risk to potential human or ecological receptors due to its limited extent (at only one well) and absence of potential downgradient receptors in close proximity. On the basis of these results, Avery requests NCDENR issue an NFA determination for the Property.

Please do not hesitate to contact me if you have any questions regarding the Property or the enclosed documents.

Sincerely,

Bruce Martin

Bruce Martin
Corp. Manager, Env. Remediation Services
Avery Dennison Corporation

Cc: Robert Martin, Martin & Slagle GeoSciences
Christopher Turner, The Johnson Company

Attachments: Environmental Investigation Report, prepared by The Johnson Company
Background Summary Report, prepared by Martin & Slagle GeoSciences
Payment of NFA request review fee

BACKGROUND SUMMARY REPORT
AVERY DENNISON FACILTY
950 GERMAN STREET
LENOIR, NORTH CAROLINA

AVERY DENNISON

PREPARED FOR:

AVERY DENNISON CORPORATION
7 BISHOP STREET
FRAMINGHAM, MASSACHUSETTS 01702

Prepared by:
MARTIN&SLAGLE GEOENVIRONMENTAL ASSOCIATES, LLC
118F Cherry Street
Black Mountain, North Carolina 28711
(828) 669-3929
FAX (828) 669-5289

MSGA PROJECT NUMBER: JC09-01

June 2011

BACKGROUND SUMMARY REPORT

Avery Dennison Facility
Lenoir Facility
Lenoir, North Carolina

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CERTIFICATION BY THE REPRESENTATIVE OF THE REMEDIATING PARTY

"I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate and complete."

Bruce A. Martin
Signed by

Corp Mgr. Env. Remediation Svcs.
Title

Virginia M. Winkley
VIRGINIA M. WINKLEY
Notary Public
Commonwealth of Massachusetts
My Commission Expires
March 18, 2016

CERTIFICATION BY THE CONSULTANT

"I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate and complete."

Robert L Mar
Signed by

Principal Geologist
Title

North Carolina

Buncombe County

I, James M. Shomaker a Notary Public for McDowell County, North Carolina, do hereby certify that

Robert L. Martin

personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the 15 day of June, 2011.

Notary Public

JAMES M. SHOMAKER NOTARY PUBLIC MCDOWELL COUNTY, NC

My commission expires March 24, 2014

INTRODUCTION

The documents included with this Request for No-Further-Action were prepared as corporate, internal studies and assessments associated with the due diligence efforts related to the acquisition of the German Street Facility. While technically comprehensive, they may not include certain technical information required by the IHSB *Guidelines for Assessment and Cleanup,* October 2008 (Guidelines). In order to comply with information requirements, the following sections contain the background and history documentation for the German Street Facility.

The following information was excerpted from a report prepared by ERM in March 2008 entitled *Phase I EHS Acquisition Due Diligence Assessment Report, Former Paxar Facility*, prepared for Avery Dennison Corporation. Additional information was excerpted from a report prepared by ERM in April 2008 entitled *Limited Environmental Investigation Report (Acquisition Due Diligence), Former Paxar Facility*, prepared for Avery Dennison Corporation. Additional information was obtained from the *Tank Closure Report* (January 2010) conducted by Martin and Slagle GeoEnvironmental Associates (MSGA) as well as from information provided by the Johnson Company (JCO), specifically from the June 2011 *Environmental Investigation Report*, prepared for Avery Dennison Corporation. The descriptions in this document reflect the historical condition of the facility up to the time of the above reports' preparation.

Background information and operating practices presented in this summary are organized as outlined in Section 2.0 – Remedial Investigation Work Plans in the Guidelines.

PHASE I REMEDIAL INVESTIGATION: IDENTIFICATION OF CONTAMINANTS AND AREAS OF CONCERN

Site Description

1. Site Location

Table 1 – Site Information
950 German Street & 2056 Harpertown Drive
Lenoir, NC
March 2008

Lot 1	*Lot 2*
950 German Street	2056 Harpertown Drive
Lenoir, Caldwell County, NC	Lenoir, Caldwell County, NC
Parcel ID: 06196-1-1	Parcel ID: 06196-1-5
Area: 25.4 acres	Area: 6.4 acres
Zoning: (City of Lenoir) I-2 (Industrial) & RR (Rural Residential)	Zoning: (City of Lenoir) RR (Rural Residential) & R6 (Residential
Latitude: 35 55' 11.16" Longitude: 81 33' 33.12"	Latitude: 35 55' 14.87" Longitude: 81 33' 41.65"

See **Figure 1** for the site's location.

Surrounding Property Uses

The Avery Dennison facility is generally surrounded by undeveloped land, residential properties and a church. Table 2, below, describes surrounding land uses.

Table 2 – Surrounding Land Uses
950 German Street & 2056 Harpertown Drive
Lenoir, NC
March 2008

Direction	*Land Uses*
North	Immediately north of the facility, the land use is wooded and undeveloped. Further north, properties are residential. A small cemetery is situated adjacent to the northern subject property boundary. Harpertown Drive is situated northwest of the subject property.
East	Properties east of the facility are a mix of residential development and wooded undeveloped land.

Direction	*Land Uses*
South	Properties south of the facility are a mix of residential development and wooded undeveloped land. German Street is south, southeast of the subject property; Broadway Street runs south, southwest of the subject property. Commercial development is present along Creekway Drive, approximately 4,600 feet southeast of the facility.
West	Properties west of the facility include a mix of wooded/undeveloped land, residential and a church (First Church of God)

2. Summary of Management Practices

Facility Operations

Prior to 2009
The facility is a manufacturer of apparel labels. Facility personnel report that their National Industry Classification System (NAICS) code is 3313221 (Narrow Fabric Mills). According to EPA's Facility Registry System (FRS), several Standard Industry Classification (SIC) codes are associated with the facility including:

- *2396*: Automotive trimmings, apparel findings, and related products;
- *2241*: Narrow fabric and other small-wares mills: cotton, wool, silk, and manmade fabrics;
- *2299*: Textile goods, not elsewhere classified;
- *2399*: Fabricated textile products, not elsewhere classified;
- *2269*: Finishers of textiles, not elsewhere classified; and
- *9999*: Non-classifiable establishments.

The process begins with the receipt of yarn bobbins delivered via truck to a leased off-site building located at 510-A Greer Circle, in Lenoir, NC where it is warped onto 54-inch beams. The warping process also uses a sizing material (a polyvinyl alcohol (PVA) starch) which stiffens the yarn to prevent yarn breakage during the weaving process. The beams are then transported to the facility located on the large parcel where it is weaved into narrow fabric ribbons.

Fabric is then taken to the dye finish department where it is scoured (washed), dyed or bleached, scoured again, finished in a polyurethane bath and then dried. The dyed/finished fabric is wound onto spools and transferred to the printing areas of the facility. Printing operations include rotary letter press, flatbed screen, and hot stamp. Inks in the facility were observed in pastes, polyurethane based liquids, and crystals. The facility prints onto pre-purchased fabric sheets using offset presses and screen presses as well as polyfilm using heat transfer methods for sheet fed and roll fed machines. The facility also utilizes an ink coater (Meyer Rod type). Emissions from the ink coaters and the ink mixing room are discharged to a regenerative thermal oxidizer (RTO) to reduce volatile organic vapor emissions. Facility personnel stated

that 1,1,1-trichloroethane (1,1,1-TCA) was formerly used as an ink carrier in this process. According to facility personnel, the facility discontinued use of 1,1,1-TCA approximately eight years ago and now uses toluene as a carrier solvent.

Once the various media has been printed, they are cut and placed into shipping containers (usually cardboard boxes) for transfer to a leased off-site shipping warehouse located at 330 Advantage Court in Lenoir, NC.

There are two 10,000-gallon diesel underground storage tanks (UST) at the subject property; the USTs are located east of the boiler room. According to the facility contact, the diesel fuel USTs were installed in 1964 and are constructed of single-walled steel. These two tanks were tightness tested in May 1991 by Superior Services of Hendersonville, North Carolina. The southern tank passed the precision and ullage (space above product line) tests. The northern tank passed the precision test, but was listed as failing the ullage test, even though recorded response was 0.001 gallons/hour, within the threshold of +/- 0.05 gallons/hour. No tightness tests have been conducted since 1991. According to facility personnel, the USTs have a UST-Permit number of 201005702O; the most recent certificate was issued in June 2010 and will expire June 2011.

During a 2008 site visit, numerous interior observations were made. In general, housekeeping was good. However, the ink mixing room (southwest corner of building) contained splattered ink on the walls of the mixing booth as well as slightly etched concrete floors covering a roughly eight foot by ten foot area. Floor trench drains are located in the dye and finishing room where process water is channeled to subgrade piping that connects to the City of Lenoir sanitary sewer system. According to facility personnel, the trenches are concrete and are not lined with any additional lining material (e.g. epoxy).

A floor drain was observed in a printing room located in the western portion of the building. The drain was located near two 55-gallon drums of color wash and a hazardous waste satellite storage drum. No apparent staining or indications of spills leading to the drain were readily observed. Facility personnel were not certain where the drain led, but believed it tied into the sanitary sewer system.

The facility is connected to the City of Lenoir's sanitary sewer system for discharge of sanitary waste, boiler blow-down, and process waste streams (washing, scouring, bleaching, dyeing operations) to the Lower Creek Wastewater Treatment Plant. An Industrial User Pretreatment Permit (IUP#0003) was issued to the facility on June 1, 2007 and expires May 31, 2012. According to Mr. Monte Wall of the Lower Creek Waste Water Treatment Plant, City of Lenoir employees routinely measure effluent

parameters. Mr. Wall stated that the facility has historically been in compliance with limits set forth in the IUP with the exception of a biological oxygen demand (BOD) exceedance.

The smaller property had an on-site septic system for sanitary wastewater. No additional information on the septic system was available.

In general, stormwater travels overland as sheet runoff to the creeks situated along the east and west subject property boundaries, which merge at the southern boundary. One stormwater catch basin is located at a dock on the north side of the building. According to Mr. Henderson, this drain discharges into the western creek. Additionally, roof drains discharge into the creek via polyvinyl chloride (PVC) pipe.

A formal ACM survey has not been performed for the facility. Mr. Paul Henderson, Maintenance Supervisor, explained that asbestos-insulated piping exists on steam pipes located in the boiler room, maintenance shop, receiving department, weaving room, and dyeing/finishing room. The piping was not labeled regarding its asbestos content. The condition of the insulation wrapping ranged from good to poor, with areas of exposed potential ACM beneath the wrapping. Mr. Henderson stated that asbestos-containing pipe insulation has been removed on a continual basis each year as maintenance activities encounter it, resulting in a significant reduction in quantity. Western Asbestos, Inc. of Marion, NC is retained to properly remove and dispose of the ACM before maintenance work is performed in areas containing ACMs. An asbestos operations and management plan was not in effect. Twelve-inch floor tile in offices and several manufacturing areas was observed throughout the facility. Given that the facility was originally constructed in 1964, it is possible that additional ACMs could be present in the facility.

A formal survey for lead-based paint has not been performed for the facility. Given that the facility was originally constructed in 1964, it is possible that lead-based paint could be present in the facility. Painted surfaces in the facility were observed to be generally in good condition.

The subject property is air-conditioned. Air-conditioning is provided by a centralized air-conditioning system. According to Mr. Henderson, one of the two chillers uses Freon 113 as a refrigerant and the other uses R-22. The air cool units for the process cooling water (PCW) system use R-22. The chillers are maintained by a contractor, MSS of Charlotte, NC; the chillers are inspected monthly and serviced annually. A 30 pound container of Freon 113 is stored in the coolant storage room located outside the building adjacent to the boiler room and chiller room. A halon fire extinguisher is located in the vicinity of the Information Technology (IT) room.

Chemical usage at the subject property includes: urethane-based inks, toluene, MEK, isopropyl acetate, isopropyl alcohol, N-methylpyrrolidone (NMP), glycol ether, heat transfer adhesives, chiller and boiler water treatment chemicals (anticorrosive/ anti-fungal), and diesel fuel (for boilers). Hazardous waste generation at the subject property includes: methyl ethyl ketone, toluene, isopropyl alcohol, isopropyl acetate, and N-methylpyrrolidone; and ink blends containing toluene, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol and 2-nitropropane.

During the site visit (2008), the following hazardous and non-hazardous wastes were observed at the facility:

Hazardous Wastes:

- One profile number containing: methyl ethyl ketone, toluene, isopropyl alcohol, isopropyl acetate, and N-methylpyrrolidone; and
- Ink blends containing: toluene, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane.

Universal Wastes:

- Light bulbs; and
- Batteries.

Non-Hazardous Wastes:

- Packaging waste such as cardboard, paper, and plastic;
- Scrap metal;
- Fabric tapes (dry);
- Water-based inks;
- Water-based adhesives;
- Used oil; and
- General household trash.

The facility is presently classified as a Large Quantity Generator (LQG) of hazardous wastes (85,800 pounds in 2006). The EPA ID number is NCD981025406. The permit, issued by NCDENR Division of Waste Management – UST Section, was issued to Paxar Corporation on June 1, 2007. No expiration date was listed; an annual fee is required.

The waste storage containers include primarily 55-gallon drums. A summary of the waste storage containers (regulated and solid wastes) is presented below, Table 3.

Table 3 – Waste Storage Container Inventory
950 German Street
Lenoir, NC
March 2008

REGULATED AND HAZARDOUS WASTES

Inventory of Small Quantities (containers less than 1 gallon)		
Wastes stored at the subject property in containers of less than one gallon were not noted.		
Inventory of Bulk and Container Storage (containers greater than 30 gallons)		
Description	*Quantity*	*Location*
Solvents and Ink Blends	55 gallons (15)	Hazardous waste storage area - southwest corner of the building
Used Oil	55 gallons (1)	Hazardous waste storage area - southwest corner of the building
Aboveground Storage Tanks		
ASTs are not utilized at the facility for storage of wastes.		
Underground Storage Tanks		
USTs are not utilized at the facility for storage of wastes. A 1,500-gallons spill recovery vault, located on the south side of the building, was installed in 1988 as part of the ink coater/ ink mixing operations; NCDENR does not require regulation or registration of the vault.		

SOLID WASTES STREAMS

Identification	*Contents*	*Capacity*	*Location*
Self-contained trash compactor	Paper, plastic, household trash	40 cubic yard	Southside of the building (adjacent to receiving room)
Scrap metal	Various types of metal	Non containerized	Southside of the building (adjacent to receiving room)

NOTE: Inventory of wastes was obtained from the Phase I EHS Acquisition Due Diligence Assessment Report, March 2008, as completed by ERM

The facility utilizes several contractors to dispose of wastes. The following table summarizes the contractors, dating back to 1964.

Table 4 – Waste Contractors and Disposal Facilities
950 German Street
Lenoir, NC
March 2008

Time Period	Vendor Name and Address
1964 to 2001	City of Lenoir, 510-B Greer Circle, Lenoir, NC 28645
2001 to present	Republic Services, Inc. dba General Services (GDS) of Hickory, NC, 4062 Section House Road, Hickory Road, Hickory, NC 28601
1988 to 2005	Southeastern Chemical and Solvent, PO Box 175 Sumter, SC 29150
2005 to Present	Parts Cleaning Technologies, LLC, 3114 Cullman Avenue, Charlotte, NC 28206
1996 to Present	SOS Recycling DFW, Inc. 206 Sentry Drive, Mansfield, TX 76063
1996 to Present	IBS Environmental Services, PO Box 1263, Lenoir, NC 28645
1964 to Present (for removal of ACMs)	Western Asbestos, Inc. 660 Old River Road, Marion, NC 28752
	Iris Glen Environmental Center, 1705 E. Main Street, Johnson City, TN 37601

Past Operations
Based on a review of historic deed records the subject property was formerly owned by Stylecraft Packaging from 1964 through 1973. Facility personnel were not knowledgeable of the manufacturing activities that took place in the facility during that time.

Facility personnel indicated that processes have generally remained the same since operations were initiated by Rospatch in 1973. The primary changes have involved the quantity and models of machines used for the various processes.

There was a covered aboveground storage tank (AST) tank farm located on the southwest corner of the building that had a concrete wall for secondary containment and included four ASTs ranging from 1,500-2,000 gallons in capacity, storing methyl ethyl ketone (MEK), toluene, isopropyl acetate, and isopropyl alcohol.

The above ASTs were installed in 1988 when the ink coater machine was installed. Fill ports for the ASTs were located within the secondary containment structure, attached to the building's wall. Product from the ASTs was piped via 2- inch steel conduit overhead into the building where it was transported according to areas of use. The ASTs were located in close proximity to an adjacent stream. The former AST previously storing 1,1,1-TCA was installed at the same time as the other ASTs, within the same basin. The 1,500-gallon 1,1,1-TCA AST was decommissioned eight to ten years ago when the facility changed to toluene as a carrier solvent.

A spill reclamation system was located in the ink mixing/ink coating room that contains trench drains at the doors and floor drains. The drains led to a 1,500-gallon concrete spill containment vault located underground on the outside of the building.

In 2009, MSGA was contracted to close the four ASTs and the 1,500-gallon concrete emergency spill containment vault; the ancillary equipment including pumps, piping, valves, controls, electrical connections, and fire suppression systems was also removed.

Potential or Known Releases
According to facility personnel, a release of approximately 100 pounds of toluene occurred in the ink mixing room on April 14, 1993. The material entered the floor drains and collected in the 1,500-gallon concrete vault located outside of the facility for reclamation by Southeastern Chemical and Solvent, Inc. of Sumter, South Carolina. The Lenoir Emergency Planning Committee was notified of the release. No other releases from aboveground or below ground sources are known by facility personnel.

The facility was reported in public database records as having one historical release documented. No information regarding the release was provided; the database was listed as being revised in January 1990. Database listings included the air permit, hazardous waste generators information with several minor violations related to inspections and manifests, wastewater permit, and toxic release inventory (TRI) reporting.

3. United States Geologieal Survey (USGS) Topographic Maps

The subject property contains two small streams situated along the eastern and western subject property boundaries. They merge at the southern subject property boundary and join with Spainhour Creek, located approximately 700 feet southeast of the subject property. Spainhour Creek is part of the Catawba River drainage basin. The Catawba River is a Class C water body, which does not require special regulatory protection.

According to facility personnel, storm water from the subject property flows into the streams that flow into Spainhour Creek. Surface water vulnerability is considered to be high given the proximity of the two creeks to the facility. According to the NCDENR Division of Water Quality's June 2004 Catawba River Basin wide planning program, Spainhour Creek is listed as impaired due to non point sources of pollution such as agriculture and cattle access to the creeks, urban runoff and construction activities.

The topography at, and surrounding, the site is displayed in **Figure 2**.

4. Site Survey Plat

A comprehensive list of figures detailing the property's location and layout, including property lines, is included in the Environmental Investigation Report, prepared by JCO (June 2011). Additional figures identifying sampling locations and potentiometic contours are also included in the November 2010 JCO report.

5. Description of Local Geologic and Hydrogeologic Conditions

Topography

The Lenoir area, including the subject property, is located within the Inner Piedmont physiographic province of North Carolina, which is characterized by intrusive and metamorphic rocks. According to the Geologic Map of North Carolina (1985), the subject property is underlain by migmatitic grantic gneiss consisting of foliated to massive granite to quartz diorite, biotite gneiss and amphibolites common.

According to the US Department of Agriculture Soil Conservation Service's *Soil Survey of Caldwell County, North Carolina, 1989*, soils at the subject property are classified as Pacolet fine sandy clay loams, which are well drained with moderate infiltration rates, and generally extend to at least seven feet below surface grade before the encounter of saprolite (weathered parent rock material). Depth to the water table is listed as greater than six feet. The soil does not meet the requirements for hydric soil.

Hydrogeology

The occurrence and movement of groundwater in the Inner Piedmont province is within two separate, but interconnected, water bearing zones. A shallow water-bearing zone occurs within the saprolite zone, and a deeper zone occurs within the underlying bedrock. Groundwater in the shallow saprolite zone occurs in the interstitial pore space of the saprolite. The depth to groundwater in the saprolitic zone can range from 20 to 45 feet along ridges and upland areas. In low lying stream valleys, the groundwater level will approach the local surface water elevations in stream channels. Groundwater flow in this zone is typically governed by water table conditions. This means that groundwater will flow under unconfined conditions and generally mimic topography. Therefore, groundwater movement will be from upland areas (recharge zones) to nearby surface streams (discharge zones).

The occurrence and movement of groundwater in the deeper water-bearing zone within crystalline bedrock is controlled by secondary joints, fractures, and faults within the bedrock. Groundwater within the bedrock zone may be under confined or unconfined conditions. The occurrence and movement of groundwater is difficult to predict on a small scale due to the erratic nature of the secondary openings that control groundwater flow in bedrock. Small surface water features generally do not provide an indication of the direction of groundwater movement in bedrock. However, on a regional scale, the direction of groundwater movement will generally be from upland areas to major surface streams down-gradient.

Based on topography, it appears that overland run-off from the subject property would ultimately drain to the south. Therefore, it is assumed that groundwater flows generally to the south. However, groundwater flow directions can be variable, and no definite statement can be made regarding groundwater flow direction in the absence of accurate water level measurements from groundwater wells. Site-specific geological and hydrogeological information is included in the Environmental Investigation Report, prepared by JCO (June 2011).

6. Inventory of all Wells, Springs and Surface Water Intakes

An inventory of wells, springs and surface water intakes used as sources of potable water within a one-half mile radius of the center of the site was performed by MSGA. According to Mack Edmisten, Director of Public Works for the City of Lenoir, all of the properties surrounding the subject site have either city- or county-supplied water. Several well-houses were observed during the site reconnaissance and are noted on **Figure 3**. Mr. Edmisten surmised that the well structures are remnants of the former water-supply system.

7.a Environmentally Sensitive Areas

Twelve federal and state agencies were contacted for information concerning sensitive environments in the vicinity of the facility. A summary of the agencies and their responses is provided below. Documentation of their responses is included in Appendix A.

- NC Department of Cultural Resources (*National and State Historical Sites*): According to Mr. Peter Sandbeck, there are **no** historic resources which would be affected by the project; therefore, the DCR does not have any comments on the project.

- US Army Corps of Engineers (*Wetlands*): According to Ms. Tasha McCormick, Regulatory Specialist with the Asheville Regulatory Field Office, the subject property *may* have jurisdictional waters of the United States and their associated wetlands, which are subject to the USACE's regulatory authority; however, due to the information provided (site location), the USACE is unable to provide specific comments concerning potential permit requirements and/or the presence of wetlands. See Appendix A for additional information.

- NCDENR Division of Water Quality (*State-Designated Areas of Protection or Maintenance of Aquatic Life; and Clean Water Act 305b Report*): According to Ms. Melanie Williams, River Basin Planner, the subject property drains to Blair Fork in the Catawba River Basin. The stream is not currently on the Impaired Waters List; however the stream has high levels of toxicity, fecal coliform bacteria, copper, turbidity and nutrients. Blair Fork also flows into Lower Creek which is on the Impaired Waters list. The subject property is in a sensitive environmental area for the protection and maintenance of aquatic life.

- NC Division of Coastal Management (*Areas Identified Under Coastal Protection Legislation; and Coastal Barriers or Units of a Coastal Barrier Resource System*): According to Stephen Rynas, the DCM does not maintain a database of environmentally sensitive areas outside of the State's coastal zone.

- NC Division of Forest Resources (*State Preserves and Forests*): According to Mr. Chris Carlson, there are **no** State Preserves or Forests in the vicinity of the facility.

- NC Division of Park and Recreation – Natural Resources and Regional Planning (*State Wild and Scenic Rivers)*: According to Amin Davis, there are **no** State Wild and Scenic Rivers in the vicinity of the facility.

- NC Wildlife Resources Commission (*National or State Refuges; Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tidal Waters in which such Fish Spend Extended Periods of Time; and Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters*): According to Ms. Shari Bryant, Piedmont Regional Coordinator, the site is **not** located within or near NCWRC game lands or any significant heritage areas nor is the site near any migratory pathways or critical feeding areas; although the NCWRC is not aware of any specific reaches of Spainhour Creek that are

critical spawning areas, the maintenance of water quality and aquatic habitat is essential for the continued survival of any fish or mussel population in the watershed.

- USDA Forest Service (*Designated and Proposed Federal Wilderness and Natural Areas; National Preserves and Forests; and Federal Land Designated for the Protection of Natural Ecosystems*): According to Ms. Ruth Berner, Forest Planner, the USDA Forest Service identifies **no** sensitive environments at or adjacent to the subject property.

- US Fish and Wildlife Service (*Endangered Species*): According to the Asheville Field Office, **no** federally listed species or their habitats occur on the subject site.

- NOAA (*Marine Sanctuaries*): According to Vicki Wedell, the project site is **not** adjacent to any National Marine Sanctuaries.

- National Parks Service – Public Affairs Office (*National Seashore, Lakeshore and River Recreational Areas; National Parks or Monuments; and Federal Designated Wild and Scenic Rivers*): the contact person was contacted through the United States Post Office and email. The phone number provided was not connected; attempts to contact the NPS were not successful. However, based on available information on the NPS website, there are no listed recreational areas or parks within 10 miles of the site; additionally, there are no designated wild and scenic rivers near the site.

- NC Division of Parks and Recreation – Natural Heritage Program (*State Parks; Areas Important to Maintenance of Unique Natural Communities; Sensitive Areas Identified Under the National Estuary Program; Designated State Natural Areas; State Seashore, Lakeshore and River Recreational Areas; Rare Species (state and federal threatened or endangered); and Sensitive Aquatic Habitat*): According to Mr. Harry LeGrand Jr., Zoologist, the Natural Heritage Program (NHP) has **no** record of rare species, significant natural communities, significant natural heritage areas, or conservation/managed areas within a mile of the subject property. Although the NHP's maps do not show records of such natural heritage elements in the project areas, it does not necessarily mean that they are not present; it may simply mean that the area has not been surveyed.

7.b Terrestrial Ecological Receptor Habitats

The facility located on the larger parcel comprises production areas, warehouse areas, and office space. The portion of the larger parcel not occupied by the manufacturing building contains asphalt parking areas, asphalt driveways, a gravel parking area, a small guard shack, and grass-covered areas. The remaining portions of the larger parcel are mostly wooded and undeveloped with steep grades.

The smaller parcel contains an abandoned residential structure in the northwest corner of the subject property, accessed by Harpertown Drive. This structure is generally in disrepair and surrounded by overgrown vegetation. The structure was serviced by an on-site sanitary septic system. No additional information on the septic system was available. A drinking water well was not observed, and facility personnel have no knowledge of a well being present.

The central urban area of Lenoir is located approximately 1.2 miles southeast of the subject property. The subject property is accessible from Broadway Street via German Street. The main access road to the subject property is Broadway Street.

The wooded and undeveloped areas (east, north and west) could possibly provide habitat for terrestrial ecological receptors. The areas further north from the facility are undeveloped, however, and may provide a more desirable habitat.

7.c Stressed Vegetation and Stressed Wildlife

Areas of stressed vegetation were not observed on the exterior subject property. No evidence of stressed wildlife was readily apparent in the vicinity of the subject property.

SITE HISTORY

8. Chronological Listing of Previous Owners

Table 5 – Summary of Previous Owners and Occupants
950 German Street
Lenoir, NC
March 2008

Property	Time Period	Property Owner	Occupant	Description of Site Uses
Large Parcel	Prior to 1964	*Tract 1:* William and Helen Craig *Tract 2:* Robert and Magdalene Nelson	Not known	Not known

Property	Time Period	Property Owner	Occupant	Description of Site Uses
	1964 - 1973	Stylecraft Packaging, Inc.	Possibly Stylecraft Packaging, Inc.	Possibly manufacturing of plastic packaging materials
	1973 - Current	Rospatch Lenoir, Inc.	Rospatch from 1973 until 1988; Paxar from 1988 - Current	Manufacturing of apparel labels
Small Parcel	Prior to 1995	Paul and Helen Robbins; Bill and Edith Millwood	Not physical occupied/used	Residential
	1995 - Current	Paxar Corporation	Not physical occupied/used	None
Sources: Caldwell County North Carolina Deed Records (Deed Book/Page): 1143/830; 970/770, 661/1478				

9. Operational History

The facility was initially constructed in 1964 with an approximate 50,000 square foot building. The building was doubled in 1967 with 50,000 additional square feet. Approximately 30,000 square feet of manufacturing space was added in 1988. A mezzanine area of approximately 10,000 square feet was then added internally to the building in 2003 for office space. Based on a review of a 1940 aerial photograph, the subject property was mostly wooded and undeveloped with an open grassy area northwest of the current building location prior to construction of the 50,000 square foot building in 1964. The 1965 aerial photograph depicted the subject property developed with a large commercial building, which was reported by facility personnel to be the initial phase of construction.

A search of FirstSearch Technology Corporation's proprietary database of historical fire insurance map availability confirmed that there are no maps available for the subject property. FirstSearch Technology Corporation's proprietary database of historical fire insurance map availability represents abstracted information from the Sanborn® Map Company obtained through online access to the U.S. Library of Congress via local libraries.

10. Hazardous Substances Used or Stored at the Site

A summary of the chemicals used at the facility, which contain hazardous materials is presented below, Table 6, along with the quantity and location of the chemicals.

Table 6 – Hazardous Material Inventory
950 German Street
Lenoir, NC
March 2008

Inventory of Small Quantities (containers less than 1 gallon)		
Description	*Quantity*	*Location*
Oil & Water Based Paint	1 gallon	Cabinets in air compressor room
Spitfire RTU Power	20 oz spray bottle	Weaving production area
Cleaner		
N-methylpyrrolidone	16 oz bottle	Print area work station
Isopropyl Alcohol	16 oz bottle	Print area work station
Inks- crystallized and urethane based	1 gallon pails	Printing areas, ink mixing/chemical rooms
Inventory of Bulk and Container Storage (containers greater than 30 gallons)		
Description	*Quantity*	*Location*
Coolclean	55 gallons (1)	Storage shed, adjacent to boiler/chiller rooms
SB Adhesive	55 gallons (1)	Heat transfer/ chemical room
Heat Transfer Fluid	55 gallons (3)	East wall of dye and finishing department
CT Release Coating	55 gallons (4)	Heat transfer/ chemical room
Aliphatic Polyester Urethane	30 gallons (1)	Heat transfer/ chemical room
Glycol Ether PNP	55 gallons (1)	Heat transfer/ chemical room
Inventory of Bulk and Container Storage (containers greater than 30 gallons)		
Description	*Quantity*	*Location*
Fixer	30 gallons (1)	Heat transfer/ chemical room
Premix VR	55 gallons (1)	Heat transfer/ chemical room
Clear Transfer	55 gallons (2)	Heat transfer/ chemical room
Adhesive for Heat Transfer	55 gallons (3)	Heat transfer/ chemical room
Multiple Urethane based inks	55 gallons (15)	Heat transfer/ chemical room
RS 1/2 Nitrocellulose	55 gallons (1)	Heat transfer/ chemical room
15W6 White Paste	55 gallons (4)	Heat transfer/ chemical room
EPON 828	55 gallons (1)	Chemical room
DOW 200	55 gallons (1)	Chemical room
MP22XF	55 gallons (1)	Chemical room
Inventory of Bulk and Container Storage (containers greater than 30 gallons)		
Description	*Quantity*	*Location*
Aluminum Flake	55 gallons (1)	Chemical room
Modaflow ResinNJE 1212	55 gallons (1)	Chemical room
Epoxodized Soybean	55 gallons (1)	Chemical room
Acetic Acid	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Sparwet WD	55 gallons (1)	Mageba Machine (dyeing/ finishing)
H-50	55 gallons (1)	Mageba Machine (dyeing/ finishing)

Lanclean BR	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Sparwet BKM	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Leucophor AC	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Lyogen ECO	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Pfaz	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Peroxide	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Caustic Soda	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Paint Stripper	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Aflian FC	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Ammonia	55 gallons (1)	Mageba Machine (dyeing/ finishing)
Optiwhite EMG	30 gallons (1)	Mageba Machine (dyeing/ finishing)
Marbright	30 gallons (1)	Mageba Machine (dyeing/ finishing)
Aliphatic Hydrocarbon Parts Cleaner	30 gallons (1)	Weaving floor, rapid response
Energol GR-XP320	55 gallons (1)	Weaving floor
Hy Diamond Fluid 6K	55 gallons (1)	Outside store room (adjacent to chiller room)
Dexron 111	55 gallons (1)	Outside store room (adjacent to chiller room)
Sterlflush	55 gallons (1)	Outside store room (adjacent to chiller room)
Caustic Soda 50%	55 gallons (1)	Outside store room (adjacent to chiller room)
BC 626 Scale Control	55 gallons (1)	Outside store room (adjacent to chiller room)
SR 333	55 gallons (1)	Outside store room (adjacent to chiller room)
Aboveground Storage Tanks		
Description	*Quantity*	*Location*
Morclean 10	55 gallons (1)	Outside store room (adjacent to chiller room)
Coolclean 3510, 38, 200 and 2015	55 gallons (1)	Outside store room (adjacent to chiller room)
Methyl Ethyl Ketone	2,000 gallons	Former tank location (REMOVED): outside, southwest corner of building
Toluene	1,500 gallons	Former tank location (REMOVED): outside, southwest corner of building
Aboveground Storage Tanks		
Description	*Quantity*	*Location*
Isopropyl Acetate	1,500 gallons	Former tank location (REMOVED): outside, southwest corner of building
Isopropyl Alcohol	1,500 gallons	Former tank location (REMOVED): outside, southwest corner of building
1,1,1-Trichloroethane	1,500 gallons	Former tank location (REMOVED): outside of southwest corner of building

Underground Storage Tanks		
Description	*Quantity*	*Location*
Diesel Fuel (tank 1 - north)	10,000 gallons	East of boiler room
Diesel Fuel (tank 2 - south)	10,000 gallons	East of boiler room

NOTE: Inventory of materials was obtained from the Phase I EHS Acquisition Due Diligence Assessment Report, March 2008, as completed by ERM

11. Environmental Permit History

The environmental permit history is summarized below in Table 7. Copies of the available permits are included in Appendix B.

Table 7 – Environmental Permit Summary
950 German Street
Lenoir, NC
March 2008

Title	Description	
Industrial User Pretreatment Permit	Issued By:	City of Lenoir
	Issued To:	Paxar Corporation
	Number:	0003
	Issue Date:	June 1, 2007
	Expiration Date:	May 31, 2012
General Air Permit	Issued By:	NCDENR - Division of Air Quality
	Issued To:	Paxar Corporation
	Number:	06118R14
	Issue Date:	August 4, 2009
	Expiration Date:	Not provided
General Air Permit *(Information received from NCDENR DAQ)*	Issued By:	NCDENR - Division of Air Quality
	Issued To:	Paxar Corporation
	Number:	06118R15
	Issue Date:	August 27, 2010
	Expiration Date:	August 31, 2013
UST Permit	Issued By:	NCDENR - Division of Waste Management - UST Section
	Issued To:	Paxar Americas Inc.
	Number:	0-034455 (Facility ID)
	Issue Date:	July 1, 2010
	Expiration Date:	June 2011
Large Quantity Hazardous Waste Generator	Issued By:	NCDENR - Division of Waste Management - Hazardous Waste Section
	Issued To:	Paxar Corporation
	Number:	NCD981025406 (Facility ID)
	Issue Date:	June 1, 2007
	Expiration Date:	No expiration date, requires annual fee only

NOTE: Summary of Environmental Permits was obtained from the Phase I EHS Acquisition Due Diligence Assessment Report, March 2008, as completed by ERM; updated information was obtained by MSGA from NCDENR and facility personnel.+

12. Summary of Previous and Ongoing Environmental Investigations

April 2010: Sampling Event – Avery Dennison Lenoir Facility
The Johnson Company (JCO) was retained by Avery Dennison to re-sample all existing monitoring wells for volatile organic compounds (VOCs); in addition to the 12 monitoring wells installed in August 2009, 5 temporary shallow monitoring wells (installed by JCO in March 2009) and 4 shallow monitoring wells (installed under supervision of ERM in October 2007) were also sampled. JCO sampled UST area wells (MW-1 through MW-3) for suite of petroleum related analytes generally required by NC DENR UST Section.

October 2009: Tank Site Closure Report – Avery Dennison Lenoir Facility
Martin and Slagle GeoEnvironmental Associates (MSGA) was retained by Avery Dennison Corporation to manage the closure of four (4) steel, aboveground storage tanks (ASTs) and one (1) concrete underground spill-control tank at the facility in Lenoir, North Carolina. The project consisted of the removal and disposal of product remaining in the tanks, removal and disposal of three (3) 1,500-gallon ASTs, one (1) 2,000-gallon AST, one (1) concrete sump (approximately 1,000-gallon capacity) used for emergency spill containment, and ancillary equipment including pumps, piping, valves, controls, electrical connections, and fire suppression systems. Following removal of the ASTs and spill-control tank, soil samples were collected and analyzed for VOCs to determine if a release associated with the tanks had occurred. A composite concrete sample was collected from the slab supporting the ASTs; this sample was analyzed for VOC concentrations, and the results were used to profile the concrete for disposal.

Three 1,500-gallon ASTs, one 2,000-gallon AST and associated aboveground piping and valves were emptied of product, disassembled and transported to IBS Environmental Services in Hudson, NC for cleaning and proper disposal. Product removed from the ASTs was placed in 55-gallon drums and used in the plant process.

One 1,000-gallon concrete spill-control tank was excavated and transported to Chemical Waste Management, Inc. in Emelle, AL and properly disposed of. Water removed from the spill-control tank and liquids generated as the result of cleaning the ASTs was transported to the ECOFLO®, Inc. facility in Greensboro, NC and properly disposed of. A copy of this report is included in Appendix C.

Two soil samples collected from beneath the concrete slab supporting the former ASTs contained no detectable concentrations of VOCs. One soil sample collected from the base of the excavation from which the concrete spill-control tank was removed had no detectable concentrations of VOCs. One concrete sample composited from the slab supporting the ASTs had a low concentration of acetone estimated at 1.2 mg/kg. The soil sample collected from the spill tank overburden had a low concentration of acetone at 0.097 mg/kg, two orders of magnitude below the North Carolina Inactive Hazardous Sites Branch-Protection of Groundwater Soil Remediation Goal of 2.8 mg/kg for acetone.

The tanks and concrete slab were all properly decommissioned, cleaned and disposed of. The water from the spill-control tank and waste liquids resulting from cleaning of the ASTs were properly disposed of as well. Soils beneath the tanks and concrete slab were not impacted based on analytical results.

August and September 2009: Groundwater Investigation – Former Paxar Facility, 950 German Street, Lenoir, NC

JCO was retained by Avery Dennison Corporation to install 12 monitoring wells (six shallow/deep couplets beginning with MW-5 and so on) on two potentially down-gradient sides of the facility to investigate groundwater quality down-gradient of the facility. JCO sampled new wells and existing ERM wells MW-1 through MW-3 for VOCs.

March 2009: Sampling Event – Former Paxar Facility, 950 German Street, Lenoir, NC

JCO was retained by Avery Dennison Corporation to install soil vapor sampling devices beneath the facility floor slab; JCO collected samples from the devices and had them analyzed for VOCs. JCO also re-sampled existing ERM monitoring well MW-4 and installed a few temporary wells around MW-4 to investigate groundwater quality in the vicinity of a planned plant expansion (completed). JCO detected low levels of a few VOCs. JCO decommissioned MW-4 and the temporary wells to make way for the plant expansion. Several of the locations were sampled for semi-volatile organic compounds (SVOCs).

April 2008: Limited Environmental Investigation Report (Acquisition Due Diligence) – Former Paxar Facility, 950 German Street, Lenoir, NC

Environmental Resources Management (ERM) was retained by Avery Dennison Corporation to conduct a Limited Environmental Investigation (Acquisition Due Diligence) hereby referred to as "Limited Environmental Investigation" at their former Paxar facility located at 950 German Street, Lenoir, North Carolina, USA (site). Avery Dennison Corporation acquired Paxar Corporation in June 2007.

Investigation activities were completed in October 2007 to assess environmental conditions associated with three (3) Areas of Potential Concern (APCs) identified during the Phase I site assessment. These investigation activities were conducted in accordance with the 5 October 2007 Scoping Document as approved by Avery Dennison.

Five soil borings were advanced in the immediate vicinity of the APCs to facilitate soil and groundwater sampling. An additional two borings were advanced on the down-gradient side of the site building to assess the potential for impacts from building operations. Thirteen soil samples were collected from these seven borings and submitted for laboratory analysis for metals, VOCs, semi-volatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPH). Four borings were converted to monitoring wells, from which groundwater samples were collected and submitted for metals, VOC, SVOC and TPH analysis. Diesel- and oil-range TPH was detected at relatively low concentrations in the vicinity of a diesel underground storage tank (UST; APC-1). These soil samples were collected at depths within approximately 3 feet of the water table. Water samples collected from monitoring wells in the vicinity of the UST basin did not contain reportable concentrations of TPH, despite the proximity of observed TPH impacts in the overlying soils. It is therefore inferred that the extent of TPH impacts in soil near the UST and as a potential source of groundwater impacts is not significant.

VOCs and SVOCs were not detected in any of the soil samples analyzed. Metals were also detected at relatively low concentrations within common background ranges. North Carolina Department of Environment and Natural Resources (NCDENR) has established compound-specific risk-based screening levels for residential use, industrial land use, and migration to ground water for individual VOCs, SVOCs, and selected metals. No detections in soil samples exceeded these screening levels. The water sample collected from southwest of the chemical storage/unloading area (APC-3) contained detections of acetone, toluene, and bis(2-ethylhexyl)phthalate (DEHP). Of these, only DEHP exceeded the regulatory screening levels. DEHP is a common laboratory and sampling contaminant; however, it was not detected in the applicable blank samples and thus cannot be written off as such. Acetone, toluene, and DEHP were not detected in soil samples, and the detections in groundwater were relatively low.

Groundwater was not encountered within the depth of the investigation at drilling locations down-gradient of the facility, and the absence of groundwater samples in this area does not allow for a thorough evaluation of potential impacts to groundwater conditions due to site operations. However, no visual or other evidence of impacts was noted during advancement of the soil borings in this area, and no constituents other than metals (probably reflective of naturally occurring background conditions) were detected in these samples.

Based on the investigation results, minor impacts to soil and groundwater were detected in the APCs investigated; however, the Limited Environmental Investigation has suggested no evidence of significant impacts to site soils or a potential source of impacts to groundwater quality.

March 2008: Phase I EHS Acquisition Due Diligence Assessment Report – Former Paxar Facility, 950 German Street, Lenoir, NC

In August 2007, Avery Dennison Corporation (Avery Dennison) contracted with ERM to conduct a Phase I EHS Acquisition Due Diligence Assessment (Phase I EHS Assessment) of 950 German Street, Lenoir, Caldwell County, North Carolina (subject property). The facility was developed by Stylecraft Packaging, Inc. in 1964. Rospatch Lenoir, Inc. purchased the subject property in 1973. Paxar Lenoir, Inc. (Paxar) acquired the subject property in 1988. Paxar was acquired by Avery Dennison in June 2007. The Phase I EHS Assessment was conducted pursuant to the June 2007 acquisition.

The objective of the assessment was to identify potential EHS issues that exist in relation to the past and current operations at the subject property. The primary purpose of this Phase I EHS Assessment was to develop an understanding of potential EHS risks associated with the acquisition of the subject property (and associated facility), and provide documentation for the following key issues associated with the Avery Dennison acquisition of that property:

- Identification of significant EHS issues which would need to be addressed or corrected by Avery Dennison (such as permit or registrations transfers or updates);
- Understanding of costs related to identified EHS issues;
- Identification of constraints and limitations related to current and future operations;
- Identification and documentation of property conditions and business operations to establish a "baseline" of information that can aid in protection from future claims of liability and/or establish necessary reserves; and
- Identification of specified EHS documentation necessary for future operation, for example, permits, training records, and compliance reporting.

In addition, the report also included substantial additional information applicable to an assessment of "business environmental risk" (a risk which can have a material environmental or environmentally-driven impact on the business) as requested by Avery Dennison. The assessment consisted of a subject property walkover; a review of EHS related documents provided by the facility; interviews with the representatives from the facility concerning the history of the subject property, operations within the subject property, and associated management practices; and

national (Federal), regional (State), and/or local files as they were available within the timeframe of the assessment.

March 2008: Phase I Environmental Issues – Findings and Conclusions Report – Former Paxar Facility, 950 German Street, Lenoir, NC
This assessment, compiled by ERM, revealed the following evidence, based on the above Phase I EHS Due Diligence Report, of Areas of Potential Concern (APCs) in connection with the subject property (see table below). No Other Potential Concerns (OPCs) were identified at the subject property.

Table 8 – Areas of Potential Concern Summary
950 German Street
Lenoir, NC
March 2008

Area of Potential Concern	Location	Issue - Potential Source
APC-1: Two 10,000-gallon diesel fuel USTs	East side of building	Potential releases to soil and groundwater
APC-2: 1,500-gallon spill recovery vault	South side of building	Potential releases to soil and groundwater
APC-3: Solvent chemical unloading and storage area	Southwest corner of building	Release of chemicals into soil/groundwater
General Groundwater Quality	Site wide	Process water discharge into sanitary sewer system via floor trench and sub-grade piping

NOTE: Summary of APCs was obtained from the Phase I Environmental Issues - Findings & Conclusions Report, March 2008, as completed by ERM

REFERENCES

Environmental Resources Management. Phase I EHS Acquisition Due Diligence Assessment Report, Former Paxar Facility, 950 German Street, Lenoir, North Carolina. March 2008 ***CONFIDENTIAL***

Environmental Resources Management. Limited Environmental Investigation Report (Acquisition Due Diligence), Former Paxar Facility, 950 German Street, Lenoir, North Carolina. April 2008. ***CONFIDENTIAL***

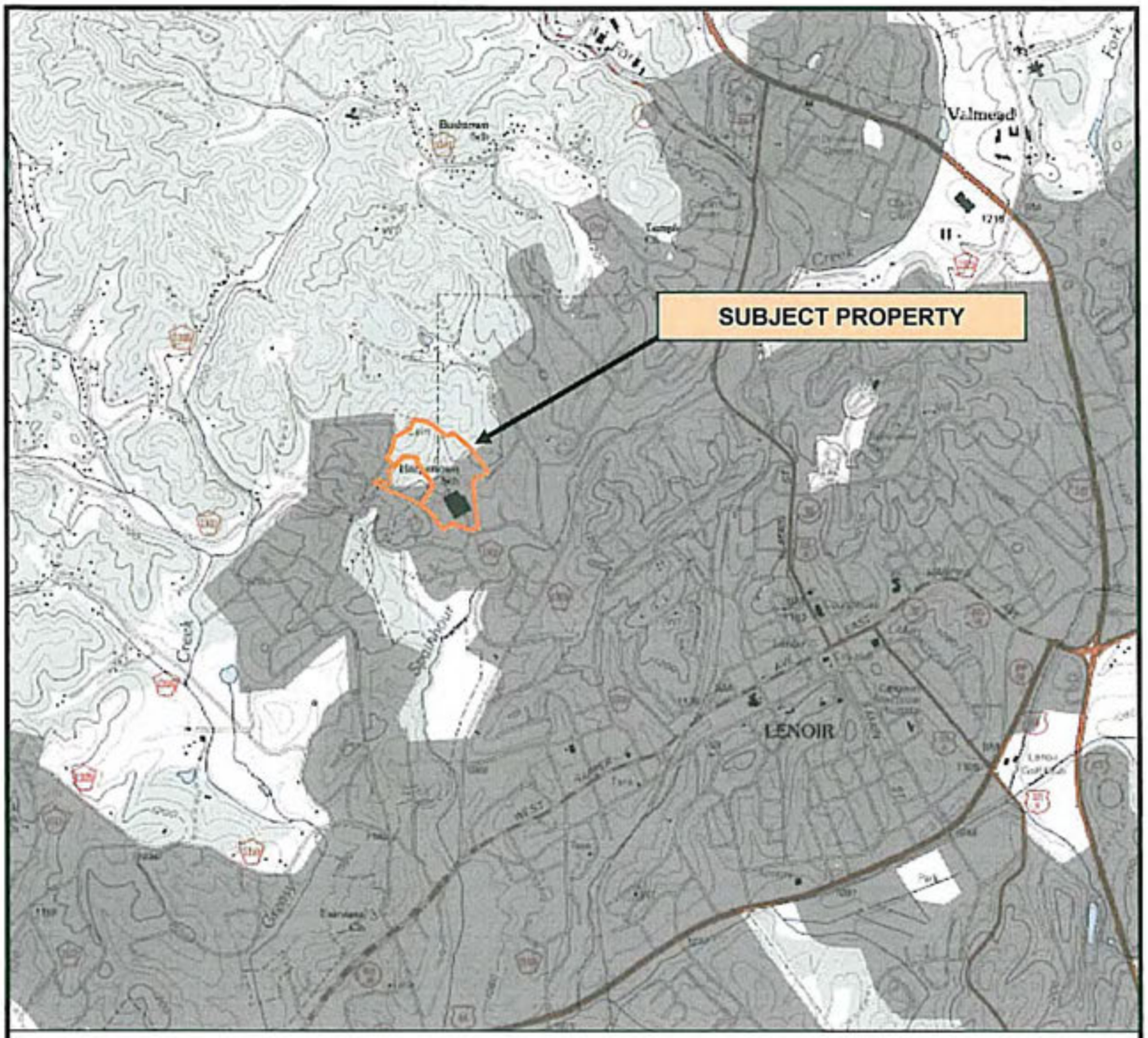
The Johnson Company, Inc. *Environmental Investigation Report*, Avery Dennison Facility, 950 German Street, Lenoir, North Carolina. June 2011.

Martin and Slagle GeoEnvironmental Associates. UST Closure Report, Avery Dennison Corporation, Lenoir Facility, Lenoir, North Carolina. October 2009.

National Recreation Areas, *Listed Recreational Areas and Parks.* http://www.recreation.gov/homeLeft.do?topTabIndex=CampingSpot. Accessed August 2010.

National Wild and Scenic Rivers, *Designated Wild and Scenic Rivers.* http://www.rivers.gov/wildriverslist.html, Accessed August 2010.

North Carolina Department of Environment and Natural Resources, Inactive Hazardous Sites Branch: *Guidelines for Assessment and Cleanup*, October 2008.

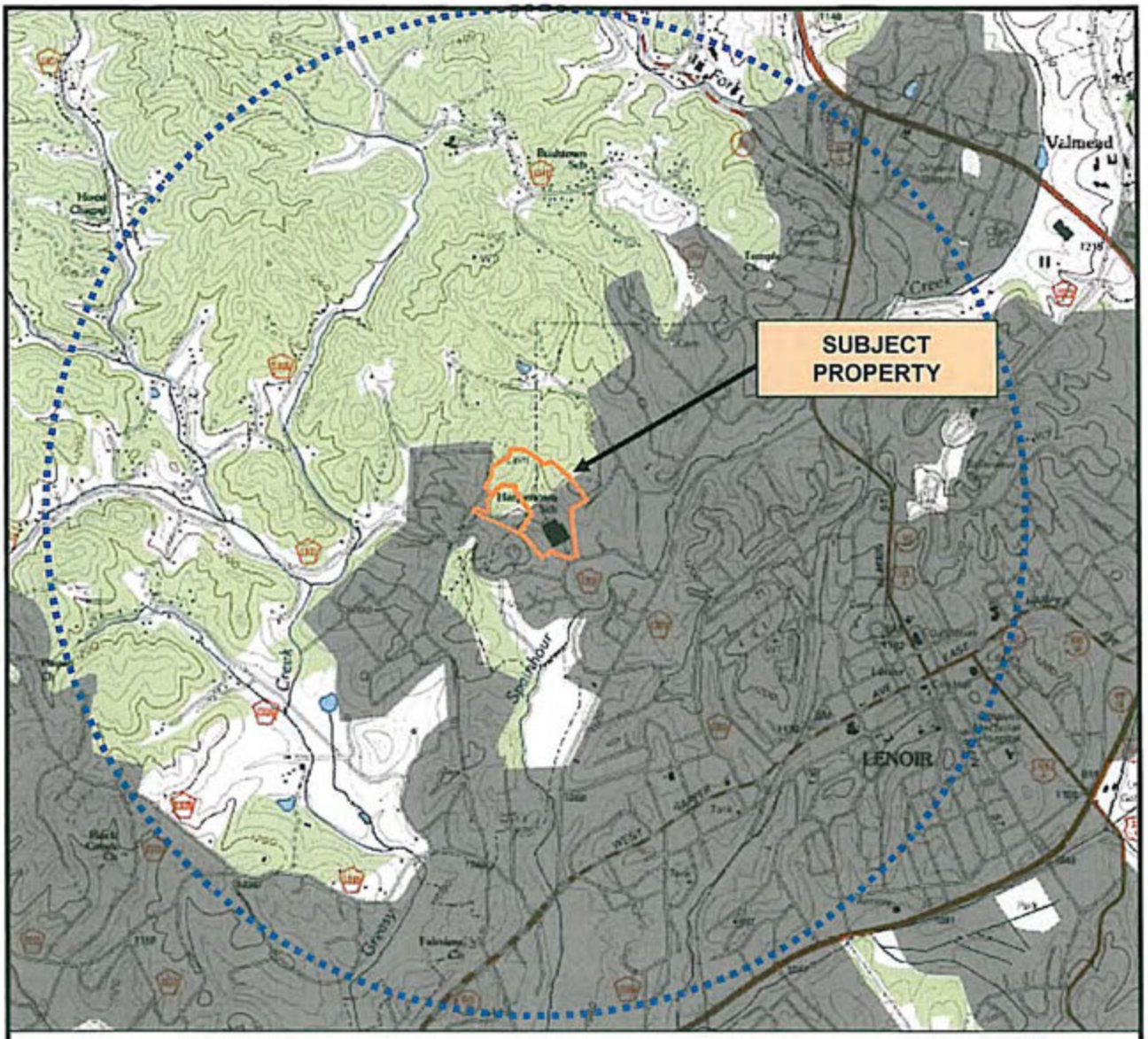


LEGEND: Approx. Property Line

SOURCES: USGS 7.5 Minute Topographic Map, Lenoir, North Carolina, 1994

Caldwell County GIS Application

MARTIN&SLAGLE GeoEnvironmental Associates, LLC PO Box 1023 Black Mountain, NC 28711 828.669.3929 828.669.5289	SCALE = 1:24,000 REV: 0 DATE: 8/5/10 DR: BCH CHK:RML	**BACKGROUND SUMMARY** Site Location Map German Street Facility 950 German Street, Lenoir, NC
PREPARED FOR: Avery Dennison Corporation		**FIGURE 1**



N
W E
S

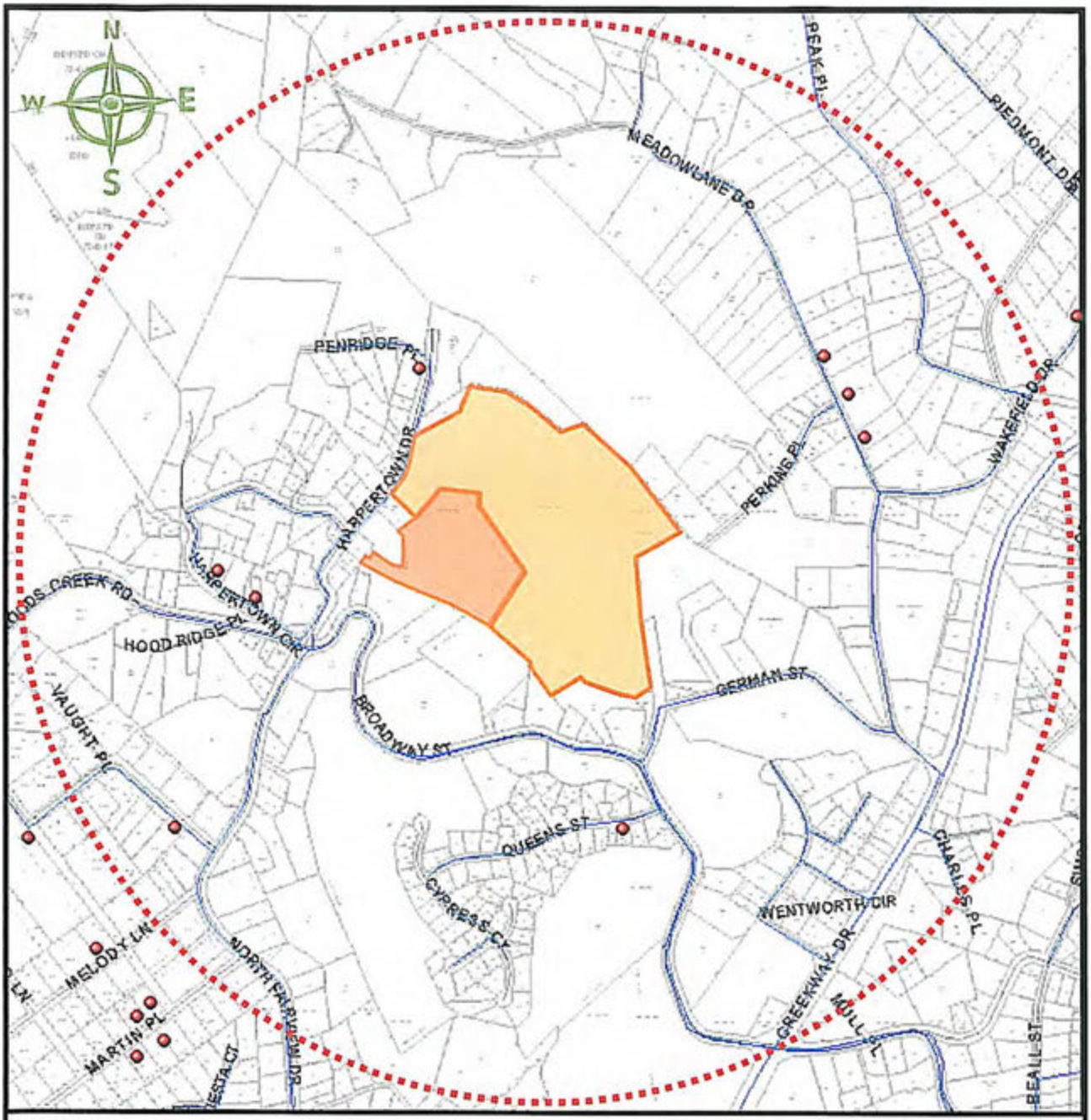
LEGEND: Approx. Property Line

Approx. 1 Mile Radius

SOURCES: USGS 7.5 Minute Topographic Map, Lenoir, North Carolina, 1994

Caldwell County GIS Application

MARTIN&SLAGLE GeoEnvironmental Associates, LLC PO Box 1023 Black Mountain, NC 28711 828.669.3929 828.669.5289	SCALE = 1:24,000 REV: 0 DATE: 8/5/10 DR: BCH CHK:RML	**BACKGROUND SUMMARY** **USGS Topographic Map with 1-Mile Radius** German Street Facility 950 German Street, Lenoir, NC
PREPARED FOR: Avery Dennison Corporation		**FIGURE 2**



LEGEND: Approx. Property Line — City of Lenior Water Lines — Observed Well House

Approx. 0.5 Mile Radius — Caldwell Co. Water Lines

SOURCE: Caldwell County GIS Application

MARTIN&SLAGLE GeoEnvironmental Associates, LLC PO Box 1023 Black Mountain, NC 28711 828.669.3929 828.669.5289	SCALE = 1:24,000 REV: 0 DATE: 8/5/10 DR: BCH CHK:RML	**BACKGROUND SUMMARY** **Half-Mile Radius Map with Drinking Water Lines and Wells** Avery Dennison Facility 950 German Street, Lenoir, NC
PREPARED FOR: Avery Dennison Corporation		**FIGURE 3**

Gmail by Google

Beth Hesse <beth.c.hesse@gmail.com>

Information Request

Ruth Berner <rberner@fs.fed.us> **Tue, Aug 17, 2010 at 2:40 PM**
To: Beth Hesse <beth.c.hesse@gmail.com>

The USDA Forest Service identifies NO sensitive environments at or adjacent to the property identified below.

Ruth Berner
Forest Planner
USDA Forest Service
National Forests in North Carolina
160A Zillicoa Street
Asheville, NC 28801
Office: 828-257-4862
FAX: 828-257-4263
rberner@fs.fed.us

Beth Hesse <beth.c.hesse@gmail.com>

08/17/2010 02:02 PM

To rberner@fs.fed.us
cc
Subject Information Request

[Quoted text hidden]

copy USFS letter.pdf
766K

Gmail by Google

Beth Hesse <beth.c.hesse@gmail.com>

[Fwd: Avery Dennison Corporation, Lenoir, Caldwell County, NC]

Robert Martin <rmartin@martinandslagle.com> **Tue, Aug 10, 2010 at 1:25 PM**
To: Beth Hesse <beth.c.hesse@gmail.com>

Another emailed response to your letters.

Robert
--

ROBERT L. MARTIN, L.G.
Principal Geologist

MARTIN & SLAGLE
GeoEnvironmental Associates, LLC
GeoSciences, PA
Office: 828-669-3929
Fax: 828-669-5289
Cell: 828-712-1115

Mr. Tyndall asked that I respond to your request. The mission of North Carolina's Division of Coastal Management (DCM) is to manage and preserve coastal resources within the State. Since the location of the proposed project is outside of the State's coastal area, DCM does not have a direct regulatory involvement. Accordingly DCM does not maintain a database of environmentally sensitive areas outside of the State's coastal zone.

Nevertheless, please be aware that even if the location of a proposed project is outside of North Carolina's coastal area, DCM may exert regulatory oversight should a proposed project have a reasonable foreseeable effect on any coastal use or coastal resource. We would therefore encourage you to evaluate whether the proposed project could have a reasonable foreseeable effect on any coastal use or any coastal resource. For example, would site remediation activities potentially result in contaminants entering nearby water bodies and then being transported into the State's coastal zone? For further information on the State's consistency review process please see: http://www.nccoastalmanagement.net/Permits/consist.htm

Moreover, while DCM may not have specifically identified any environmental sensitive areas that may exist at the project location or in the general vicinity of the project site; other State agencies, such as the Division of Water Quality and/or the Wildlife Resources Commission, may consider that the project area possess "*environmental sensitive areas*". These other State agencies should also be contacted to evaluate the existence and extent of any environmentally sensitive areas that may exist. Should you have any further questions, please email me at stephen.rynas@ncdenr.gov or phone me at 252-808-2808. Thank you for your consideration of the North Carolina Coastal Management Program.

Stephen Rynas
Federal Consistency Coordinator

North Carolina
Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557-3421

(252) 808-2808
stephen.rynas@ncdenr.gov

---

http://dcm2.enr.state.nc.us/Permits/consist.htm

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

2 attachments

image001.jpg
13K

Stephen Rynas.vcf
7K

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Parks and Recreation

Beverly Eaves Perdue, Governor | Dee Freeman, Secretary | Lewis Ledford, Director

September 23, 2010

Robert Martin
Martin & Slagle GeoEnvironmental Associates, LLC
PO Box 1023
Black Mountain, NC. 28711

Dear Mr. Martin:

The North Carolina Division of Parks and Recreation (DPR) has reviewed the site location of the Avery Dennison Facility located on 950 German Street in Lenoir, Caldwell County, North Carolina. Per the site information you sent via your email dated August 23, 2010 we did not find records of *Sensitive Environments* documented within or adjacent to this project site.

Please contact me if you require additional information.

Sincerely,

Amin K. Davis

Amin K. Davis, C.E.
Environmental Review Coordinator
Division of Parks and Recreation, Natural Resources Program
North Carolina Department of Environment and Natural Resources
(919) 715-7584 / amin.davis@ncdenr.gov

Cc Via Email: Ms. Beth C. Hesse, Martin & Slagle GeoEnvironmental Associates

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

24 August 2010

Robert Martin
Martin & Slagle GeoEnvironmental Associates, LLC
P.O. Box 1023
Black Mountain, NC 28711

Subject: Information Request for Avery Dennison Corporation, 950 German Street, Lenoir, Caldwell County, North Carolina.

Dear Mr. Martin:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the subject document and we are familiar with the habitat values of the area. Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d) and North Carolina General Statutes (G.S. 113-131 et seq.).

The site drains to Spainhour Creek in the Catawba River basin. Martin & Slagle GeoEnvironmental Associates is requesting information regarding the following environmentally sensitive areas within or near the site.

- **National or State Wildlife Refuges:** The site is not located within or near NCWRC game lands or any Significant Natural Heritage Areas. Please note: The U.S. Fish and Wildlife Service (USFWS) manages National Wildlife Refuges. Although we do not have records of any National Wildlife Refuges within or near the site, we suggest confirming this with the USFWS.
- **Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tide Waters in which such Fish Spend Extended Periods of Time:** We are not aware of any migratory pathways or critical feeding areas for anadromous fish species within or near the project site.
- **Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters:** The Spainhour Creek watershed likely supports a freshwater fishery. Although we are not aware of any specific reaches of this stream that are critical spawning areas, maintaining water quality and aquatic habitat are essential for the continued survival of any fish or mussel populations in this watershed. Therefore, maintaining forested riparian buffers and minimizing impacts from stormwater runoff would help to protect water quality and aquatic habitat within this watershed.

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

If we can be of further assistance, please contact our office at (336) 449-7625.

Sincerely,

Shari L. Bryant

Shari L. Bryant
Piedmont Region Coordinator
Habitat Conservation Program

Gmail

Beth Hesse <beth.c.hesse@gmail.com>

[Fwd: Fw: Sensitive Environment Information Request]

Vicki Wedell <Vicki.Wedell@noaa.gov> **Tue, Aug 24, 2010 at 11:41 AM**
To: beth.c.hesse@gmail.com

Thank you for your interest in your national marine sanctuaries. The only National Marine Sanctuary (under NOAA's Office of National Marine Sanctuaries) near North Carolina is the Monitor National Marine Sanctuary. The description for this national marine sanctuary taken from the final designation document describes the site under section 924.2 as follows:

* The Sanctuary consists of a vertical water column in the Atlantic Ocean one mile in diameter extending from the surface to the seabed. the center of which is at 35° 00' 23" north latitude, and 75° 24' 32" west longitude.

Based on our location and the description of the site you are working in Lenoir, NC, I can state that you are not adjacent to any National Marine Sanctuaries. As to whether or not you are in proximity to any other environmentally sensitive areas, state wildlife preserve, or other protected areas, I suggest you contact the North Carolina State Department of Natural Resources. I hope this was helpful.

Regards,
Vicki Wedell

-------- Original Message --------
Subject: Fw: Sensitive Environment Information Request
Date: Mon, 23 Aug 2010 18:03:31 -0400
From: Matthew Stout <Matthew.Stout@noaa.gov>
To: 'Vicki.Wedell@noaa.gov' <Vicki.Wedell@noaa.gov>

Matt Stout
Chief of Staff/Communications Director
NOAA Office of Marine Sanctuaries

From: Beth Hesse [mailto:beth.c.hesse@gmail.com]
Sent: Monday, August 23, 2010 06:00 PM
To: matthew.stout@noaa.gov <matthew.stout@noaa.gov>
Subject: Sensitive Environment Information Request

Mr. Stout,

I recently sent a request for information to you at the NOAA National Marine Sanctuary Program office; I am seeking information regarding *Sensitive Environments*, in relation to a project site in Lenoir, NC. I've attached a scanned copy of the letter and location map for your convenience. Thank you in advance for your assistance and timely response.

Respectfully,

Beth C. Hesse

Martin & Slagle GeoEnvironmental Associates, LLC.
(828) 669-3929

--
Vicki A. Wedell
NOAA Office of National Marine Sanctuaries
1305 East-West Highway (N/ORM6)
SSMC4, 11th Floor
Silver Spring, MD 20910
Ph: 301-713-7237
Fx: 301-713-0404
http://sanctuaries.noaa.gov
For whatever we lose (like a you or a me),
It's always our self we find in the sea.
~e.e. cummings

2 attachments

Figure 1-Location Map.pdf
195K

NOAA 8-4-10.pdf
24K

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
151 PATTON AVENUE
ROOM 208
ASHEVILLE, NORTH CAROLINA 28801-5006

REPLY TO
ATTENTION OF:

September 17, 2010

Regulatory Division

Action ID No. SAW-2010-01571

Robert L Martin
Martin and Slagle GeoEnvironmental Associates, LLC
Post Office Box 1023
Black Mountain, North Carolina 28711

Dear Mr. Martin:

Reference is made to the letter you submitted regarding the Avery Dennison Corporation's plans to assess a site for contaminated media under rules of the NC Inactive Hazardous Sites Branch. As part of the assessment you have asked for comments concerning sensitive environments, (i.e. wetlands). The site is located north west of Lenoir, Caldwell County, North Carolina. This letter is to clarify Department of the Army permit requirements for possible impacts to waters of the U.S.

We have reviewed the subject documents and determined that the location referenced on the vicinity map submitted on August 12, 2010, may have jurisdictional waters of the United States and their associated wetlands, which are subject to our regulatory authority pursuant to Section 404 of the Clean Water Act. Any discharge of excavated or fill material into waters of the United States and/or any adjacent wetlands, as well as the resultant flooding of adjacent wetlands, that may be present within the project limits will require Department of the Army (DA) permit authorization. The type of DA authorization required (i.e., general or individual permit) will be determined by the location, type, and extent of jurisdictional area impacted by the project, and by the project design and construction limits. The maximum processing time for a nationwide permit application is 45 days from the date of receipt of a complete application.

Due to the limited information provided regarding the extent of jurisdictional impacts associated with the project, we are unable to provide specific comments concerning DA permit requirements until additional data is furnished which details the extent of the jurisdictional impacts within the construction limits of the proposed project. To assist you in this process, we recommend a detailed delineation of waters of the United States (including wetlands, ponds, and/or perennial and intermittent stream channels) within the project area be performed. When this information becomes available, it should be forwarded to our office for review and comment, as well as a determination of DA permit eligibility.

Should you have any further questions related to DA permits for this project, please contact me at 828-271-7980, extension 226. You may also visit our website at http://www.saw.usace.army.mil/WETLANDS/Permits.html to view the conditions associated with Nationwide Permits as well as notification procedures and applications.

Sincerely,

Tasha L. McCormick

Tasha L. McCormick
Regulatory Specialist,
Asheville Field Office

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street
Asheville, North Carolina 28801

August 26, 2010

Mr. Robert Martin
Martin & Slagle
P.O. Box 1023
Black Mountain, NC 28711

Dear Mr. Martin:

Subject: Site Assessment for the Avery Dennison Facility, 950 German Street, Lenoir, Caldwell County, North Carolina

In your letter of August 5, 2010, you requested our comments about the subject project. **(Please note that you sent the letter to our Raleigh Field Office. They forwarded it to us, and we received it August 13, 2010. In the future, you would receive our responses in a more timely fashion if requests were sent to the appropriate office. To assist you with this, enclosed is a list of North Carolina's counties showing which ones are handled by our respective offices in North Carolina)** The following comments are provided in accordance with the provisions of the National Environmental Policy Act (42 U.S.C.§ 4321 et seq.) (NEPA) and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

According to our records and a review of the information you provided, no federally listed species or their habitats occur on the subject site. Therefore, we believe the requirements under section 7 of the Act are fulfilled. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of these identified actions that may affect listed species or critical habitat in a manner not previously considered, (2) these actions are subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified actions.

Thank you for allowing us to comment on this project. Please contact Mr. Allen Ratzlaff of our staff at 828/258-3939, Ext. 229, if you have any questions. In any future correspondence concerning this project, please reference our Log Number 4-2-10-255.

cc:
Mr. Ron Linville, Western Piedmont Region Reviewer, North Carolina Wildlife Resources Commission, 3855 Idlewild Road, Kernersville, NC 27284-9180

U

North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

Beverly Eaves Perdue, Governor
Linda A. Carlisle, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

September 2, 2010

Robert Martin
Martin & Slagle GeoEnvironmental Associates, LLC
PO Box 1023
Black Mountain, NC 28711

Re: Inactive Hazardous Site, Avery Dennison Corporation, 950 German Street, Lenoir, Caldwell County, ER 10-1499

Dear Mr. Martin:

Thank you for your letter of August 5, 2010, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Peter Sandbeck

Subject: (RE) Information Request-Avery Dennision Corp.
From: "Williams, Melanie" <melanie.williams@ncdenr.gov>
Date: Mon, 16 Aug 2010 11:00:42 -0400
To: "rmartin@martinandslagle.com" <rmartin@martinandslagle.com>

Mr. Martin,
I have reviewed your sensitive environment request for the Avery Dennison Corporation property. This property drains to Blair Fork in the Catawba River Basin. This stream is not currently on the Impaired Waters List. However, the stream has high levels of toxicity, fecal coliform bacteria, copper, turbidity, and nutrients. Blair Fork also flows into Lower Creek which is on the Impaired Waters List.

This property is in a sensitive environmental area for the protection and maintenance of aquatic life.

Please feel free to e-mail any future inquiries to assist in our efforts to reduce the use of paper. If you have any further question, please let me know.
Thanks so much,
Melanie

Melanie Williams
River Basin Planner
NC DENR, Div. of Water Quality
Basinwide Planning Unit
1617 Mail Service Center
Raleigh, NC 27699-1617
melanie.williams@ncdenr.gov
Phone: (919) 807-6447
http://portal.ncdenr.org/web/wq/ps/bpu

-- E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.
Please consider the environment before printing this email.

Subject: State Preserves and Forests...
From: "Carlson, Chris" <chris.carlson@ncdenr.gov>
Date: Mon, 9 Aug 2010 16:08:46 -0400
To: "rmartin@martinandslagle.com" <rmartin@martinandslagle.com>

Mr. Martin,

The N.C. Division of Forest Resources has NO State Preserves or Forest in the vicinity of your "Avery Dennison Facility" site.
You are good to go with us.

Thanks, Chris Carlson

Christopher R. Carlson
Information & Education Chief
North Carolina Division of Forest Resources
1616 Mail Service Center, Raleigh NC 27699-1616
Phone: 919-857-4619
Fax: 919-857-4806
Cell: 919-632-0185

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

NCDENR

North Carolina Department of Environment and Natural Resources
Office of Conservation, Planning, & Community Affairs
Beverly Eaves Perdue, Governor | **Linda Pearsall, Director** | Dee Freeman, Secretary

August 10, 2010

Mr. Robert L. Martin
Martin & Slagle GeoEnvironmental Associates, LLC
118F Cherry Street, P.O. Box 1023
Black Mountain, NC 28711

Subject: Review of Sensitive Environments – Avery Dennison Corporation site; 950 German Street, Lenoir, Caldwell County

Dear Mr. Martin:

The Natural Heritage Program (NHP) has no record of rare species, significant natural communities, significant natural heritage areas, or conservation/managed areas within a mile of the project area. Although our maps do not show records of such natural heritage elements in the project area, it does not necessarily mean that they are not present. It may simply mean that the area has not been surveyed. The use of NHP data should not be substituted for actual field surveys, particularly if the project area contains suitable habitat for rare species, significant natural communities, or priority natural areas.

You may wish to check the Natural Heritage Program database website at www.ncnhp.org for a listing of rare plants and animals and significant natural communities in the county and on the quad map. Our Program also has a new website that allows users to obtain information on element occurrences and significant natural heritage areas within two miles of a given location:, <http://nhpweb.enr.state.nc.us/nhis/public/gmap75_main.phtml>. The user name is "public" and the password is "heritage". You may want to click "Help" for more information.

NC OneMap now provides digital Natural Heritage data online for free. This service provides site specific information on GIS layers with Natural Heritage Program rare species occurrences and Significant Natural Heritage Areas. The NC OneMap website provides Element Occurrence (EO) ID numbers (instead of species name), and the data user is then encouraged to contact the Natural Heritage Program for detailed information. This service allows the user to quickly and efficiently get site specific NHP data without visiting the NHP workroom or waiting for the Information Request to be answered by NHP staff. For more information about data formats and access, visit <www.nconemap.com>, then click on "FTP Data Download", and then "nheo.zip" [to the right of "Natural Heritage Element Occurrences"]. You may also e-mail NC OneMap at <dataq@ncmail.net> for more information.

Please do not hesitate to contact me at 919-715-8697 if you have questions or need further information.

Sincerely,

Harry E. LeGrand, Jr.

Harry E. LeGrand, Jr., Zoologist
Natural Heritage Program

1601 Mail Service Center, Raleigh, North Carolina 27699-1601
Phone: 919-715-4195 \ FAX: 919-715-3060 Internet: www.oneNCNaturally.org

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One NorthCarolina Naturally
Natural Resources Planning and Conservation

North Carolina Department of Environment and Natural Resources

DIVISION OF AIR QUALITY

Michael F. Easley, Governor

William G. Ross Jr., Secretary
B. Keith Overcash, P.E., Director

March 18, 2005

Mr. Gene Beasley
Vice President/General Manager
Paxar Corporation
P O Box 735
Lenoir, NC 28645

Subject: Air Permit No. 06118R12
Paxar Corporation - Printed Label Group
Lenoir, Caldwell County, North Carolina
Fee Class: Synthetic Minor
Site Number: 01/14/00069

Dear Mr. Beasley:

In accordance with your completed application received February 11, 2005, we are forwarding herewith Permit No. 06118R12 to Paxar Corporation - Printed Label Group, Lenoir, Caldwell County, North Carolina for the construction and operation of air emissions sources or air cleaning devices and appurtenances. Additionally, any emissions activities determined from your air permit application as meeting the exemption requirements contained in 15A NCAC 2Q .0102 or 15A NCAC 2Q .0503 have been listed for information purposes as an "ATTACHMENT" to the enclosed air permit. Please note the records retention requirements are contained in General Condition 2 of the General Conditions and Limitations.

If any parts, requirements, or limitations contained in this permit are unacceptable to you, you have the right to request a formal adjudicatory hearing within 30 days following receipt of this permit, identifying the specific issues to be contested. Such a request will stay the effectiveness of the entire permit. This hearing request must be in the form of a written petition, conforming to G.S. 150B-23 of the North Carolina General Statutes, and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714. The form for requesting a formal adjudicatory hearing may be obtained upon request from the Office of Administrative Hearings. Unless a request for a hearing is made pursuant to G.S. 150B-23, this air permit shall be final and binding.

You may request modification of your air permit through informal means pursuant to G.S. 150B-22. This request must be submitted in writing to the Director and must identify the specific

provisions or issues for which the modification is sought. Please note that the permit will become final and binding regardless of a request for informal modification unless a request for a hearing is also made under G.S. 150B-23.

Unless exempted by a condition of this permit or the regulations, construction of new air pollution sources or air cleaning devices, or modifications to the sources or air cleaning devices described in this permit must be covered under a permit issued by the Division of Air Quality prior to construction. Failure to do so is a violation of G.S. 143-215.108 and may subject the Permittee to civil or criminal penalties as described in G.S. 143-215.114A and 143-215.114B.

This permit shall be effective from March 18, 2005 until January 31, 2008, is nontransferable to future owners and operators, and shall be subject to the conditions and limitations as specified therein.

Changes have been made to the permit stipulations. The Permittee is responsible for carefully reading the entire permit and evaluating the requirements of each permit stipulation. The Permittee shall comply with all terms, conditions, requirements, limitations and restrictions set forth in this permit. Noncompliance with any permit condition is grounds for enforcement action, for permit termination, revocation and reissuance, or modification, or for denial of a permit renewal application. Specific changes and additions are summarized below (note: this list may not include all changes and additions):

- **Four 1-color sheet-fed screen printers with electric drying ovens (ID Nos. E16-A though ES16-D) are added to the permit.**
- **Start-up notification for the Aztec III (ES13) and Kinzel (ID No. ES1-E) lines are removed from the permit.**

Should you have any questions concerning this matter, please contact Harold Brady at (828) 296-4500.

Sincerely,

Mike Parker

for Paul K. Muller, P.E.
Regional Air Quality Supervisor

PKM:hlb
Enclosures

c: Central Files
Asheville Regional Office
Shannon Vogel, permit only

NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF AIR QUALITY

AIR PERMIT NO. 06118R12

Issue Date: March 18, 2005
Expiration Date: January 31, 2008

Effective Date: March 18, 2005
Replaces Permit: 06118R11

To construct and operate air emission source(s) and/or air cleaning device(s), and for the discharge of the associated air contaminants into the atmosphere in accordance with the provisions of Article 21B of Chapter 143, General Statutes of North Carolina (NCGS) as amended, and other applicable Laws, Rules and Regulations,

Paxar Corporation - Printed Label Group
950 German Street
Lenoir, Caldwell County, North Carolina
Fee Class: Synthetic Minor
Site Number: 01/14/00069

(the Permittee) is hereby authorized to construct and operate the air emissions sources and/or air cleaning devices and appurtenances described below:

Emission Source ID	Emission Source Description	Control System ID	Control System Description
Fabric Finishing			
ES8	one "Mageba" natural gas-fired (1.2 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A
ES9	one "Aztec" natural gas-fired (1.0 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A
ES10	one "Morrison" steam heated narrow fabric finishing line	N/A	N/A
ES11	one "Line A" natural gas-fired (0.75 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A
ES12	one "Webtex" electrically heated narrow fabric finishing line	N/A	N/A
ES13	one "Aztec III" natural gas-fired (0.5 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A
ES15	one "Aztec II" natural gas-fired (0.8 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A

Emission Source ID	Emission Source Description	Control System ID	Control System Description
Plastic Film Coating			
ES5	one ink mixing room	CD1	one natural gas-fired thermal oxidizer (8 million Btu per hour minimum heat input rate)
ES6	one plastic film coating operation consisting of stations Rotogravure I and Rotogravure II	CD1	one natural gas-fired thermal oxidizer (8 million Btu per hour minimum heat input rate)
Offset Printing			
ES14-A	one 2-color offset printing press	N/A	N/A
ES14-B	one 5-color offset printing press	N/A	N/A
ES14-C	one 5-color offset printing press	N/A	N/A
Screen Printing			
ES1-A	one 1-color screen printing line	N/A	N/A
ES1-B	one 1-color screen printing line	N/A	N/A
ES1-C	one 2-color "Stork" screen printing line	N/A	N/A
ES1-D	one 4-color "Kinzel" screen printing line	N/A	N/A
ES1-E	one 3-color "Kinzel" screen printing line	N/A	N/A
ES16-A	one ATMA 1-color sheet fed screen press with electric drying oven	N/A	N/A
ES16-B	one ATMA 1-color sheet fed screen press with electric drying oven	N/A	N/A
ES16-C	one ATMA 1-color sheet fed screen press with electric drying oven	N/A	N/A
ES16-D	one ATMA 1-color sheet fed screen press with electric drying oven	N/A	N/A
Rotary Printing			
ES2	one rotary printing operation consisting of twenty (20) rotary printing presses	N/A	N/A
Printing Support Operations			
ES4	one "sample mill" ink grinding mill	N/A	N/A
ES3	one 3-roll ink grinding mill	N/A	N/A
ES7	one plate making process	N/A	N/A

in accordance with the completed application 1400069.05A received February 11, 2005 including any plans, specifications, previous applications, and other supporting data, all of which are filed with the Department of Environment and Natural Resources, Division of Air Quality (DAQ) and are incorporated as part of this permit.

This permit is subject to the following specified conditions and limitations including any TESTING, REPORTING, OR MONITORING REQUIREMENTS:

A. SPECIFIC CONDITIONS AND LIMITATIONS

1. Any air emission sources or control devices authorized to construct and operate above must be operated and maintained in accordance with the provisions contained herein. The Permittee shall comply with applicable Environmental Management Commission Regulations, including Title 15A North Carolina Administrative Code (NCAC), Subchapter 2D .0202, 2D .0515, 2D .0516, 2D .0521, 2D .0535, 2D .0605, 2D .0611, 2D .0958, 2Q .0315, 2Q .0317 (Avoidance) and 2Q .0711.

2. EMISSION INVENTORY REQUIREMENT - At least 90 days prior to the expiration date of this permit, the Permittee shall submit the air pollution emission inventory report in accordance with 15A NCAC 2D .0202, pursuant to N.C. General Statute 143 215.65. The report shall be submitted to the Regional Supervisor, DAQ. The report shall document air pollutants emitted for the 2006 calendar year. The Regional Office will send information on how to submit the emissions inventory, along with a reminder to renew your permit, about six months prior to your permit expiration. If you do not receive this information, please contact the Regional Supervisor, DAQ.

3. PARTICULATE CONTROL REQUIREMENT - As required by 15A NCAC 2D .0515 "Particulates from Miscellaneous Industrial Processes," particulate matter emissions from the emission sources shall not exceed allowable emission rates. The allowable emission rates are, as defined in 15A NCAC 2D .0515, a function of the process weight rate and shall be determined by the following equation(s), where P is the process throughput rate in tons per hour (tons/hr) and E is the allowable emission rate in pounds per hour (lbs/hr).

$$E = 4.10 * (P)^{0.67} \quad \text{for } P <= 30 \text{ tons/hr, or}$$
$$E = 55 * (P)^{0.11} - 40 \quad \text{for } P > 30 \text{ tons/hr}$$

4. SULFUR DIOXIDE CONTROL REQUIREMENT - As required by 15A NCAC 2D .0516 "Sulfur Dioxide Emissions from Combustion Sources," sulfur dioxide emissions from the combustion sources shall not exceed 2.3 pounds per million Btu heat input.

5. VISIBLE EMISSIONS CONTROL REQUIREMENT - As required by 15A NCAC 2D .0521 "Control of Visible Emissions," visible emissions from the emissions sources, manufactured after July 1, 1971, shall not be more than 20 percent opacity when averaged over a six-minute period, except that six-minute periods averaging not more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period. However, sources which must comply with 15A NCAC 2D .0524 "New Source Performance Standards" or .1110 "National Emission Standards for Hazardous Air Pollutants" must comply with applicable visible emissions requirements contained therein.

6. NOTIFICATION REQUIREMENT - As required by 15A NCAC 2D .0535, the Permittee of a source of excess emissions that last for more than four hours and that results from a malfunction, a breakdown of process or control equipment or any other abnormal conditions, shall:

a. Notify the Director or his designee of any such occurrence by 9:00 a.m. Eastern time of the Division's next business day of becoming aware of the occurrence and describe:

   i. the name and location of the facility,

   ii. the nature and cause of the malfunction or breakdown,

   iii. the time when the malfunction or breakdown is first observed,

   iv. the expected duration, and

   v. an estimated rate of emissions.

b. Notify the Director or his designee immediately when the corrective measures have been accomplished.

This reporting requirement does not allow the operation of the facility in excess of Environmental Management Commission Regulations.

7. TESTING REQUIREMENT - Under the provisions of North Carolina General Statute 143-215.108, the Permittee shall demonstrate compliance with the emission limit(s) by testing the emission source(s) for the specified pollutant(s) as follows:

Affected Source(s)	Pollutant	Emission Limits (Facility-Wide)	Test Method
plastic film coating operation (ES6) and ink mixing room (ES5)	VOCs HAPs Methy Ethyl Ketone Toluene	100 tpy VOCs 10 tpy each individual HAP 25 tpy total HAPS 22.4 pounds per hour Methyl Ethyl Ketone 14.4 pounds per hour Toluene 98 pounds per day Toluene	DAQ Approved Method

a. At least 45 days prior to performing any required emissions testing, the Permittee must submit a testing protocol to the Regional Supervisor, DAQ for review and approval. All testing protocols must be approved by the DAQ prior to performing such tests.

b. To afford the Regional Supervisor, DAQ, the opportunity to have an observer present, the Permittee shall PROVIDE the Regional Office, in WRITING, at least 15 days notice of any required performance test(s).

c. The test results must be submitted to the Regional Supervisor, DAQ, in accordance with the approved procedures of the Environmental Management Commission by November 30, 2007.

d. This permit may be revoked, with proper notice to the Permittee, or enforcement procedures initiated, if the results of the test(s) indicate that the facility does not meet applicable limitations.

e. The source shall be responsible for ensuring, within the limits of practicality, that the equipment or process being tested is operated at or near its maximum normal production rate, or at a lesser rate if specified by the Director or his delegate.

f. All associated testing costs are the responsibility of the Permittee.

8. NOTIFICATION REQUIREMENT - Within 15 days after start-up of the ATMA 1-color sheet fed screen presses with drying ovens (ID No. ES16-A, ES16-B, ES16-C, and ES16-D), the Permittee shall NOTIFY, in WRITING, the Regional Supervisor, DAQ, of the start-up.

9. WORK PRACTICES REQUIREMENTS FOR PARTS WASHERS - As required by 15A NCAC 2D .0958(d) "Work Practices for Sources of Volatile Organic Compounds," the Permittee shall adhere to the required work practices for parts washers.

   a. The Permittee shall flush parts in the freeboard area.

   b. The Permittee shall take precautions to reduce the pooling of solvent on and in the parts.

   c. The Permittee shall tilt or rotate parts to drain solvent and allow a minimum of 15 seconds for drying or until all dripping has stopped, whichever is longer.

   d. The Permittee shall not fill cleaning machines above fill line.

   e. The Permittee shall not agitate solvent to the point of causing splashing.

10. REQUIREMENT TO CONTINUE TO USE CONTROL DEVICE - As required by 15A NCAC 2D .0958(e) "Work Practices for Sources of Volatile Organic Compounds," VOC emissions from the plastic film coating operation and the ink mixing room (ID No. ES5) shall continue to be controlled by one natural gas-fired thermal oxidizer (8 million Btu per hour minimum heat input rate) (CD1) until January 01, 2016.

11. WORK PRACTICES REQUIREMENTS - As required by 15A NCAC 2D .0958(c) "Work Practices for Sources of Volatile Organic Compounds," the Permittee shall adhere to the following required work practices:

   a. The Permittee shall store all VOC-containing material not in use (including waste material) in containers covered with a tightly fitting lid that is free of cracks, holes, or other defects.

   b. The Permittee shall clean up spills as soon as possible following proper safety procedures.

   c. The Permittee shall store wipe rags in closed containers.

d. The Permittee shall not clean sponges, fabric, wood, paper products, and other absorbent materials.

e. The Permittee shall drain solvents used to clean supply lines and other coating equipment into closable containers and close containers immediately after each use.

f. The Permittee shall clean mixing, blending, and manufacturing vats and containers by adding cleaning solvent, closing the vat or container before agitating the cleaning solvent.

g. The Permittee shall pour spent cleaning solvent into closable containers and close containers immediately after each use.

12. LIMITATION TO AVOID 15A NCAC 2Q .0501 - Pursuant to 15A NCAC 2Q .0315 "Synthetic Minor Facilities," to avoid the applicability of 15A NCAC 2Q .0501 "Purpose of Section and Requirement for a Permit," as requested by the Permittee, facility-wide emissions shall be less than the following:

Pollutant	Emission Limit (Tons per consecutive 12-month period)
VOC	100
Individual HAPs	10
Total HAPs	25

a. THERMAL OXIDIZER REQUIREMENSTS – Emissions from the ink mixing booth (ID No. ES-5) and the plastic film coating operation (ID No. ES6 shall be controlled by the thermal oxidizer (ID No. CD1).

i. Operational Parameters

A. the maximum flow rate to the oxidizer shall not exceed the design capacity of 12,000 acfm unless determined otherwise by destruction efficiency source testing;

B. the thermal oxidizer shall not be used to control emissions of methyl chloroform; and

C. the minimum temperature shall not be less than the design operating temperature of 1400 degrees F unless demonstrated otherwise by destruction efficiency source testing.

ii. Inspection and Maintenance Requirements

To comply with the provisions of this permit and ensure that optimum control efficiency is maintained, the Permittee establish an inspection and maintenance schedule/checklist based on the manufacturer's recommendations. As a minimum, the Permittee shall perform an annual internal inspection of the primary heat exchanger and associated inlet/outlet valves to ensure structural

integrity. The results of this inspection shall be recorded in the oxidizer logbook described below.

iii. Monitoring Requirements

The Permittee shall ensure the proper performance of the thermal oxidizer by monitoring the operating temperature once per shift and recording it in a logbook. The operating temperature shall be measured in the second half of the oxidizer, away from the flame zone.

iv. Recordkeeping and Reporting Requirements

An oxidizer logbook shall be kept on site and made available to DAQ personnel upon request. Any variance from the manufacturer's recommendations shall be investigated with corrections made and the date of actions recorded in the oxidizer logbook.

b. To qualify for the presumption of 100 percent capture efficiency for the total enclosures around the ink mixing booth (ID No. ES5) and the plastic film coating operation (ID No. ES6), the following criteria must be met:

i. VOC sources shall be as far away as practical from indraft openings,

ii. maximum openings in the room shall be less than 5 percent of total enclosure surface area,

iii. minimum in draft air velocity of 200 feet per minute is required with the direction of air through natural draft openings into the enclosure,

iv. all access doors and windows shall be closed during routine operation,

v. all exhaust points must be directed to the thermal oxidizer (ID No. 1), and

vi. barometric room pressure shall be demonstrated to be less than ambient barometric pressure during thermal oxidizer efficiency source testing.

c. The Permittee shall maintain monthly facility-wide consumption records of each material used containing volatile organic compounds as follows:

i. the quantity of volatile organic compound in pounds per gallon of each material used,

ii. the pounds of volatile organic compounds from each material used per month and <u>total</u> pounds of volatile organic compounds of each material used during the 12-month period ending on that month,

iii. the quantity of each hazardous air pollutant in pounds per gallon of each material used,

iv. the pounds of each hazardous air pollutant from each material used per month and total pounds of each hazardous air pollutant of each material used during the 12-month period ending on that month,

v. the quantity of all hazardous air pollutants in pounds per gallon of each material used, and

vi. the pounds of all hazardous air pollutants from each material used per month and total pounds of all hazardous air pollutants of each material used during the 12-month period ending on that month.

d. For compliance purposes, the Permittee shall submit to the Regional Supervisor, Division of Air Quality, each quarter a report summarizing emissions of volatile organic compounds and hazardous air pollutants containing the following:

i. the pounds of volatile organic compounds emitted during the previous calendar year,

A) for each month during the quarter, and
B) for each 12-month period ending on each month during the quarter using a 12-month rolling average;

ii. the greatest quantity in pounds of an individual hazardous air pollutant emitted:

A) for each month during the quarter, and
B) for each 12-month period ending on each month during the quarter using a 12-month rolling average;

iii. the pounds of all hazardous air pollutants emitted:

A) for each month during the quarter, and
B) for each 12-month period ending on each month during the quarter using a 12-month rolling average;

iv. The emissions (Ec) from the ink mixing booth (ID No. ES5) and the plastic film coating line (ID No. ES6) which have been reduced by the thermal oxidizer (ID No. CD1) shall be calculated as follows:

Ec = Eunc x [1 - ((Deff/100) x (Ceff/100))] where;

Ec = controlled emissions from the thermal oxidizer

Eunc = usage rate from the ink mixing booth and the plastic coating line
Deff = destruction efficiency determined from a destruction efficiency source test
Ceff = 100 capture efficiency, provided all conditions of item (b) of this condition are met.

e. The Permittee shall also maintain purchase orders and invoices of materials containing volatile organic compounds. These purchase orders and invoices shall be maintained for a period of at least three years and be made available to DAQ personnel upon request.

13. LIMITATION TO AVOID 15A NCAC 2D .0530 "PREVENTION OF SIGNIFICANT DETERIORATION" - In accordance with 15A NCAC 2Q .0317, to comply with this permit and avoid applicability of 15A NCAC 2D .0530 "Prevention of Significant Deterioration," as requested by the Permittee, volatile organic compound (VOC) emissions shall be limited according to the following table. Recordkeeping and reporting for this condition shall be fulfilled by the synthetic minor provisions of Specific Condition No. 12, above.

Affected Source(s)	Pollutant	Emission Limit (Tons Per Consecutive 12-month Period)
Ink mixing room (ES5) and Plastic film coating operation (ES6)	VOC Emissions	250

14. TOXIC AIR POLLUTANT EMISSIONS LIMITATION REQUIREMENT - Pursuant to 15A NCAC 2Q .0711 "Emission Rates Requiring a Permit," for each of the below listed toxic air pollutants (TAPs), the Permittee has made a demonstration that facility-wide actual emissions do not exceed the Toxic Permit Emission Rates (TPERs) listed in 15A NCAC 2Q .0711. The facility shall be operated and maintained in such a manner that emissions of any listed TAPs from the facility, including fugitive emissions, will not exceed TPERs listed in 15A NCAC 2Q .0711.

a. A permit to emit any of the below listed TAPs shall be required for this facility if actual emissions from all sources will become greater than the corresponding TPERs.

b. PRIOR to exceeding any of these listed TPERs, the Permittee shall be responsible for obtaining a permit to emit TAPs and for demonstrating compliance with the requirements of 15A NCAC 2D .1100 "Control of Toxic Air Pollutants".

c. In accordance with the approved application, the Permittee shall maintain records of operational information demonstrating that the TAP emissions do not exceed the TPERs as listed below.

d. To establish compliance with these limits, methyl ethyl ketone and toluene emissions from the ink mixing room (ID No. ES5) and the plastic film coating operation (ID No. ES6) shall be controlled by the thermal oxidizer (ID No. CD1) as described in Specific Condition No. 12, above.

Pollutant	Carcinogens (lb/yr)	Chronic Toxicants (lb/day)	Acute Systemic Toxicants (lb/hr)	Acute Irritants (lb/hr)
Ethyl acetate			36	
Formaldehyde				0.04

Pollutant	Carcinogens (lb/yr)	Chronic Toxicants (lb/day)	Acute Systemic Toxicants (lb/hr)	Acute Irritants (lb/hr)
Methyl ethyl ketone		78		22.4
Toluene		98		14.4
Xylene		57		16.4

B. GENERAL CONDITIONS AND LIMITATIONS

1. REPORTS, TEST DATA, MONITORING DATA, NOTIFICATIONS, AND REQUESTS FOR RENEWAL shall be submitted to:

   Paul K. Muller, P.E.
   Regional Air Quality Supervisor
   North Carolina Division of Air Quality
   Asheville Regional Office
   2090 U.S. Highway 70
   Swannanoa, NC 28778
   (828) 296-4500

2. RECORDS RETENTION REQUIREMENT - Any records required by the conditions of this permit shall be kept on site and made available to DAQ personnel for inspection upon request. These records shall be maintained in a form suitable and readily available for expeditious inspection and review. These records must be kept on site for a minimum of 2 years, unless another time period is otherwise specified.

3. PERMIT RENEWAL REQUIREMENT - The Permittee, at least 90 days prior to the expiration date of this permit, shall request permit renewal by letter in accordance with 15A NCAC 2Q .0304(d) and (f). Pursuant to 15A NCAC 2Q .0203(i), no permit application fee is required for renewal of an existing air permit. The renewal request should be submitted to the Regional Supervisor, DAQ.

4. ANNUAL FEE PAYMENT - Pursuant to 15A NCAC 2Q .0203(a), the Permittee shall pay the annual permit fee within 30 days of being billed by the DAQ. Failure to pay the fee in a timely manner will cause the DAQ to initiate action to revoke the permit.

5. EQUIPMENT RELOCATION - A new air permit shall be obtained by the Permittee prior to establishing, building, erecting, using, or operating the emission sources or air cleaning equipment at a site or location not specified in this permit.

6. This permit is subject to revocation or modification by the DAQ upon a determination that information contained in the application or presented in the support thereof is incorrect, conditions under which this permit was granted have changed, or violations of conditions contained in this permit have occurred. The facility shall be properly operated and maintained at all times in a manner that will effect an overall reduction in air pollution. Unless otherwise specified by this permit, no emission source may be operated without the concurrent operation of its associated air cleaning device(s) and appurtenances.

7. REPORTING REQUIREMENT - Any of the following that would result in previously unpermitted, new, or increased emissions must be reported to the Regional Supervisor, DAQ:

    a. changes in the information submitted in the application regarding facility emissions;

    b. changes that modify equipment or processes of existing permitted facilities; or

    c. changes in the quantity or quality of materials processed.

    If appropriate, modifications to the permit may then be made by the DAQ to reflect any necessary changes in the permit conditions. In no case are any new or increased emissions allowed that will cause a violation of the emission limitations specified herein.

8. This permit is nontransferable by the Permittee. Future owners and operators must obtain a new air permit from the DAQ.

9. This issuance of this permit in no way absolves the Permittee of liability for any potential civil penalties which may be assessed for violations of State law which have occurred prior to the effective date of this permit.

10. This permit does not relieve the Permittee of the responsibility of complying with all applicable requirements of any Federal, State, or Local water quality or land quality control authority.

11. Reports on the operation and maintenance of the facility shall be submitted by the Permittee to the Regional Supervisor, DAQ at such intervals and in such form and detail as may be required by the DAQ. Information required in such reports may include, but is not limited to, process weight rates, firing rates, hours of operation, and preventive maintenance schedules.

12. A violation of any term or condition of this permit shall subject the Permittee to enforcement pursuant to G.S. 143-215.114A, 143-215.114B, and 143-215.114C, including assessment of civil and/or criminal penalties.

13. Pursuant to North Carolina General Statute 143-215.3(a)(2), no person shall refuse entry or access to any authorized representative of the DAQ who requests entry or access for purposes of inspection, and who presents appropriate credentials, nor shall any person obstruct, hamper, or interfere with any such representative while in the process of carrying out his official duties. Refusal of entry or access may constitute grounds for permit revocation and assessment of civil penalties.

14. The Permittee must comply with any applicable Federal, State, or Local requirements governing the handling, disposal, or incineration of hazardous, solid, or medical wastes, including the Resource Conservation and Recovery Act (RCRA) administered by the Division of Waste Management.

15. PERMIT RETENTION REQUIREMENT - The Permittee shall retain a current copy of the air permit at the site. The Permittee must make available to personnel of the DAQ, upon request, the current copy of the air permit for the site.

16. CLEAN AIR ACT SECTION 112(r) REQUIREMENTS - Pursuant to 40 CFR Part 68 "Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)," if the Permittee is required to develop and register a risk management plan pursuant to Section 112(r) of the Federal Clean Air Act, then the Permittee is required to register this plan in accordance with 40 CFR Part 68.

17. PREVENTION OF ACCIDENTAL RELEASES - GENERAL DUTY - Pursuant to Title I Part A Section 112(r)(1) of the Clean Air Act "Hazardous Air Pollutants - Prevention of Accidental Releases - Purpose and General Duty," although a risk management plan may not be required, if the Permittee produces, processes, handles, or stores any amount of a listed hazardous substance, the Permittee has a general duty to take such steps as are necessary to prevent the accidental release of such substance and to minimize the consequences of any release. **This condition is federally-enforceable only.**

Permit issued this the 18th of March 2005.

NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION

Mike Parlin

for Paul K. Muller, P.E.
Regional Air Quality Supervisor
By Authority of the Environmental Management Commission

Air Permit No. 06118R12

ATTACHMENT to Permit No. 06118R12, March 18, 2005

Insignificant / Exempt Activities

Source	Date of Application	Exemption Regulation	Source of TAPs?	Source of Title V Pollutants?
I-1 - one natural gas-fired boiler (8.38 million Btu per hour maximum heat in put rate)	N/A	2Q .0102 (c)(2)(B)(ii)	Yes	Yes
I-2 - one natural gas-fired boiler (8.38 million Btu per hour maximum heat input rate)	N/A	2Q .0102 (c)(2)(B)(ii)	Yes	Yes

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1. Because an activity is exempted from being required to have a permit or permit modification does not mean that the activity is exempted from an applicable requirement or that the owner or operator of the source is exempted from demonstrating compliance with any applicable requirement.

2. When applicable, emissions from stationary source activities identified above shall be included in determining compliance with the permit requirements for toxic air pollutants under 15A NCAC 2D .1100 "Control of Toxic Air Pollutants" or 2Q .0711 "Emission Rates Requiring a Permit."

Paxar Corporation
950 German Street
PO Box 735
Lenoir, NC 28645
828 758-2338 FAX 828 758-2038

PAXAR

April 18, 2205

North Carolina Department
Of Environment & Natural Resources
Division of Air Quality
2090 US Hwy 70
Swannanoa, NC 28778

Dear Mr. Muller,

Per our new Air Permit # 06118R12, I am writing to inform you that we now have 2 of our ATMA Sheet Fed Screen Printers with dryers in full operation.

Should you have any questions or concerns, please feel free to call me at 828-759-3420.

Sincerely,

Gene Beasley
Vice President/General Manager

GB/klh

08/24/10 INFORMATION FOR FACILITY: PAXAR PRINTED LABEL FS-2

FACILITY INFORMATION: INV MAIL: N PERMIT MAIL: N STATUS:
ID : 0-034455 ADDRESS: 950 GERMAN STREET
CITY : LENOIR STATE : NC ZIP: 28645
COUNTY : CALDWELL PHONE : (828) 758-2338 OPER ID:
MANAGER: BILL OXFORD TITLE : SAFETY ENVIR MGR NOTAR'D: Y
OWNER INFORMATION: STATUS :
NAME : PAXAR AMERICAS INC DATE TRANSF: 19880101 LESSEE : N
ID : 54678 ADDRESS: PO BOX 608 ATTN: ACCTS PAYABLE
CITY : DAYTON STATE : OH ZIP: 45401-0608
COUNTY : PHONE : (828) 758-2338 CLERK : APN
DATE RECEIVED: 19930610 DATE SIGNED : 19930524 BILL TYPE: A OWNER TYPE : 3
DATE ENTERED : 19951114 DATE UPDATED: 20040714 BILL QTR : 3 FILE STATUS: A

PF3=SEARCH MENU PF4=FACID SCREEN PF5=PREV OPERATOR PF6=CURR.OPER.INFO

TANK INFORMATION FOR: 0-034455 PAXAR PRINTED LABEL EXE FS-3

ID	STAT	INSTALL	REMOVE	SIZE	PROD	TYPE	COM	MPT
1	C	19640101		10000	6	HEA	N	N
2	C	19740801		10000	6	HEA	N	N

CERTIFICATE INFORMATION FOR: 0-034455 PAXAR PRINTED LABEL

ACCOUNT BALANCE .00

CERT #	DATE ISSUED	BIG TANKS	SMALL TANKS	REVOKE DATE
1996054820	1996/06/04	2	0	
1997069890	1997/06/11	2	0	
1998070660	1998/06/15	2	0	
1999068620	1999/06/29	2	0	
2000065000	2000/06/14	2	0	
2004065850	2004/07/15	2	0	
2005064520	2005/07/22	2	0	
2006063240	2006/06/30	2	0	
2007058770	2007/06/08	2	0	
2008055040	2008/06/13	2	0	
2009052710	2009/06/09	2	0	
2010057020	2010/06/22	2	0	

PF3=SEARCH MENU PF4=FAC ID SCREEN PF5=FORWARD PF6=BACKWARD

UST Permit

Underground Storage Tank Operating Permit Certificate

Department of Environment and Natural Resources Division of Waste Management

Ownership of USTs:
YAZAR AMERICAS INC
PO BOX 001 ATTN ACCTS PAYABLE
DAYTON, OH 45401-0001

UST Facility:
YAZAR PRINTED LABEL
958 GERMAN STREET
LENOIR, NC 28645

Number of Large Commercial USTs (> 3,500 gallons): 2 Number of Small Commercial USTs (≤ 3,500 gallons): 0

The operating permit is valid from July 01, 2010 and will expire on the last day of the month of:

06/2011

Facility ID #: [illegible] Certificate #: [illegible]

Pursuant to the General Statutes 143-215.94B(g) no person shall place a petroleum product, and no owner or operator shall cause a petroleum product to be placed, into an underground storage tank at a facility for which the owner or operator does not hold a currently valid operating permit.

See reverse side for more information, including a list of fees based on the facility inventory above.

North Carolina Department of Environment and Natural Resources
Division of Air Quality

Beverly Eaves Perdue
Governor

B. Keith Overcash, P.E.
Director

Dee Freeman
Secretary

August 27, 2010

Mr. Gene Beasley
Vice President/General Manager
Avery Dennison Corporation - Lenoir
P. O. Box 735
950 German Street
Lenoir, NC 28645

Subject: Air Permit No. 06118R15
Avery Dennison Corporation - Lenoir
Lenoir, Caldwell County, North Carolina
Permit Class: Synthetic Minor
Facility ID# 1400069

Dear Mr. Beasley:

In accordance with your completed application received June 9, 2010, we are forwarding herewith Permit No. 06118R15 to Avery Dennison Corporation - Lenoir, Lenoir, Caldwell County, North Carolina for the construction and operation of air emissions sources or air cleaning devices and appurtenances. Additionally, any emissions activities determined from your air permit application as meeting the exemption requirements contained in 15A NCAC 2Q .0102 have been listed for information purposes as an "ATTACHMENT" to the enclosed air permit. Please note the records retention requirements are contained in General Condition 2 of the General Conditions and Limitations.

If any parts, requirements, or limitations contained in this permit are unacceptable to you, you have the right to request a formal adjudicatory hearing within 30 days following receipt of this permit, identifying the specific issues to be contested. Such a request will stay the effectiveness of the entire permit. This hearing request must be in the form of a written petition, conforming to G.S. 150B-23 of the North Carolina General Statutes, and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714. The form for requesting a formal adjudicatory hearing may be obtained upon request from the Office of Administrative Hearings. Unless a request for a hearing is made pursuant to G.S. 150B-23, this air permit shall be final and binding.

You may request modification of your air permit through informal means pursuant to G.S.

150B-22. This request must be submitted in writing to the Director and must identify the specific provisions or issues for which the modification is sought. Please note that the permit will become final and binding regardless of a request for informal modification unless a request for a hearing is also made under G.S. 150B-23.

Unless exempted by a condition of this permit or the regulations, construction of new air pollution sources or air cleaning devices, or modifications to the sources or air cleaning devices described in this permit must be covered under a permit issued by the Division of Air Quality prior to construction. Failure to do so is a violation of G.S. 143-215.108 and may subject the Permittee to civil or criminal penalties as described in G.S. 143-215.114A and 143-215.114B.

This permit shall be effective from July 27, 2010 until August 31, 2013, is nontransferable to future owners and operators, and shall be subject to the conditions and limitations as specified therein.

Changes have been made to the permit stipulations. The Permittee is responsible for carefully reading the entire permit and evaluating the requirements of each permit stipulation. The Permittee shall comply with all terms, conditions, requirements, limitations and restrictions set forth in this permit. Noncompliance with any permit condition is grounds for enforcement action, for permit termination, revocation and reissuance, or modification, or for denial of a permit renewal application. Specific changes and additions are summarized below (note: this list may not include all changes and additions):

- **Roller-type Coater ES-18 may be controlled with either Thermal Oxidizer CD-1 or Thermal Oxidizer CD-2;**
- **The initial testing requirement for Roller-type Coaters ES-17 and ES-18 has been removed from the permit; and**
- **Initial testing requirement for Roller-type Coater ES-18 while being controlled by Thermal Oxidizer CD-1 has been added to the permit with this modification.**

Should you have any questions concerning this matter, please contact Christopher Scott at (828) 296-4500.

Sincerely,

Paul K. Muller, P.E.
Regional Air Quality Supervisor

PKM:ces
Enclosures

c: Central Files
Asheville Regional Office
Shannon Vogel, permit only

NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF AIR QUALITY

AIR PERMIT NO. 06118R15

Issue Date: August 27, 2010 | Effective Date: August 27, 2010
Expiration Date: August 31, 2013 | Replaces Permit: 06118R14

To construct and operate air emission source(s) and/or air cleaning device(s), and for the discharge of the associated air contaminants into the atmosphere in accordance with the provisions of Article 21B of Chapter 143, General Statutes of North Carolina (NCGS) as amended, and other applicable Laws, Rules and Regulations,

Avery Dennison Corporation - Lenoir
950 German Street
Lenoir, Caldwell County, North Carolina
Permit Class: Synthetic Minor
Facility ID# 1400069

(the Permittee) is hereby authorized to construct and operate the air emissions sources and/or air cleaning devices and appurtenances described below:

Emission Source ID	Emission Source Description	Control System ID	Control System Description
Fabric Finishing			
ES8	one "Mageba" natural gas-fired (1.2 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A
ES9	one "Aztec" natural gas-fired (1.0 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A
ES10	one "Morrison" steam heated narrow fabric finishing line	N/A	N/A
ES11	one "Line A" natural gas-fired (0.75 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A
ES12	one "Webtex" electrically heated narrow fabric finishing line	N/A	N/A
ES13	one "Aztec III" natural gas-fired (0.5 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A
ES15	one "Aztec II" natural gas-fired (0.8 million Btu per hour maximum heat input rate) narrow fabric finishing line	N/A	N/A

Emission Source ID	Emission Source Description	Control System ID	Control System Description
Plastic Film Coating			
ES5	one ink mixing room	CD1	one natural gas-fired thermal oxidizer (8 million Btu per hour minimum heat input rate)
ES6	one plastic film coating operation consisting of stations Rotogravure I and Rotogravure II		
ES18	one roller-type coater		
ES17	one roller-type coater equipped with a natural gas-fired drying oven (1.5 million Btu per hour maximum heat input rate)	CD2	one natural gas-fired thermal oxidizer (4 million Btu per hour minimum heat input rate)
ES18	one roller-type coater		
Offset Printing			
ES14-A	one 2-color offset printing press	N/A	N/A
ES14-B	one 5-color offset printing press	N/A	N/A
ES14-C	one 5-color offset printing press	N/A	N/A
Screen Printing			
ES1-A	one 1-color screen printing line	N/A	N/A
ES1-B	one 1-color screen printing line	N/A	N/A
ES1-C	one 2-color "Stork" screen printing line	N/A	N/A
ES1-D	one 4-color "Kinzel" screen printing line	N/A	N/A
ES1-E	one 3-color "Kinzel" screen printing line	N/A	N/A
ES16-A	one ATMA 1-color sheet fed screen press with electric drying oven	N/A	N/A
ES16-B	one ATMA 1-color sheet fed screen press with electric drying oven	N/A	N/A
ES16-C	one ATMA 1-color sheet fed screen press with electric drying oven	N/A	N/A
ES16-D	one ATMA 1-color sheet fed screen press with electric drying oven	N/A	N/A
Rotary Printing			
ES2	one rotary printing operation consisting of twenty (20) rotary printing presses	N/A	N/A
Printing Support Operations			
ES4	one "sample mill" ink grinding mill	N/A	N/A
ES3	one 3-roll ink grinding mill	N/A	N/A
ES7	one plate making process	N/A	N/A

in accordance with the completed application 1400069.09C received December 14, 2009 including any plans, specifications, previous applications, and other supporting data, all of which are filed with the Department of Environment and Natural Resources, Division of Air Quality (DAQ) and are incorporated as part of this permit.

This permit is subject to the following specified conditions and limitations including any TESTING, REPORTING, OR MONITORING REQUIREMENTS:

A. SPECIFIC CONDITIONS AND LIMITATIONS

1. Any air emission sources or control devices authorized to construct and operate above must be operated and maintained in accordance with the provisions contained herein. The Permittee shall comply with applicable Environmental Management Commission Regulations, including Title 15A North Carolina Administrative Code (NCAC), Subchapter 2D .0200, 2D .0202, 2D .0515, 2D .0516, 2D .0521, 2D .0535, 2D .0540, 2D .0605, 2D .0611, 2D .0958, 2Q .0315, 2Q .0317 (Avoidance) and 2Q .0711.

2. PERMIT RENEWAL AND EMISSION INVENTORY REQUIREMENT - The Permittee, at least 90 days prior to the expiration date of this permit, shall request permit renewal by letter in accordance with 15A NCAC 2Q .0304(d) and (f). Pursuant to 15A NCAC 2Q .0203(i), no permit application fee is required for renewal of an existing air permit (without a modification request). The renewal request (with AA application form) should be submitted to the Regional Supervisor, DAQ. Also, at least 90 days prior to the expiration date of this permit, the Permittee shall submit the air pollution emission inventory report (with Certification Sheet) in accordance with 15A NCAC 2D .0202, pursuant to N.C. General Statute 143 215.65. The report shall be submitted to the Regional Supervisor, DAQ and shall document air pollutants emitted for the 2012 calendar year.

3. PARTICULATE CONTROL REQUIREMENT - As required by 15A NCAC 2D .0515 "Particulates from Miscellaneous Industrial Processes," particulate matter emissions from the emission sources shall not exceed allowable emission rates. The allowable emission rates are, as defined in 15A NCAC 2D .0515, a function of the process weight rate and shall be determined by the following equation(s), where P is the process throughput rate in tons per hour (tons/hr) and E is the allowable emission rate in pounds per hour (lbs/hr).

$$E = 4.10 * (P)^{0.67} \quad \text{for } P <= 30 \text{ tons/hr, or}$$
$$E = 55 * (P)^{0.11} - 40 \quad \text{for } P > 30 \text{ tons/hr}$$

4. SULFUR DIOXIDE CONTROL REQUIREMENT - As required by 15A NCAC 2D .0516 "Sulfur Dioxide Emissions from Combustion Sources," sulfur dioxide emissions from the emission sources shall not exceed 2.3 pounds per million Btu heat input.

5. VISIBLE EMISSIONS CONTROL REQUIREMENT - As required by 15A NCAC 2D .0521 "Control of Visible Emissions," visible emissions from the emission sources, manufactured after July 1, 1971, shall not be more than 20 percent opacity when averaged over a six-minute period, except that six-minute periods averaging not more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period. However, sources which must comply with 15A NCAC 2D .0524 "New Source

Performance Standards" or .1110 "National Emission Standards for Hazardous Air Pollutants" must comply with applicable visible emissions requirements contained therein.

6. NOTIFICATION REQUIREMENT - As required by 15A NCAC 2D .0535, the Permittee of a source of excess emissions that last for more than four hours and that results from a malfunction, a breakdown of process or control equipment or any other abnormal conditions, shall:

   a. Notify the Director or his designee of any such occurrence by 9:00 a.m. Eastern time of the Division's next business day of becoming aware of the occurrence and describe:

      i. the name and location of the facility,
      ii. the nature and cause of the malfunction or breakdown,
      iii. the time when the malfunction or breakdown is first observed,
      iv. the expected duration, and
      v. an estimated rate of emissions.

   b. Notify the Director or his designee immediately when the corrective measures have been accomplished.

   This reporting requirement does not allow the operation of the facility in excess of Environmental Management Commission Regulations.

7. FUGITIVE DUST CONTROL REQUIREMENT - As required by 15A NCAC 2D .0540 "Particulates from Fugitive Dust Emission Sources," the Permittee shall not cause or allow fugitive dust emissions to cause or contribute to substantive complaints or excess visible emissions beyond the property boundary. If substantive complaints or excessive fugitive dust emissions from the facility are observed beyond the property boundaries for six minutes in any one hour (using Reference Method 22 in 40 CFR, Appendix A), the owner or operator may be required to submit a fugitive dust plan as described in 2D .0540(f).

8. TESTING REQUIREMENT - Under the provisions of North Carolina General Statute 143-215.108 and in accordance with 15A NCAC 2D .0605, the Permittee shall demonstrate compliance with the emission limit(s) by testing the emission source(s) for the specified pollutant(s) as follows:

Affected Source(s)	Pollutant	Emission Limit (facility-wide)	Test Method
ink mixing room (ES5) one plastic film coating operation (ES6) roller-type coater (ES18)	VOCs, HAPs, methyl ethyl ketone, and toluene	100 tpy VOCs 10 tpy each individual HAP 25 tpy total HAPs 22.4 lb per hour methyl ethyl ketone 14.4 lb per hour toluene 98 lb per day toluene	DAQ Approved Method

a. At least 45 days prior to performing any required emissions testing, the Permittee must submit a testing protocol to the Regional Supervisor, DAQ for review and approval. All testing protocols must be approved by the DAQ prior to performing such tests.

b. To afford the Regional Supervisor, DAQ, the opportunity to have an observer present, the Permittee shall PROVIDE the Regional Office, in WRITING, at least 15 days notice of any required performance test(s).

c. Two copies of the test results must be submitted to the Regional Supervisor, DAQ, in accordance with the approved procedures of the Environmental Management Commission within 180 days of startup **(If this req. is based on startup date, remember to ad startup notice requirement for CD1 controlling ES18)**.

d. This permit may be revoked, with proper notice to the Permittee, or enforcement procedures initiated, if the results of the test(s) indicate that the facility does not meet applicable limitations.

e. The source shall be responsible for ensuring, within the limits of practicality, that the equipment or process being tested is operated at or near its maximum normal production rate, or at a lesser rate if specified by the Director or his delegate.

f. All associated testing costs are the responsibility of the Permittee.

9. TESTING REQUIREMENT - Under the provisions of North Carolina General Statute 143-215.108 and in accordance with 15A NCAC 2D .0605, the Permittee shall demonstrate compliance with the emission limit(s) by testing the emission source(s) for the specified pollutant(s) as follows:

Affected Source(s)	Pollutant	Emission Limit (facility-wide)	Test Method
ink mixing room (ES5) plastic film coating operation (ES6)	VOCs, HAPs, methyl ethyl ketone, and toluene	100 tpy VOCs 10 tpy each individual HAP 25 tpy total HAPs 22.4 lb per hour methyl ethyl ketone 14.4 lb per hour toluene 98 lb per day toluene	DAQ Approved Method

a. At least 45 days prior to performing any required emissions testing, the Permittee must submit a testing protocol to the Regional Supervisor, DAQ for review and approval. All testing protocols must be approved by the DAQ prior to performing such tests.

b. To afford the Regional Supervisor, DAQ, the opportunity to have an observer present, the Permittee shall PROVIDE the Regional Office, in WRITING, at least 15 days notice of any required performance test(s).

c. Two copies of the test results must be submitted to the Regional Supervisor, DAQ, in accordance with the approved procedures of the Environmental Management Commission by **August 31, 2012.**

d. This permit may be revoked, with proper notice to the Permittee, or enforcement procedures initiated, if the results of the test(s) indicate that the facility does not meet applicable limitations.

e. The source shall be responsible for ensuring, within the limits of practicality, that the equipment or process being tested is operated at or near its maximum normal production rate, or at a lesser rate if specified by the Director or his delegate.

f. All associated testing costs are the responsibility of the Permittee.

10. TESTING REQUIREMENT - Under the provisions of North Carolina General Statute 143-215.108 and in accordance with 15A NCAC 2D .0605, the Permittee shall demonstrate compliance with the emission limit(s) by testing the emission source(s) for the specified pollutant(s) as follows:

Affected Source(s)	Pollutant	Emission Limit (facility-wide)	Test Method
roller-type coater and drying oven (ES17) roller-type coater (ES18)	VOCs, HAPs, methyl ethyl ketone, and toluene	100 tpy VOCs 10 tpy each individual HAP 25 tpy total HAPs 22.4 lb per hour methyl ethyl ketone 14.4 lb per hour toluene 98 lb per day toluene	DAQ Approved Method

a. At least 45 days prior to performing any required emissions testing, the Permittee must submit a testing protocol to the Regional Supervisor, DAQ for review and approval. All testing protocols must be approved by the DAQ prior to performing such tests.

b. To afford the Regional Supervisor, DAQ, the opportunity to have an observer present, the Permittee shall PROVIDE the Regional Office, in WRITING, at least 15 days notice of any required performance test(s).

c. Two copies of the test results must be submitted to the Regional Supervisor, DAQ, in accordance with the approved procedures of the Environmental Management Commission by **December 31, 2009.**

d. This permit may be revoked, with proper notice to the Permittee, or enforcement procedures initiated, if the results of the test(s) indicate that the facility does not meet applicable limitations.

e. The source shall be responsible for ensuring, within the limits of practicality, that the equipment or process being tested is operated at or near its maximum normal production rate, or at a lesser rate if specified by the Director or his delegate.

f. All associated testing costs are the responsibility of the Permittee.

11. NOTIFICATION REQUIREMENT - In accordance with 15A NCAC 2D .0611, within 15 days after startup of the roller-type coater (ID No. ES18) under the control of the thermal oxidizer (ID No. CD1), the Permittee shall NOTIFY, in WRITING, the Regional Supervisor, DAQ, of the start-up.

12. WORK PRACTICES REQUIREMENTS FOR PARTS WASHERS - As required by 15A NCAC 2D .0958(d) "Work Practices for Sources of Volatile Organic Compounds," the Permittee shall adhere to the required work practices for parts washers.

    a. The Permittee shall flush parts in the freeboard area.

    b. The Permittee shall take precautions to reduce the pooling of solvent on and in the parts.

    c. The Permittee shall tilt or rotate parts to drain solvent and allow a minimum of 15 seconds for drying or until all dripping has stopped, whichever is longer.

    d. The Permittee shall not fill cleaning machines above fill line.

    e. The Permittee shall not agitate solvent to the point of causing splashing.

13. WORK PRACTICES REQUIREMENTS - As required by 15A NCAC 2D .0958(c) "Work Practices for Sources of Volatile Organic Compounds," the Permittee shall adhere to the following required work practices:

    a. The Permittee shall store all VOC-containing material not in use (including waste material) in containers covered with a tightly fitting lid that is free of cracks, holes, or other defects.

    b. The Permittee shall clean up spills as soon as possible following proper safety procedures.

    c. The Permittee shall store wipe rags in closed containers.

    d. The Permittee shall not clean sponges, fabric, wood, paper products, and other absorbent materials.

    e. The Permittee shall drain solvents used to clean supply lines and other coating equipment into closable containers and close containers immediately after each use.

    f. The Permittee shall clean mixing, blending, and manufacturing vats and containers by adding cleaning solvent, closing the vat or container before agitating the cleaning solvent.

    g. The Permittee shall pour spent cleaning solvent into closable containers and close containers immediately after each use.

14. REQUIREMENT TO CONTINUE TO USE CONTROL DEVICE - As required by 15A NCAC 2D .0958(e) "Work Practices for Sources of Volatile Organic Compounds," VOC emissions from one ink mixing room (ID No. ES5) and one plastic film coating operation consisting of stations Rotogravure I and Rotogravure II (ID No. ES6) shall continue to be controlled by the natural gas-fired thermal oxidizer (ID No. CD1) until June 09, 2010.

15. LIMITATION TO AVOID 15A NCAC 2Q .0501 - Pursuant to 15A NCAC 2Q .0315 "Synthetic Minor Facilities," to avoid the applicability of 15A NCAC 2Q .0501 "Purpose of Section and Requirement for a Permit," as requested by the Permittee, facility-wide emissions shall be less than the following:

Pollutant	Emission Limit (Tons per consecutive 12-month period)
VOC	100
Individual HAPs	10
Total HAPs	25

a. Operations Restrictions

i. To ensure emissions do not exceed the limitations above, emissions from the ink mixing booth (ID No. ES5) and the plastic film coating operation (ID No. ES6) shall be controlled by the thermal oxidizer (ID No. CD1) with the following operational parameters:

A. the maximum flow rate to the oxidizer shall not exceed the design capacity of 12,000 acfm unless determined otherwise by destruction efficiency source testing;

B. the thermal oxidizer shall not be used to control emissions of methyl chloroform or methylene chloride; and

C. the minimum temperature shall not be less than the design operating temperature of 1,400 degrees F unless demonstrated otherwise by destruction efficiency source testing.

ii. To ensure emissions do not exceed the limitations above, emissions from the two roller-type coaters (ID Nos. ES17 and ES18), shall be controlled by the thermal oxidizer (ID No. CD2) with the following operational parameters:

A. the maximum flow rate to the oxidizer shall not exceed the design capacity of 8,000 acfm unless determined otherwise by destruction efficiency source testing;

B. the thermal oxidizer shall not be used to control emissions of methyl chloroform or methylene chloride; and

C. the minimum temperature shall not be less than the design operating temperature of 1,390 degrees F unless demonstrated otherwise by destruction efficiency source testing.

b. Inspection and Maintenance Requirements - To comply with the provisions of this permit and ensure that emissions do not exceed the regulatory limits, the Permittee shall perform periodic inspections and maintenance (I&M) as recommended by the manufacturer. As a minimum, the Permittee shall perform an annual internal inspection of the primary heat exchangers and associated inlet/outlet valves to ensure structural integrity for the thermal oxidizers (ID Nos. CD1 and CD2).

c. Monitoring Requirements

i. Thermal Oxidizer Requirements - The Permittee shall ensure the proper performance of the thermal oxidizers by monitoring the following operational parameters:

A. The Permittee shall monitor the operating temperature of both thermal oxidizers (ID Nos. CD1 and CD2) once per shift and record the temperature in a logbook. The operating temperature shall be measured in the second half of the oxidizers, away from the flame zone.

B. To qualify for the presumption of 100 percent capture efficiency for the total enclosures around the ink mixing booth (ID No. ES5), the plastic film coating operation (ID No. ES6) and the two roller-type coaters (ID Nos. ES17 and ES18), the following criteria must be met:

1. VOC sources shall be as far away as practical from indraft openings;

2. maximum openings in the room shall be less than 5 percent of total enclosure surface area;

3. minimum in draft air velocity of 200 feet per minute is required with the direction of air through natural draft openings into the enclosure;

4. all access doors and windows shall be closed during routine operation;

5. all exhaust points must be directed to the thermal oxidizers (ID Nos. CD1 and CD2); and

6. barometric room pressure shall be demonstrated to be less than ambient barometric pressure during thermal oxidizer efficiency source testing.

ii. The Permittee shall maintain monthly facility-wide consumption records of each material used containing volatile organic compounds as follows:

A. the quantity of volatile organic compound in pounds per gallon of each material used;

B. the pounds of volatile organic compounds from each material used per month and total pounds of volatile organic compounds of each material used during the 12-month period ending on that month;

C. the quantity of each hazardous air pollutant in pounds per gallon of each material used;

D. the pounds of each hazardous air pollutant from each material used per month and total pounds of each hazardous air pollutant of each material used during the 12-month period ending on that month;

E. the quantity of all hazardous air pollutants in pounds per gallon of each material used; and

F. the pounds of all hazardous air pollutants from each material used per month and total pounds of all hazardous air pollutants of each material used during the 12-month period ending on that month.

d. Reporting Requirements - Within 30 days after each calendar year quarter, regardless of the actual emissions, the Permittee shall report to the Regional Supervisor, Division of Air Quality, the following emissions of volatile organic compounds and hazardous air pollutants:

i. the pounds of volatile organic compounds emitted during the previous calendar year,

A. for each month during the quarter, and

B. for each 12-month period ending on each month during the quarter using a 12-month rolling total; the pounds of volatile organic compounds emitted during the previous calendar year.

ii. the greatest quantity in pounds of an individual hazardous air pollutant emitted:

A. for each month during the quarter, and

B. for each 12-month period ending on each month during the quarter using a 12-month rolling total.

iii. the pounds of all hazardous air pollutants emitted:

A. for each month during the quarter, and

B. for each 12-month period ending on each month during the quarter using a 12-month rolling average.

iv. The emissions from the ink mixing booth (ID No. ES5) and the plastic film coating line (ID No. ES6) which have been reduced by the thermal oxidizer (ID No. CD1) shall be calculated as follows:

Ec = Eunc x [1 - ((Deff/100) x (Ceff/100))] where;

Ec = controlled emissions from the thermal oxidizer

Eunc = usage rate from the ink mixing booth and the plastic coating line

Deff = destruction efficiency determined from a destruction efficiency source test

Ceff = 100 capture efficiency, provided all conditions of items (a), (b), and (c) of this condition are met.

v. The emissions from the two roller-type coaters (ID Nos. ES17 and ES18) which have been reduced by the thermal oxidizer (ID No. CD2) shall be calculated as follows:

Ec = Eunc x [1 - ((Deff/100) x (Ceff/100))] where;

Ec = controlled emissions from the thermal oxidizer

Eunc = usage rate from the ink mixing booth and the plastic coating line

Deff = destruction efficiency determined from a destruction efficiency source test

Ceff = 100 capture efficiency, provided all conditions of items (a), (b), and (c) of this condition are met.

e. The Permittee shall also maintain purchase orders and invoices of materials containing volatile organic compounds. These purchase orders and invoices shall be maintained for a period of at least three years and be made available to DAQ personnel upon request.

f. Recordkeeping Requirements - A log book shall be kept on site for the thermal oxidizers (ID No. CD1 and CD2) and be made available to Division of Air Quality personnel upon request. The Permittee shall record all inspection, maintenance and monitoring requirements listed above in the log book. Any variance from the manufacturer's recommendations shall be investigated with corrections made and date of actions recorded in the log book.

16. LIMITATION TO AVOID 15A NCAC 2D .0530 "PREVENTION OF SIGNIFICANT DETERIORATION" - In accordance with 15A NCAC 2Q .0317, to comply with this permit and avoid applicability of 15A NCAC 2D .0530 "Prevention of Significant Deterioration,"

as requested by the Permittee, volatile organic compound (VOC) emissions shall be limited as follows:

Affected Source(s)	Pollutant	Emission Limit (Tons Per Consecutive 12-month Period)
Facility Wide	VOC (Meeting Federal Definition as photochemically reactive)	250 tons

Compliance with this limit shall be established by compliance with the Synthetic Minor limit, recordkeeping, and reporting requirements outlined in Specific Condition and Limitation No. 14.

17. TOXIC AIR POLLUTANT EMISSIONS LIMITATION REQUIREMENT - Pursuant to 15A NCAC 2Q .0711 "Emission Rates Requiring a Permit," for each of the below listed toxic air pollutants (TAPs), the Permittee has made a demonstration that facility-wide actual emissions do not exceed the Toxic Permit Emission Rates (TPERs) listed in 15A NCAC 2Q .0711. The facility shall be operated and maintained in such a manner that emissions of any listed TAPs from the facility, including fugitive emissions, will not exceed TPERs listed in 15A NCAC 2Q .0711.

    a. A permit to emit any of the below listed TAPs shall be required for this facility if actual emissions from all sources will become greater than the corresponding TPERs.

    b. PRIOR to exceeding any of these listed TPERs, the Permittee shall be responsible for obtaining a permit to emit TAPs and for demonstrating compliance with the requirements of 15A NCAC 2D .1100 "Control of Toxic Air Pollutants".

    c. In accordance with the approved application, the Permittee shall maintain records of operational information demonstrating that the TAP emissions do not exceed the TPERs as listed below:

Pollutant	Carcinogens (lb/yr)	Chronic Toxicants (lb/day)	Acute Systemic Toxicants (lb/hr)	Acute Irritants (lb/hr)
ethyl acetate (141-78-6)			36	
formaldehyde (50-00-0)				0.04
MEK (methyl ethyl ketone, 2-butanone) (78-93-3)		78		22.4
methylene chloride (75-09-2)	1600		0.39	

Pollutant	Carcinogens (lb/yr)	Chronic Toxicants (lb/day)	Acute Systemic Toxicants (lb/hr)	Acute Irritants (lb/hr)
toluene (108-88-3)		98		14.4
xylene (mixed isomers) (1330-20-7)		57		16.4

d. To establish compliance with these limits, methyl ethyl ketone and toluene emissions from the ink mixing room (ID No. ES5) and the plastic film coating operation (ID No. ES6) shall be controlled by the thermal oxidizer (ID No. CD1), and the two roller-type coaters (ID Nos. ES17 and ES18), shall be controlled by the natural gas-fired thermal oxidizer (ID No. CD2) as described in Specific Condition No. 14, above.

B. GENERAL CONDITIONS AND LIMITATIONS

1. TWO COPIES OF ALL DOCUMENTS, REPORTS, TEST DATA, MONITORING DATA, NOTIFICATIONS, REQUESTS FOR RENEWAL, AND ANY OTHER INFORMATION REQUIRED BY THIS PERMIT shall be submitted to the:

   Regional Air Quality Supervisor
   North Carolina Division of Air Quality
   Asheville Regional Office
   2090 U.S. Highway 70
   Swannanoa, NC 28778
   (828) 296-4500

   For identification purposes, each submittal should include the facility name as listed on the permit, the facility identification number, and the permit number.

2. RECORDS RETENTION REQUIREMENT - Any records required by the conditions of this permit shall be kept on site and made available to DAQ personnel for inspection upon request. These records shall be maintained in a form suitable and readily available for expeditious inspection and review. These records must be kept on site for a minimum of 2 years, unless another time period is otherwise specified.

3. ANNUAL FEE PAYMENT - Pursuant to 15A NCAC 2Q .0203(a), the Permittee shall pay the annual permit fee within 30 days of being billed by the DAQ. Failure to pay the fee in a timely manner will cause the DAQ to initiate action to revoke the permit.

4. EQUIPMENT RELOCATION - A new air permit shall be obtained by the Permittee prior to establishing, building, erecting, using, or operating the emission sources or air cleaning equipment at a site or location not specified in this permit.

5. This permit is subject to revocation or modification by the DAQ upon a determination that information contained in the application or presented in the support thereof is incorrect, conditions under which this permit was granted have changed, or violations of conditions contained in this permit have occurred. The facility shall be properly operated and maintained at all times in a manner that will effect an overall reduction in air pollution. Unless otherwise specified by this permit, no emission source may be operated without the concurrent operation of its associated air cleaning device(s) and appurtenances.

6. REPORTING REQUIREMENT - Any of the following that would result in previously unpermitted, new, or increased emissions must be reported to the Regional Supervisor, DAQ:

   a. changes in the information submitted in the application regarding facility emissions;

   b. changes that modify equipment or processes of existing permitted facilities; or

   c. changes in the quantity or quality of materials processed.

   If appropriate, modifications to the permit may then be made by the DAQ to reflect any necessary changes in the permit conditions. In no case are any new or increased emissions allowed that will cause a violation of the emission limitations specified herein.

7. This permit is nontransferable by the Permittee. Future owners and operators must obtain a new air permit from the DAQ.

8. This issuance of this permit in no way absolves the Permittee of liability for any potential civil penalties which may be assessed for violations of State law which have occurred prior to the effective date of this permit.

9. This permit does not relieve the Permittee of the responsibility of complying with all applicable requirements of any Federal, State, or Local water quality or land quality control authority.

10. Reports on the operation and maintenance of the facility shall be submitted by the Permittee to the Regional Supervisor, DAQ at such intervals and in such form and detail as may be required by the DAQ. Information required in such reports may include, but is not limited to, process weight rates, firing rates, hours of operation, and preventive maintenance schedules.

11. A violation of any term or condition of this permit shall subject the Permittee to enforcement pursuant to G.S. 143-215.114A, 143-215.114B, and 143-215.114C, including assessment of civil and/or criminal penalties.

12. Pursuant to North Carolina General Statute 143-215.3(a)(2), no person shall refuse entry or access to any authorized representative of the DAQ who requests entry or access for purposes of inspection, and who presents appropriate credentials, nor shall any person obstruct, hamper, or interfere with any such representative while in the process of carrying out his official duties. Refusal of entry or access may constitute grounds for permit revocation and assessment of civil penalties.

13. The Permittee must comply with any applicable Federal, State, or Local requirements governing the handling, disposal, or incineration of hazardous, solid, or medical wastes, including the Resource Conservation and Recovery Act (RCRA) administered by the Division of Waste Management.

14. PERMIT RETENTION REQUIREMENT - The Permittee shall retain a current copy of the air permit at the site. The Permittee must make available to personnel of the DAQ, upon request, the current copy of the air permit for the site.

15. CLEAN AIR ACT SECTION 112(r) REQUIREMENTS - Pursuant to 40 CFR Part 68 "Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)," if the Permittee is required to develop and register a risk management plan pursuant to Section 112(r) of the Federal Clean Air Act, then the Permittee is required to register this plan in accordance with 40 CFR Part 68.

16. PREVENTION OF ACCIDENTAL RELEASES - GENERAL DUTY - Pursuant to Title I Part A Section 112(r)(1) of the Clean Air Act "Hazardous Air Pollutants - Prevention of Accidental Releases - Purpose and General Duty," although a risk management plan may not be required, if the Permittee produces, processes, handles, or stores any amount of a listed hazardous substance, the Permittee has a general duty to take such steps as are necessary to prevent the accidental release of such substance and to minimize the consequences of any release. **This condition is federally-enforceable only.**

17. GENERAL EMISSIONS TESTING AND REPORTING REQUIREMENTS - If emissions testing is required by this permit, or the DAQ, or if the Permittee submits emissions testing to the DAQ in support of a permit application or to demonstrate compliance, the Permittee shall perform such testing in accordance with 15A NCAC 2D .2600 and follow all DAQ procedures including protocol approval, regional notification, report submittal, and test results approval.

Permit issued this the 30th of July, 2010.
NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION

_____

Paul K. Muller, P.E.
Regional Air Quality Supervisor
By Authority of the Environmental Management Commission

Air Permit No. 06118R15

ATTACHMENT to Permit No. 06118R15, July 30, 2010

Insignificant / Exempt Activities

Source	Exemption Regulation	Source of TAPs?	Source of Title V Pollutants?
I-1 - one natural gas/No. 2 fuel oil-fired boiler (8.38 million Btu per hour maximum heat in put rate)	2Q .0102 (c)(2)(B)(i)(II)	Yes	Yes
I-2 - one natural gas/No. 2 fuel oil-fired boiler (8.38 million Btu per hour maximum heat input rate)	2Q .0102 (c)(2)(B)(i)(II)	Yes	Yes

1. Because an activity is exempted from being required to have a permit or permit modification does not mean that the activity is exempted from an applicable requirement or that the owner or operator of the source is exempted from demonstrating compliance with any applicable requirement.

2. When applicable, emissions from stationary source activities identified above shall be included in determining compliance with the permit requirements for toxic air pollutants under 15A NCAC 2D .1100 "Control of Toxic Air Pollutants" or 2Q .0711 "Emission Rates Requiring a Permit."

http://oaspub.epa.gov/enviro/fii_query_dtl.disp_program_facility?p_registry_id=110000764897
Last updated on Friday, September 10, 2010

Facility Registry System (FRS)

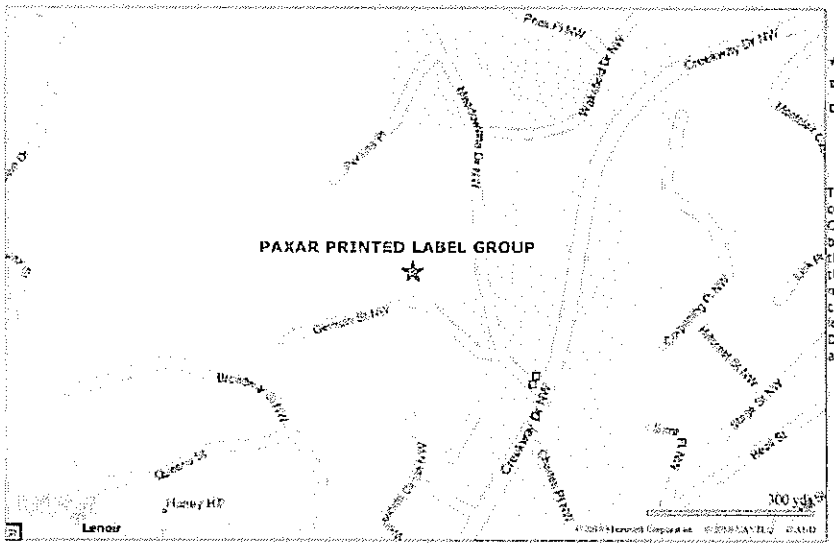
You are here: EPA Home Envirofacts FRS Report

Facility Detail Report

FRS

PAXAR PRINTED LABEL GROUP

950 GERMAN ST.
LENOIR, NC 28645
EPA Registry Id: 110000764897



Legend

- ★ Selected Facility
- ▫ EPA Facility of Interest
- ▫ State/Tribe Facility of Interest

The facility locations displayed come from the FRS Spatial Coordinates tables. They are the best representative locations for the displayed facilities based on the accuracy of the collection method and quality assurance checks performed against each location. The North American Datum of 1983 is used to display all coordinates.

Environmental Interests

Information System	Information System ID	Environmental Interest Type	Data Source	Last Updated Date	Supplemental Environmental Interests:
AIR FACILITY SYSTEM	3702700089	AIR SYNTHETIC MINOR (ACTIVE)	AIRS/AFS	08/04/2010	
EMISSION INVENTORY SYSTEM (EIS)	0488011	CRITERIA AND HAZARDOUS AIR POLLUTANT INVENTORY	EIS		
NORTH CAROLINA - FACILITY IDENTIFICATION TEMPLATE FOR STATES	1368	STATE MASTER	NC-FITS		-154 AIR PROGRAM
NORTH CAROLINA - FACILITY IDENTIFICATION TEMPLATE FOR STATES	7348	STATE MASTER	NC-FITS		-115DA4YG00YX1W64FBEP8BN216 WASTEWATER FACILITY
NATIONAL EMISSIONS INVENTORY	NEI44786	CRITERIA AND HAZARDOUS AIR POLLUTANT INVENTORY	NEI		
PERMIT COMPLIANCE SYSTEM	NCG050114	NPDES NON-MAJOR	NPDES PERMIT	11/10/1992	
RESOURCE CONSERVATION AND RECOVERY ACT INFORMATION SYSTEM	NCD981025406	LQG (ACTIVE)	NOTIFICATION (RCRA)	06/07/2010	
TOXIC RELEASE INVENTORY SYSTEM	28645RSPTC950GE	TRI REPORTER	TRI REPORTING FORM	05/29/2010	ICIS-ENFORCEMENT/COMPLIANCE ACTIVITY

Additional EPA Reports: MyEnvironment Enforcement and Compliance Site Demographics Watershed Report

Standard Industrial Classification Codes (SIC)

Data Source	SIC Code	Description	Primary
TRIS	2269	FINISHERS OF TEXTILES, NOT ELSEWHERE CLASSIFIED	
AIRS/AFS	2396	AUTOMOTIVE TRIMMINGS, APPAREL FINDINGS, AND RELATED PRODUCTS	
PCS	2241	NARROW FABRIC AND OTHER SMALLWARES MILLS: COTTON, WOOL, SILK, AND MANMADE FIBER	
NC-FITS	2396	AUTOMOTIVE TRIMMINGS, APPAREL FINDINGS, AND RELATED PRODUCTS	
TRIS	2241	NARROW FABRIC AND OTHER SMALLWARES MILLS: COTTON, WOOL, SILK, AND MANMADE FIBER	
TRIS	2299	TEXTILE GOODS, NOT ELSEWHERE CLASSIFIED	
NC-FITS	2396	AUTOMOTIVE TRIMMINGS, APPAREL FINDINGS, AND RELATED PRODUCTS	
TRIS	2893	PRINTING INK	
TRIS	2396	AUTOMOTIVE TRIMMINGS, APPAREL FINDINGS, AND RELATED PRODUCTS	
TRIS	2399	FABRICATED TEXTILE PRODUCTS, NOT ELSEWHERE CLASSIFIED	
NEI	2396	AUTOMOTIVE TRIMMINGS, APPAREL FINDINGS, AND RELATED PRODUCTS	
AIRS/AFS	9999	NONCLASSIFIABLE ESTABLISHMENTS	

National Industry Classification System Codes (NAICS)

Data Source	NAICS Code	Description	Primary
TRIS	325910	PRINTING INK MANUFACTURING.	
NC-FITS	323113	COMMERCIAL SCREEN PRINTING.	
NEI	33636	MOTOR VEHICLE SEATING AND INTERIOR TRIM MANUFACTURING	
TRIS	313000		
TRIS	313312	TEXTILE AND FABRIC FINISHING (EXCEPT BROADWOVEN FABRIC) MILLS	
RCRAINFO	315999	OTHER APPAREL ACCESSORIES AND OTHER APPAREL MANUFACTURING.	
NEI	323113	COMMERCIAL SCREEN PRINTING.	
TRIS	313221	NARROW FABRIC MILLS.	
RCRAINFO	313221	NARROW FABRIC MILLS.	
FRS	31331	TEXTILE AND FABRIC FINISHING MILLS	
FRS	313221	NARROW FABRIC MILLS.	
RCRAINFO	32591	PRINTING INK MANUFACTURING	

Facility Mailing Addresses

Affiliation Type	Delivery Point	City Name	State	Postal Code	Information System

Facility Codes and Flags

EPA Region:	04
Duns Number:	556216315
Congressional District Number:	10
Legislative District Number:	
HUC Code/Watershed:	03050101 / UPPER CATAWBA
US Mexico Border Indicator:	NO
Federal Facility:	NO
Tribal Land:	NO

Alternative Names

Alternative Name	Source of Data
PAXAR PRINTED LABEL	TRI REPORTING FORM
AVERY DENNISON IDMD LENOIR	TRI REPORTING FORM
PAXAR CORP PRINTED LABELS	RCRAINFO
PAXAR CORPORATION - PRINTED LABEL GROUP	AIRS/AFS
AVERY DENNISON CORPORATION - LENOIR	AIRS/AFS
PAXAR AMERICAS, INC.	AIRS/AFS
PAXAR - LENOIR DIVISION	NC-FITS
AVERY DENNISON	TRI REPORTING FORM

Organizations

Affiliation Type	Name	DUNS Number	Information System	Mailing Address
OPERATOR	AVERY DENNISON CORP INC		RCRAINFO	
OWNER	AVERY DENNISON CORP INC		RCRAINFO	View
OWNER/OPERATOR		829557516	TRIS	
PARENT ORGANIZATION	AVERY DENNISON CORP	829557516	TRIS	

FACILITY MAILING ADDRESS	950 GERMAN STREET	LENOIR	NC	28645	AIRS/AFS
FACILITY MAILING ADDRESS	950 GERMAN STREET	LENOIR	NC	28645	RCRAINFO
FACILITY MAILING ADDRESS	PO BOX 750	LENOIR	NC	28645	TRIS
AUTHORIZED CONTACT	P O BOX 735	LENOIR	NC	28645	NC-FITS
AUTHORIZED CONTACT	950 GERMAN STREET	LENOIR	NC	28645	NC-FITS
FACILITY CONTACT	P O BOX 735	LENOIR	NC	28645	NC-FITS
REGULATORY CONTACT	950 GERMAN STREET	LENOIR	NC	28645	RCRAINFO
PRIMARY MAILING ADDRESS	PO BOX 735	LENOIR	NC	28645	PCS
PERMIT CONTACT	P O BOX 735	LENOIR	NC	28645	NC-FITS
OWNER	7 BISHOP STREET	FRAMINGHAM	MA	01702	RCRAINFO

Contacts

Affiliation Type	Full Name	Office Phone	Information System	Mailing Address
REGULATORY CONTACT	KELLY HAMEL	8287593435	RCRAINFO	View
PERMIT CONTACT	BEASLEY GENE	(828) 758-2338	NC-FITS	View
PUBLIC CONTACT	GENE BEASLEY	8287582338	TRIS	
COMPLIANCE CONTACT	GENE BEASLEY	8287582338	AIRS/AFS	
AUTHORIZED CONTACT	BURKE D R	(828) 758-2338	NC-FITS	View
COGNIZANT OFFICIAL	BILL OXFORD	7047582338	PCS	
FACILITY CONTACT	BEASLEY GENE	(828) 758-2338	NC-FITS	View
AUTHORIZED CONTACT	BEASLEY GENE	(828) 758-2338	NC-FITS	View

Query executed on: SEP-10-2010

Additional information for CERCLIS or TRI sites:

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- National Library of Medicine (NLM) TOXMAP

Tank Site Closure Report

Lenoir Facility
Lenoir, North Carolina

MSGA PROJECT NUMBER: AD09-01

Prepared for

Avery Dennison Corporation

October 2009

GeoEnvironmental Associates, LLC | MARTIN & SLAGLE

Tank Site Closure Report

Lenoir Facility
Lenoir, North Carolina

Prepared for

Avery Dennison Corporation

Prepared by:

MARTIN&SLAGLE GEOENVIRONMENTAL ASSOCIATES, LLC

118F Cherry Street

Black Mountain, North Carolina 28711

(828) 669-3929

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October 2009

Robert L. Martin, LG, RSM

NORTH CAROLINA LICENSED SEAL 391 GEOLOGIST ROBERT L. MARTIN

TANK SITE CLOSURE REPORT

Avery Dennison Corporation
Lenoir Facility
Lenoir, North Carolina

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1.0 INTRODUCTION

On behalf of the Avery Dennison Corporation, Martin & Slagle GeoEnvironmental Associates, LLC (MSGA) managed the closure of four (4) steel aboveground storage tanks (ASTs) and one (1) concrete underground spill-control tank at Avery Dennison's facility in Lenoir, Caldwell County, North Carolina. (hereafter referred to as the "project site"). The project consisted of the removal and disposal of product remaining in the tanks, removal and disposal of three (3) 1,500-gallon ASTs, one (1) 2,000-gallon AST, one (1) concrete sump (approximately 1000-gallon capacity) used for emergency spill containment, and ancillary equipment including pumps, piping, valves, controls, electrical connections, and fire suppression systems. Following removal of the spill-control tank and the ASTs soil samples were collected and analyzed for volatile organic compounds (VOCs) to determine if a release associated with the tanks had occurred. A composite concrete sample was collected from the slab supporting the ASTs. This sample was analyzed for VOC concentrations, and the results were used to profile the concrete for disposal.

2.0 SITE INFORMATION

The project site is located at 950 German Street in Lenoir, North Carolina. The site is located west of Lenoir at latitude N 35° 55' 11", longitude W 81°33' 24". A project site vicinity map is provided as **Figure 1**.

The project site is located in the Inner Piedmont Belt of the Piedmont Physiographic Province. The site is underlain by migmatitic granitic gneiss, which is foliated to massive, with biotite and amphibolite common. Soil beneath the site results from in-place physical and chemical weathering of the parent bedrock material and consists of micaceous, red to brown, silty fine sand and fine sandy silt. The Project Area shown on **Figure 2** is situated on fill material placed during construction site grading.

The ASTs and spill-control tank were located on the southwest corner of the plant building. The ASTs were supported on a concrete slab with a concrete block spill-containment structure

surrounding two sides. The plant-building walls provided containment on the remaining two sides. The tank farm, approximately 41 feet x 15 feet, had three 1,500-gallon ASTs that separately contained toluene, isopropyl alcohol, and isopropyl acetate, and one 2,000-gallon AST that contained methyl ethyl ketone (MEK). All piping to the AST tank farm was located aboveground. A short run of underground piping, approximately four linear feet, joined the spill-control tank to drains inside the plant building.

3.0 CLOSURE ACTIVITIES

On April 7, 2009, IBS Environmental Services (IBS) of Lenoir, NC, removed and disposed of four ASTs and ancillary equipment, and a concrete spill-containment tank located on the southwest corner of the plant building. The tank locations are shown on **Figure 2**. Removal of the concrete slab supporting the ASTs and the concrete block containment wall surrounding two sides of the tank farm were removed approximately two months later.

Product remaining in the ASTs was removed using a vacuum truck. The removed product was dispensed into 55-gallon drums for use in the plant process. The spill-containment tank contained approximately 100 gallons of water at time of closure. **Table 1** summarizes the amount of product removed from the tanks at the time of closure.

Empty ASTs, and associated piping were loaded onto a flatbed truck and transported to the IBS shop to be cleaned, cut up, crushed and sold for scrap. Liquids used to clean the ASTs were contained, mixed with water from the spill-control tank and disposed of at a regulated facility. Certificates for Tank Disposal are included in the **Appendix A**. The concrete slab supporting the ASTs was removed and disposed of at the municipal landfill following receipt of analytical results.

Approximately 100 gallons of water were removed from the concrete spill-containment tank prior to removal. The 1000-gallon capacity tank was uncovered and disconnected from the discharge line from the plant building, removed from the excavation and loaded onto a flatbed

truck. The empty tank, weighing 13,500 lbs., was transported to, and disposed of, at the Chemical Waste Management, Inc. facility in Emelle, Alabama. The Uniform Hazardous Waste Manifest for disposal of the spill-containment tank is included in **Appendix A**.

Following removal of the tank from the excavation, soils in the sidewalls and excavation base and stockpiled soil were monitored with a photoionization detector (PID). No volatile organic vapors were detected. The field geologist observed no odors or stains.

Water that was removed from the spill-containment tank was combined with the wastewater generated during cleaning of the ASTs. A total of 1,700 gallons of water/wastewater were transported to ECOFLO®, Inc., 2750 Patterson St., Greensboro, NC 27407 for disposal. The Uniform Hazardous Waste Manifest for disposal of the water/wastewater is included in the **Appendix A**.

4.0 SOIL AND CONCRETE SAMPLING

Two soil samples were collected following removal of the spill-containment tank. One soil grab-sample was collected from the base of the tank excavation. The sample was collected from approximately six feet below ground surface (bgs) in the base of the excavation and prior to backfilling of the pit. A second soil sample was collected from the stockpiled soil removed from the excavation during tank removal. The samples were collected using 10-milligram (mg) Terra Core samplers and placed in two sodium bisulfate preserved 40-milliliter (ml) vials and one methanol preserved 40-ml vial with Teflon septum caps. The samples were placed on ice for shipment to a North Carolina certified laboratory, Prism Laboratories, Inc. in Charlotte, NC. Both samples were analyzed for VOCs by EPA Method 8260B.

One concrete sample was obtained from drill-bit cuttings and composited from several locations on the surface of the slab supporting the ASTs. The sample was collected into a 4-ounce jar and placed on ice for shipment to Prism Laboratories. The sample was analyzed for VOC concentrations by EPA Method 8260B.

On June 15, 2009, two soil grab-samples were collected from beneath the AST tank farm after the concrete slab beneath the ASTs was removed and disposed of. The samples were collected from beneath construction joints in the concrete slab. Neither odors nor stained soil were observed. The samples were collected using 10-milligram (mg) Terra Core samplers and placed in two sodium bisulfate preserved 40-ml vials and one methanol preserved 40-ml vial with Teflon septum caps. The samples were placed on ice for shipment to Prism Laboratories. Both samples were analyzed for VOCs by EPA Method 8260B.

5.0 ANALYTICAL RESULTS

5.1 Laboratory Report

The soil sample collected from the spill tank overburden and the composite concrete sample had concentrations of acetone in excess of its method reporting limit (MRL). EPA Method 8260B analysis did not identify VOC concentrations in excess of MRLs in any of the soil samples from the AST tank farm, or the soil sample collected from base of the spill-containment tank excavation. Acetone was detected in sample AD-UT-02 at 0.097 mg/kg. This sample was taken from the overburden removed from the spill-containment tank excavation during tank removal. Sample AD-UT-03, the matching duplicate sample for AD-UT-02 had acetone detected at 0.13 mg/kg. Laboratory reports are provided in **Appendix B**. The concrete sample, AD-CONC, had an acetone concentration estimated at 1.2 mg/kg. Analytical results are summarized in **Table 2**.

5.2 Quality Assurance/Quality Control (QA/QC)

Based on the QA/QC measures taken while handling the samples in the field, MSGA believes the analytical results for the soil and concrete samples are representative of site conditions at the time the samples were collected. Acetone was detected in AD-UT-02 and its matching duplicate sample, AD-UT-03. The acetone detection in concrete sample AD-CONC was an estimated concentration greater than the instrument calibration range. Acetone was not detected in the QC laboratory method blank.

Overall, there were no anomalies reported that suggested laboratory QA/QC measures were not appropriately adhered to.

6.0 CONCLUSIONS

The following conclusions have been made based on field and laboratory data, as reported herein.

Three 1,500-gallon ASTs, one 2,000-gallon AST and associated aboveground piping and valves were emptied of product, disassembled and transported to IBS Environmental Services in Hudson, NC for cleaning and proper disposal. Product removed from the ASTs was placed in 55-gallon drums and used in the plant process.

One 1,000-gallon concrete spill-control tank was excavated and transported to Chemical Waste Management, Inc. in Emelle, AL and properly disposed of. Water removed from the spill-control tank and liquids generated as the result of cleaning the ASTs was transported to the ECOFLO®, Inc. facility in Greensboro, NC and properly disposed of.

Two soil samples collected from beneath the concrete slab supporting the former ASTs contained no detectable concentrations of VOCs. One soil sample collected from the base of the excavation from which the concrete spill-control tank was removed had no detectable concentrations of VOCs. One concrete sample composited from the slab supporting the ASTs, had a low concentration of acetone estimated at 1.2 mg/kg. The soil sample collected from the spill tank overburden had a low concentration of acetone at 0.097 mg/kg, two orders of magnitude below the North Carolina Inactive Hazardous Sites Branch-Protection of Groundwater Soil Remediation Goal of 2.8 mg/kg for acetone.

The tanks and concrete slab were all properly decommissioned, cleaned and disposed of. The water from the spill-control tank and waste liquids resulting from cleaning of the ASTs were

properly disposed of as well. Soils beneath the tanks and concrete slab were not impacted based on analytical results.

7.0 REMARKS

The conclusions contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted hydrogeologic practices and relevant regulatory guidelines at this time and location. Other than this, no warranty is implied or intended.

Table 1

Summary of Tank Contents
Avery Dennison Corporation
Lenoir, North Carolina

Tank Designation	Tank Capacity (gallons)	Contents	Volume* (gallons)
Toluene	1500	Toluene	Empty
MEK	2000	MEK	400
Isopropyl Alcohol	1500	Isopropyl Alcohol	230
Isopropyl Acetate	1500	Isopropyl Acetate	350
Emergency Spill Containment	1000	Water	100

** At time of closure*

TABLE 2

Soil and Concrete Analytical Summary
Tank Site Closure
Avery Dennison Corporation
Lenoir Facility, Lenoir, NC

Sample ID	AD-AST-001	DUPLICATE OF AD-AST-01	AD-AST-002	AD-UT-1	AD-UT-2	AD-CONC	AD-UT-3 DUPLICATE OF AD-UT-02	NC IHSB Protection of Groundwater Soil Remediation Goals	NC IHSB Health-Based Soil Remediation Goals
Sample Date	6/15/2009	6/15/2009	6/15/2009	4/7/2009	4/7/2009	4/7/2009	4/7/2009		
Analyses	EPA Method 8260B	EPA Method 8260B	EPA Method 8260B	EPA Method 8260B	EPA Method 8260B	EPA Method 8260B	EPA Method 8260B		
Compound	Compound Concentrations *mg/kg*	Compound Concentrations *mg/kg*	Compound Concentrations *mg/kg*	Compound Concentrations *mg/kg*	Compound Concentrations *mg/kg*	Compound Concentrations *mg/kg*	Compound Concentrations *mg/kg*	*mg/kg*	*mg/kg*
Toluene	<0.0042[A]	<0.0044	<0.0044	<0.0050	<0.0054	<0.0058	<0.0052	7.27	930
Methy Ethyl Ketone	<0.0084	<0.088	<0.087	<0.10	<0.11	<0.12	<0.10	17.1	5600
Isopropyl Alcohol	ND	ND	ND	ND	ND	0.62	ND	__[B]	__
Isopropyl Acetate	ND	ND	ND	ND	ND	ND	ND	__	__
Acetone	<0.042	<0.044	<0.044	<0.050	0.097	1.2E	0.13	2.8	12000
m,p-xylenes	<0.084	<0.088	<0.087	<0.010	<0.011	<0.012	<0.010	4.96	120

[A]: "<" preceeding the laboratory Method Reporting Limit value indicates the results are less than the MRL.
[B]: "__" indicates that no Remediation Goal established for the reported compound.
E: Estimated concentration greater than the instrument calibration range.

S•T•A•T
INCORPORATED

CERTIFICATE FOR TANK DISPOSAL

TANK LOCATION: 950 GERMAN STREET

TANK SIZE: 2,000 GALLON MATERIAL: STEEL PRODUCT: MEK

TANK OWNER: AVERY DENNISON / PAXAR

ADDRESS: 950 GERMAN STREET

CONTRACTOR: IBS ENVIRONMENTAL SERVICES

ADDRESS: P.O. BOX 1263, LENOIR NC 28645

We, the tank disposal firm, have received the above referenced tank, and hereby assume all responsibility concerning cleaning and disposing of this tank.

In addition, we hereby certify that the tank will be cleaned in accordance with API Publication 2015 and disposed of in accordance with API Publication 1604, thereby rendering the tank unsuitable for future use as a storage tank.

Certified By: Kathy Eckard Date: 4-7-09

STAT, Inc.

S•T•A•T
INCORPORATED

CERTIFICATE FOR TANK DISPOSAL

TANK LOCATION: 950 GERMAN STREET

TANK SIZE: 1500 GALLON MATERIAL: STEEL PRODUCT: TOLUENE

TANK OWNER: AVERY DENNISON / PAXAR

ADDRESS: 950 GERMAN STREET

CONTRACTOR: IBS ENVIRONMENTAL SERVICES

ADDRESS: P.O. BOX 1263, LENOIR - NC 28645

We, the tank disposal firm, have received the above referenced tank, and hereby assume all responsibility concerning cleaning and disposing of this tank.

In addition, we hereby certify that the tank will be cleaned in accordance with API Publication 2015 and disposed of in accordance with API Publication 1604, thereby rendering the tank unsuitable for future use as a storage tank.

Certified By: Kathy Eckard Date: 4-7-09

STAT, Inc.

S•T•A•T
INCORPORATED

CERTIFICATE FOR TANK DISPOSAL

TANK LOCATION: 950 GERMAN STREET

TANK SIZE: 1500 GALLON MATERIAL: STEEL PRODUCT: Isopropy | ALCOHOL

TANK OWNER: AVERY DENNISON / PAXAR

ADDRESS: 950 GERMAN STREET

CONTRACTOR: IBS ENVIRONMENTAL SERVICES

ADDRESS: P.O. BOX 1263, LENOIR - NC 28645

We, the tank disposal firm, have received the above referenced tank, and hereby assume all responsibility concerning cleaning and disposing of this tank.

In addition, we hereby certify that the tank will be cleaned in accordance with API Publication 2015 and disposed of in accordance with API Publication 1604, thereby rendering the tank unsuitable for future use as a storage tank.

Certified By: Kathy Eckard Date: 4-7-09

STAT, Inc.

S•T•A•T
INCORPORATED

CERTIFICATE FOR TANK DISPOSAL

TANK LOCATION: 950 GERMAN STREET

TANK SIZE: 1500 GALLON MATERIAL: STEEL PRODUCT: ISOPROPYL ACETATE

TANK OWNER: AVERY DENNISON / PAXAR

ADDRESS: 950 GERMAN STREET

CONTRACTOR: IBS ENVIRONMENTAL SERVICES

ADDRESS: P.O. BOX 1263, LENOIR NC 28645

We, the tank disposal firm, have received the above referenced tank, and hereby assume all responsibility concerning cleaning and disposing of this tank.

In addition, we hereby certify that the tank will be cleaned in accordance with API Publication 2015 and disposed of in accordance with API Publication 1604, thereby rendering the tank unsuitable for future use as a storage tank.

Certified By: Kathy Eckard Date: 4-7-09

STAT, Inc.

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: N C D 9 8 1 0 2 5 4 0 6
2. Page 1 of: 1
3. Emergency Response Phone: (800)627-1451
4. Manifest Tracking Number: 001886207 FLE

5. Generator's Name and Mailing Address
Avery Dennison
950 German Street
Lenoir NC 28645
Generator's Phone: 828 758-2333

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name: STAT, Inc.
U.S. EPA ID Number: N C D 9 8 0 7 9 9 1 4 2

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
CWM-Emelle
Hwy 17 North Mile Marker 183
Emelle AL 35459
Facility's Phone: 800 852-5755
U.S. EPA ID Number: A L D 0 0 0 6 2 3 4 8 4

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
	RQ, Hazardosu Waste, Solid, N.O.S. (D035), 9, NA3077, PGIII	001	CM	13500 5-11-09 CM		D035
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
Profile Number AL185913
905 373

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Charles B Fausnaf
Signature: Charles B Fausnaf agent FOR
Month 5 Day 7 Year 09

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: C Dan Horton
Signature: C Dan Horton
Month 05 Day 07 Year 09
Transporter 2 Printed/Typed Name
Signature
Month Day Year

18. Discrepancy
18a. Discrepancy Indication Space: ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Added wt. per Doug Hensley 5-11-09 CM
Manifest Reference Number:
18b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:
18c. Signature of Alternate Facility (or Generator)
Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)
1. 2. 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name: Anna Davis
Signature: Anna Davis
Month Day Year 05 08 09

GENERATOR — INT'L — TRANSPORTER — DESIGNATED FACILITY

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)

70

M2G

CYM, INC. - EMELLE ***** Receipt # 455173 ***** Page - 1

Date/Time In 5/08/09 7:01
Load Type Rolloff
Transporter STAT INC
HUDSON NC

Federal EPA ID NCD980759142

Avail
ALL SHIPS

** WEIGHT SUMMARY **
Gross 60549.00
Tare .00
Net .00
Adj. .00
Adj. Net .00

Truck Number 119 Trailer/Contnr 01 EXHU013249 02 #3

Rcpt Doc Ln#	Ln#	Document Number	Profile Sales	Profile Generator Invoicing Customer	Cnt #	Cnt Code	Total Quan.	# DCS # Units	PCB	Sched Cat	Federal EPA Waste Status	ADEM #
1	1	2018862077LE	AL185913	AVERY DENNISON	1	CN	1.00	P Pounds		HAOB PN	Check Restriction	053111-0001

LENOIR NC SUBCC Value - 80
Doc Seq # 1 EME STAT INC P.O. Num
Scheduled Date 05/08/09 Time 08:01 905373-1

CBD Req'd
13500

Federal Waste Codes D035
>51% OR <51% DEBRIS (CIRCLE)
PREFILLED VAULT Y OR N (CIRCLE)
>51% OR <51% HAC 10% INSPECTION (CIRCLE)
BULK MATERIAL ONLY:
SAMPLED/INSPECTED_____ FREE LIQUIDS DETECTED? YES / NO
SELECT MATERIAL/NON-SELECT MATERIAL_____ USED DISPERSAL MATERIAL? YES / NO

PHYSICAL DESCRIPTION OF WASTE:_____ SAMPLER/APPROVAL_____

SPOT SAMPLE:_____ DOG-_____ PHYS. DESCRIPTION_____
RAD.SCREEN POS NEG
ION.SCREEN POS NEG
H2O SOL. S F PT/SOL
H2O RXN/TEMP. NO RXN REACTS_____
ph (PAPER)_____
CN_SCREEN__+__-__SULFIDE SCREEN__+__-__
ADDITIONAL ANALYTICAL REQ'D? Y N
DESCRIBE:
PCB CONC.(PPM)_____ SULFIDE (9030)_____
HNO3 BY HF_____ CYANIDE (9010)_____ TAB WASTE Y N
PAINT FILTER TEST/ P F SPEC. GRAVITY_____ BRZ CONC.____PPM
COMMENTS:(SAFETY/OPERATIONAL)_____

COMPAT. TEST W/_____ OK___RXN__

ADD'L SPOT SAMPLE ATTACHED? Y N
DISPOSAL METHOD: S SP ST-3 ST-3/PT P-ST-3 P-ST-3/PT ST-5 ST-5/PT P-ST-5 S01-PTA B-PIN OTHER_____
P-ST-5/PT ST-8 ST-8/PT HIC HAC (HAC INSPECT) F INC SP-VS PCB-HAC P-HAC
P-ST-8 P-ST-8/PT VS-3 VS-5 VS-8
INDICATOR PARAMETER WILL BE CIRCLED
B-HAC LOADS REQUIRING INSPECTION THAT ARE FOUND TO BE LESS THAN 51% MUST
BE RETURNED TO LAB AND PLACED ON HOLD._____
RELEASED FOR DISPOSAL BY:_____ DATE:_____

ase print or type. (Form designed for use on elite (12-pitch) typewriter.) Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: [illegible]
2. Page 1 of: 1
3. Emergency Response Phone: [illegible]
4. Manifest Tracking Number: 001835200 FLE

5. Generator's Name and Mailing Address: [illegible]
Generator's Site Address (if different than mailing address):
Generator's Phone: [illegible]

6. Transporter 1 Company Name: [illegible] — U.S. EPA ID Number: [illegible]

7. Transporter 2 Company Name: — U.S. EPA ID Number:

8. Designated Facility Name and Site Address: [illegible] — U.S. EPA ID Number: [illegible]
Facility's Phone: [illegible]

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
X	1. [illegible] Liquid, N.O.S., [illegible] UN1993, PGII	[illegible]	TT	1700	C	F003	[illegible]	[illegible]
	2.							
	3.							
	4.							

14. Special Handling Instructions and Additional Information: [illegible]

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: [illegible] — Signature: [illegible] — Month [illegible] Day [illegible] Year [illegible]

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: [illegible] — Signature: [illegible] — Month [illegible] Day [illegible] Year [illegible]
Transporter 2 Printed/Typed Name: — Signature: — Month Day Year

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number:
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems):
1. H141 2. 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name: [illegible] — Signature: — Month [illegible] Day [illegible] Year [illegible]

GENERATOR — INT'L — TRANSPORTER — DESIGNATED FACILITY

ATTENTION SHIPPERS! FREIGHT CHARGES ARE PREPAID ON THIS BILL OF LADING UNLESS MARKED COLLECT.

This Memorandum is an acknowledgment that a Bill of Lading has been issued and is not Original Bill of Lading, nor a copy or duplicate, covering the property named herein, and is intended solely for filing of record.

Shipper No. H 79

Carrier No.

Page 1 of 1 STAT INC (Name of carrier) (SCAC)

Date 4/7/09

In Collect on Delivery shipments, the letters "COD" must appear before consignee's name or as otherwise provided in Item 450, Sec.1.

TO:
Consignee STAT INC
Street 3002 Ft Lane
City Hudson State NC Zip Code 28638

FROM:
Shipper Avery Dawson
Street Cochran St
City Lenoir State NC Zip Code 28645
24 hr. Emergency Contact Tel. No. 1-800-627-1851 (Company)

Route

Vehicle Number

No. of Units & Container Type	HM	BASIC DESCRIPTION Proper Shipping Name, Hazard Class UN or NA Number, Packing Group or UN or NA Number, Proper Shipping Name, Hazard Class, Packing Group	TOTAL QUANTITY (Weight, Volume, Gallons, etc.)	WEIGHT (Subject to Correction)	RATE	CHARGES (For Carrier Use Only)
77		ADS Flammable liquid, 3, UN1993, PG2	1400	gals		

PLACARDS TENDERED: YES NO

Note — (1) Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property, as follows: "The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding _____ per _____."
(2) Where the applicable tariff provisions specify a limitation of the carrier's liability, a release or a value declaration by the shipper and the shipper does not indicate the carrier's liability or declare a value, the carrier's liability shall be limited to the extent provided by such provisions. See NMFC Item 172.
(3) Commodities requiring special or additional care or attention in handling or stowing must be so marked and packaged as to ensure safe transportation. See Section 2(e) of Item 360, Bills of Lading, Freight Bills and Statements of Charges and Section 1(a) of the Contract Terms and Conditions for a list of such articles.

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packed, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Signature

REMIT C.O.D. TO: ADDRESS

COD Amt: $

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of Consignor)

C.O.D. FEE: PREPAID COLLECT $

TOTAL CHARGES $

FREIGHT CHARGES
FREIGHT PREPAID except when box at right is checked ☐ Check box if charges are to be collect

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment.
Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

SHIPPER Avery Dawson
PER AC David Mayard Agent for
DATE 4-7-09

CARRIER STAT
PER Gary Lantz
DATE 4-7-09

4

Permanent post-office address of shipper.

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SEP. 1. 2009 10:06AM ABS ENVIRONMENT SERVICES NO. 334

PRISM LABORATORIES, INC.

Case Narrative

Date:	04/10/09	**Client Project ID:**	Avery Dennison
Company:	Martin & Slagle	**Prism COC Group No:**	G0409207
Contact:	Robert Martin	**Collection Date(s):**	04/07/09
Address:	PO Box 1023 Black Mountain, NC 28711	**Lab Submittal Date(s):**	04/08/09

This data package contains the analytical results for the project identified above and includes a Case Narrative, Laboratory Report and Quality Control Data totaling 19 pages. A chain-of-custody is also attached for the samples submitted to Prism for this project.

Data qualifiers are flagged individually on each sample. A key reference for the data qualifiers appears at the end of this case narrative. Quality control statements and/or sample specific remarks are included in the sample comments section of the laboratory report for each sample affected.

Semi Volatile Analysis

N/A

Volatile Analysis

No Anomalies Reported

Metals Analysis

N/A

Wet Lab and Micro Analysis

N/A

Please call if you have any questions relating to this analytical report.

Data Reviewed by:	Steven H. Guptill	**Project Manager:**	Angela D. Overcash
Signature:		**Signature:**	
Review Date:	04/10/09	**Approval Date:**	04/10/09

Data Qualifiers Key Reference:

B: Compound also detected in the method blank.
#: Result outside of the QC limits.
DO: Compound diluted out.
E: Estimated concentration, calibration range exceeded.
J: The analyte was positively identified but the value is estimated below the reporting limit.
H: Estimated concentration with a high bias.
L: Estimated concentration with a low bias.
M: A matrix effect is present.

Notes: This report should not be reproduced, except in its entirety, without the writtten consent of Prism Laboratories, Inc. The results in this report relate only to the samples submitted for analysis.

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Phone: 704/529-6364 Toll Free: 800/529-6364 Fax: 704/529-0409

Full Service Analytical & Environmental Solutions

NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-1
Prism Sample ID 242714
COC Group: G0409207
Time Collected: 04/07/09 13:05
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Percent Solids Determination									
Percent Solids	79.9	%			1	SM2540 G	04/08/09 14:30	dsullivan	
Sample Weight Determination									
Weight Bisulfate 1	6.50	g			1	5035	04/08/09 0:00	lbrown	
Weight Bisulfate 2	6.20	g			1	5035	04/08/09 0:00	lbrown	
Weight Methanol	5.42	g			1	5035	04/08/09 0:00	lbrown	
Volatile Organic Compounds by GC/MS									
1,1,1-Trichloroethane	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
1,1,2,2-Tetrachloroethane	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,1,2-Trichloroethane	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,1-Dichloroethane	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
1,1-Dichloroethene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
1,1-Dichloropropene	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
1,2,3-Trichlorobenzene	BRL	mg/kg	0.0050	0.0017	1	8260B	04/08/09 14:45	atintle	Q40514
1,2,3-Trichloropropane	BRL	mg/kg	0.0050	0.0021	1	8260B	04/08/09 14:45	atintle	Q40514
1,2,4-Trichlorobenzene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,2,4-Trimethylbenzene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
1,2-Dibromoethane (EDB)	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,2-Dichlorobenzene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,2-Dichloroethane	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
1,2-Dichloropropane	BRL	mg/kg	0.0050	0.0015	1	8260B	04/08/09 14:45	atintle	Q40514
1,3,5-Trimethylbenzene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
1,3-Dichlorobenzene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
1,3-Dichloropropane	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
1,4-Dichlorobenzene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
2,2-Dichloropropane	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
2-Chlorotoluene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-1
Prism Sample ID 242714
COC Group: G0409207
Time Collected: 04/07/09 13:05
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
2-Hexanone	BRL	mg/kg	0.050	0.0015	1	8260B	04/08/09 14:45	atintle	Q40514
4-Chlorotoluene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
4-Methyl-2-pentanone (MIBK)	BRL	mg/kg	0.050	0.0011	1	8260B	04/08/09 14:45	atintle	Q40514
Acetone	BRL	mg/kg	0.050	0.0022	1	8260B	04/08/09 14:45	atintle	Q40514
Benzene	BRL	mg/kg	0.0030	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Bromobenzene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
Bromochloromethane	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Bromodichloromethane	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
Bromoform	BRL	mg/kg	0.0050	0.0011	1	8260B	04/08/09 14:45	atintle	Q40514
Bromomethane	BRL	mg/kg	0.010	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Carbon tetrachloride	BRL	mg/kg	0.0050	0.0015	1	8260B	04/08/09 14:45	atintle	Q40514
Chlorobenzene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
Chlorodibromomethane	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Chloroethane	BRL	mg/kg	0.010	0.0026	1	8260B	04/08/09 14:45	atintle	Q40514
Chloroform	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Chloromethane	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
cis-1,2-Dichloroethene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
cis-1,3-Dichloropropene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
Dichlorodifluoromethane	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
Ethylbenzene	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
Isopropyl ether (IPE)	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Isopropylbenzene	BRL	mg/kg	0.0050	0.0011	1	8260B	04/08/09 14:45	atintle	Q40514
m,p-Xylenes	BRL	mg/kg	0.010	0.0027	1	8260B	04/08/09 14:45	atintle	Q40514
Methyl ethyl ketone (MEK)	BRL	mg/kg	0.10	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Methyl t-butyl ether (MTBE)	BRL	mg/kg	0.010	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
Methylene chloride	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
n-Butylbenzene	BRL	mg/kg	0.0050	0.0018	1	8260B	04/08/09 14:45	atintle	Q40514

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NC Certification No. 402
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Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-1
Prism Sample ID 242714
COC Group: G0409207
Time Collected: 04/07/09 13:05
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
n-Propylbenzene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Naphthalene	BRL	mg/kg	0.010	0.0027	1	8260B	04/08/09 14:45	atintle	Q40514
o-Xylene	BRL	mg/kg	0.0050	0.0011	1	8260B	04/08/09 14:45	atintle	Q40514
p-Isopropyltoluene	BRL	mg/kg	0.0050	0.0015	1	8260B	04/08/09 14:45	atintle	Q40514
sec-Butylbenzene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Styrene	BRL	mg/kg	0.0050	0.00098	1	8260B	04/08/09 14:45	atintle	Q40514
tert-Butylbenzene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Tetrachloroethene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Toluene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
trans-1,2-Dichloroethene	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
trans-1,3-Dichloropropene	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
Trichloroethene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Trichlorofluoromethane	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Vinyl acetate	BRL	mg/kg	0.025	0.0034	1	8260B	04/08/09 14:45	atintle	Q40514
Vinyl chloride	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514

Surrogate	% Recovery	Control Limits
Toluene-d8	101	81 - 128
Dibromofluoromethane	97	67 - 143
Bromofluorobenzene	106	77 - 128

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-1
Prism Sample ID 242714
COC Group: G0409207
Time Collected: 04/07/09 13:05
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID

Sample Comment(s):

BRL = Below Reporting Limit
J = Estimated value between the Reporting Limit and the MDL
The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.
All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-CONC
Prism Sample ID 242715
COC Group: G0409207
Time Collected: 04/07/09 16:00
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Percent Solids Determination									
Percent Solids	96.7	%			1	SM2540 G	04/08/09 14:30	dsullivan	
Volatile Organic Compounds by GC/MS									
1,1,1-Trichloroethane	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
1,1,2,2-Tetrachloroethane	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,1,2-Trichloroethane	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,1-Dichloroethane	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
1,1-Dichloroethene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
1,1-Dichloropropene	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
1,2,3-Trichlorobenzene	BRL	mg/kg	0.0058	0.0019	1	8260B	04/09/09 13:50	atintle	Q40514
1,2,3-Trichloropropane	BRL	mg/kg	0.0058	0.0024	1	8260B	04/09/09 13:50	atintle	Q40514
1,2,4-Trichlorobenzene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,2,4-Trimethylbenzene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
1,2-Dibromoethane (EDB)	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,2-Dichlorobenzene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,2-Dichloroethane	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
1,2-Dichloropropane	BRL	mg/kg	0.0058	0.0017	1	8260B	04/09/09 13:50	atintle	Q40514
1,3,5-Trimethylbenzene	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
1,3-Dichlorobenzene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
1,3-Dichloropropane	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
1,4-Dichlorobenzene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
2,2-Dichloropropane	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
2-Chlorotoluene	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
2-Hexanone	BRL	mg/kg	0.058	0.0017	1	8260B	04/09/09 13:50	atintle	Q40514
4-Chlorotoluene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
4-Methyl-2-pentanone (MIBK)	BRL	mg/kg	0.058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
Acetone	1.2 E	mg/kg	0.058	0.0025	1	8260B	04/09/09 13:50	atintle	Q40514

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NC Drinking Water Cert. No. 37735

Full Service Analytical & Environmental Solutions

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-CONC
Prism Sample ID 242715
COC Group: G0409207
Time Collected: 04/07/09 16:00
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Benzene	BRL	mg/kg	0.0035	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Bromobenzene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
Bromochloromethane	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Bromodichloromethane	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
Bromoform	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
Bromomethane	BRL	mg/kg	0.012	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Carbon tetrachloride	BRL	mg/kg	0.0058	0.0017	1	8260B	04/09/09 13:50	atintle	Q40514
Chlorobenzene	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
Chlorodibromomethane	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Chloroethane	BRL	mg/kg	0.012	0.0030	1	8260B	04/09/09 13:50	atintle	Q40514
Chloroform	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Chloromethane	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
cis-1,2-Dichloroethene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
cis-1,3-Dichloropropene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
Dichlorodifluoromethane	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
Ethylbenzene	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
Isopropyl ether (IPE)	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
Isopropylbenzene	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
m,p-Xylenes	BRL	mg/kg	0.012	0.0031	1	8260B	04/09/09 13:50	atintle	Q40514
Methyl ethyl ketone (MEK)	BRL	mg/kg	0.12	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Methyl t-butyl ether (MTBE)	BRL	mg/kg	0.012	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
Methylene chloride	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
n-Butylbenzene	BRL	mg/kg	0.0058	0.0021	1	8260B	04/09/09 13:50	atintle	Q40514
n-Propylbenzene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Naphthalene	BRL	mg/kg	0.012	0.0031	1	8260B	04/09/09 13:50	atintle	Q40514
o-Xylene	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
p-Isopropyltoluene	BRL	mg/kg	0.0058	0.0017	1	8260B	04/09/09 13:50	atintle	Q40514

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-CONC
Prism Sample ID 242715
COC Group: G0409207
Time Collected: 04/07/09 16:00
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
sec-Butylbenzene	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Styrene	BRL	mg/kg	0.0058	0.0011	1	8260B	04/09/09 13:50	atintle	Q40514
tert-Butylbenzene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Tetrachloroethene	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Toluene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
trans-1,2-Dichloroethene	BRL	mg/kg	0.0058	0.0011	1	8260B	04/09/09 13:50	atintle	Q40514
trans-1,3-Dichloropropene	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
Trichloroethene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Trichlorofluoromethane	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Vinyl acetate	BRL	mg/kg	0.029	0.0039	1	8260B	04/09/09 13:50	atintle	Q40514
Vinyl chloride	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514

Surrogate recovery was outside of the control limits. Matrix interference is suspected. E - Estimated concentration greater than the instrument calibration range.

Surrogate	% Recovery	Control Limits
Toluene-d8	99	81 - 128
Dibromofluoromethane	38 #	67 - 143
Bromofluorobenzene	101	77 - 128

Sample Comment(s):

BRL = Below Reporting Limit

J = Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-2
Prism Sample ID 242716
COC Group: G0409207
Time Collected: 04/07/09 16:30
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Percent Solids Determination									
Percent Solids	82.9	%			1	SM2540 G	04/08/09 14:30	dsullivan	
Sample Weight Determination									
Weight Bisulfate 1	5.97	g			1	5035	04/08/09 0:00	lbrown	
Weight Bisulfate 2	5.63	g			1	5035	04/08/09 0:00	lbrown	
Weight Methanol	6.14	g			1	5035	04/08/09 0:00	lbrown	
Volatile Organic Compounds by GC/MS									
1,1,1-Trichloroethane	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
1,1,2,2-Tetrachloroethane	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
1,1,2-Trichloroethane	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
1,1-Dichloroethane	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,1-Dichloroethene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
1,1-Dichloropropene	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
1,2,3-Trichlorobenzene	BRL	mg/kg	0.0054	0.0018	1	8260B	04/08/09 16:12	atintle	Q40514
1,2,3-Trichloropropane	BRL	mg/kg	0.0054	0.0022	1	8260B	04/08/09 16:12	atintle	Q40514
1,2,4-Trichlorobenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,2,4-Trimethylbenzene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
1,2-Dibromoethane (EDB)	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
1,2-Dichlorobenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,2-Dichloroethane	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,2-Dichloropropane	BRL	mg/kg	0.0054	0.0016	1	8260B	04/08/09 16:12	atintle	Q40514
1,3,5-Trimethylbenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,3-Dichlorobenzene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
1,3-Dichloropropane	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
1,4-Dichlorobenzene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
2,2-Dichloropropane	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
2-Chlorotoluene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514

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NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-2
Prism Sample ID 242716
COC Group: G0409207
Time Collected: 04/07/09 16:30
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
2-Hexanone	BRL	mg/kg	0.054	0.0016	1	8260B	04/08/09 16:12	atintle	Q40514
4-Chlorotoluene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
4-Methyl-2-pentanone (MIBK)	BRL	mg/kg	0.054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
Acetone	0.097	mg/kg	0.054	0.0023	1	8260B	04/08/09 16:12	atintle	Q40514
Benzene	BRL	mg/kg	0.0032	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Bromobenzene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Bromochloromethane	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
Bromodichloromethane	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
Bromoform	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
Bromomethane	BRL	mg/kg	0.011	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Carbon tetrachloride	BRL	mg/kg	0.0054	0.0016	1	8260B	04/08/09 16:12	atintle	Q40514
Chlorobenzene	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
Chlorodibromomethane	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Chloroethane	BRL	mg/kg	0.011	0.0028	1	8260B	04/08/09 16:12	atintle	Q40514
Chloroform	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Chloromethane	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
cis-1,2-Dichloroethene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
cis-1,3-Dichloropropene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Dichlorodifluoromethane	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
Ethylbenzene	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
Isopropyl ether (IPE)	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Isopropylbenzene	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
m,p-Xylenes	BRL	mg/kg	0.011	0.0028	1	8260B	04/08/09 16:12	atintle	Q40514
Methyl ethyl ketone (MEK)	BRL	mg/kg	0.11	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Methyl t-butyl ether (MTBE)	BRL	mg/kg	0.011	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
Methylene chloride	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
n-Butylbenzene	BRL	mg/kg	0.0054	0.0020	1	8260B	04/08/09 16:12	atintle	Q40514

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Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-2
Prism Sample ID 242716
COC Group: G0409207
Time Collected: 04/07/09 16:30
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
n-Propylbenzene	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
Naphthalene	BRL	mg/kg	0.011	0.0029	1	8260B	04/08/09 16:12	atintle	Q40514
o-Xylene	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
p-Isopropyltoluene	BRL	mg/kg	0.0054	0.0016	1	8260B	04/08/09 16:12	atintle	Q40514
sec-Butylbenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Styrene	BRL	mg/kg	0.0054	0.0010	1	8260B	04/08/09 16:12	atintle	Q40514
tert-Butylbenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Tetrachloroethene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Toluene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
trans-1,2-Dichloroethene	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
trans-1,3-Dichloropropene	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
Trichloroethene	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
Trichlorofluoromethane	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
Vinyl acetate	BRL	mg/kg	0.027	0.0037	1	8260B	04/08/09 16:12	atintle	Q40514
Vinyl chloride	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514

Surrogate	% Recovery	Control Limits
Toluene-d8	103	81 - 128
Dibromofluoromethane	98	67 - 143
Bromofluorobenzene	95	77 - 128

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Full Service Analytical & Environmental Solutions

NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-2
Prism Sample ID 242716
COC Group: G0409207
Time Collected: 04/07/09 16:30
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID

Sample Comment(s):

BRL = Below Reporting Limit
J = Estimated value between the Reporting Limit and the MDL
The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.
All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-3
Prism Sample ID 242717
COC Group: G0409207
Time Collected: 04/07/09
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Percent Solids Determination									
Percent Solids	80.1	%			1	SM2540 G	04/08/09 14:30	dsullivan	
Sample Weight Determination									
Weight Bisulfate 1	6.25	g			1	5035	04/08/09 0:00	lbrown	
Weight Bisulfate 2	5.95	g			1	5035	04/08/09 0:00	lbrown	
Weight Methanol	5.78	g			1	5035	04/08/09 0:00	lbrown	
Volatile Organic Compounds by GC/MS									
1,1,1-Trichloroethane	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
1,1,2,2-Tetrachloroethane	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
1,1,2-Trichloroethane	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
1,1-Dichloroethane	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,1-Dichloroethene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
1,1-Dichloropropene	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
1,2,3-Trichlorobenzene	BRL	mg/kg	0.0052	0.0017	1	8260B	04/08/09 16:56	atintle	Q40514
1,2,3-Trichloropropane	BRL	mg/kg	0.0052	0.0022	1	8260B	04/08/09 16:56	atintle	Q40514
1,2,4-Trichlorobenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,2,4-Trimethylbenzene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
1,2-Dibromoethane (EDB)	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
1,2-Dichlorobenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,2-Dichloroethane	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,2-Dichloropropane	BRL	mg/kg	0.0052	0.0016	1	8260B	04/08/09 16:56	atintle	Q40514
1,3,5-Trimethylbenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,3-Dichlorobenzene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
1,3-Dichloropropane	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
1,4-Dichlorobenzene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
2,2-Dichloropropane	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
2-Chlorotoluene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-3
Prism Sample ID 242717
COC Group: G0409207
Time Collected: 04/07/09
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
2-Hexanone	BRL	mg/kg	0.052	0.0016	1	8260B	04/08/09 16:56	atintle	Q40514
4-Chlorotoluene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
4-Methyl-2-pentanone (MIBK)	BRL	mg/kg	0.052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Acetone	0.13	mg/kg	0.052	0.0023	1	8260B	04/08/09 16:56	atintle	Q40514
Benzene	BRL	mg/kg	0.0031	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Bromobenzene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Bromochloromethane	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Bromodichloromethane	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
Bromoform	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Bromomethane	BRL	mg/kg	0.010	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Carbon tetrachloride	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
Chlorobenzene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
Chlorodibromomethane	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Chloroethane	BRL	mg/kg	0.010	0.0027	1	8260B	04/08/09 16:56	atintle	Q40514
Chloroform	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Chloromethane	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
cis-1,2-Dichloroethene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
cis-1,3-Dichloropropene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
Dichlorodifluoromethane	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Ethylbenzene	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Isopropyl ether (IPE)	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Isopropylbenzene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
m,p-Xylenes	BRL	mg/kg	0.010	0.0028	1	8260B	04/08/09 16:56	atintle	Q40514
Methyl ethyl ketone (MEK)	BRL	mg/kg	0.10	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Methyl t-butyl ether (MTBE)	BRL	mg/kg	0.010	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Methylene chloride	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
n-Butylbenzene	BRL	mg/kg	0.0052	0.0019	1	8260B	04/08/09 16:56	atintle	Q40514

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Full Service Analytical & Environmental Solutions

NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Stagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-3
Prism Sample ID 242717
COC Group: G0409207
Time Collected: 04/07/09
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
n-Propylbenzene	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
Naphthalene	BRL	mg/kg	0.010	0.0028	1	8260B	04/08/09 16:56	atintle	Q40514
o-Xylene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
p-Isopropyltoluene	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
sec-Butylbenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Styrene	BRL	mg/kg	0.0052	0.0010	1	8260B	04/08/09 16:56	atintle	Q40514
tert-Butylbenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Tetrachloroethene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Toluene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
trans-1,2-Dichloroethene	BRL	mg/kg	0.0052	0.0010	1	8260B	04/08/09 16:56	atintle	Q40514
trans-1,3-Dichloropropene	BRL	mg/kg	0.0052	0.0010	1	8260B	04/08/09 16:56	atintle	Q40514
Trichloroethene	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
Trichlorofluoromethane	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
Vinyl acetate	BRL	mg/kg	0.026	0.0036	1	8260B	04/08/09 16:56	atintle	Q40514
Vinyl chloride	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514

Surrogate	% Recovery	Control Limits
Toluene-d8	99	81 - 128
Dibromofluoromethane	94	67 - 143
Bromofluorobenzene	102	77 - 128

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NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-3
Prism Sample ID 242717
COC Group: G0409207
Time Collected: 04/07/09
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID

Sample Comment(s):

BRL = Below Reporting Limit

J = Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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NC Drinking Water Cert. No. 37735

Level II QC Report

04/10/09

Martin & Slagle
Attn: Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison

COC Group Number: G0409207
Date/Time Submitted: 04/08/09 9:15

Volatile Organic Compounds by GC/MS, method 8260B

Method Blank	Result	RL	Control Limit	Units	QC Batch ID
1,1,1-Trichloroethane	ND	0.005	<0.0025	mg/kg	Q40514
1,1,2,2-Tetrachloroethane	ND	0.005	<0.0025	mg/kg	Q40514
1,1,2-Trichloroethane	ND	0.005	<0.0025	mg/kg	Q40514
1,1-Dichloroethane	ND	0.005	<0.0025	mg/kg	Q40514
1,1-Dichloroethene	ND	0.005	<0.0025	mg/kg	Q40514
1,1-Dichloropropene	ND	0.005	<0.0025	mg/kg	Q40514
1,2,3-Trichlorobenzene	ND	0.005	<0.0025	mg/kg	Q40514
1,2,3-Trichloropropane	ND	0.005	<0.0025	mg/kg	Q40514
1,2,4-Trichlorobenzene	ND	0.005	<0.0025	mg/kg	Q40514
1,2,4-Trimethylbenzene	ND	0.005	<0.0025	mg/kg	Q40514
1,2-Dibromoethane (EDB)	ND	0.005	<0.0025	mg/kg	Q40514
1,2-Dichlorobenzene	ND	0.005	<0.0025	mg/kg	Q40514
1,2-Dichloroethane	ND	0.005	<0.0025	mg/kg	Q40514
1,2-Dichloropropane	ND	0.005	<0.0025	mg/kg	Q40514
1,3,5-Trimethylbenzene	ND	0.005	<0.0025	mg/kg	Q40514
1,3-Dichlorobenzene	ND	0.005	<0.0025	mg/kg	Q40514
1,3-Dichloropropane	ND	0.005	<0.0025	mg/kg	Q40514
1,4-Dichlorobenzene	ND	0.005	<0.0025	mg/kg	Q40514
2,2-Dichloropropane	ND	0.005	<0.0025	mg/kg	Q40514
2-Chlorotoluene	ND	0.005	<0.0025	mg/kg	Q40514
2-Hexanone	ND	0.05	<0.025	mg/kg	Q40514
4-Chlorotoluene	ND	0.005	<0.0025	mg/kg	Q40514
4-Methyl-2-pentanone (MIBK)	ND	0.05	<0.025	mg/kg	Q40514
Acetone	ND	0.05	<0.025	mg/kg	Q40514
Benzene	ND	0.003	<0.0015	mg/kg	Q40514
Bromobenzene	ND	0.005	<0.0025	mg/kg	Q40514
Bromochloromethane	ND	0.005	<0.0025	mg/kg	Q40514
Bromodichloromethane	ND	0.005	<0.0025	mg/kg	Q40514
Bromoform	ND	0.005	<0.0025	mg/kg	Q40514
Bromomethane	ND	0.01	<0.005	mg/kg	Q40514
Carbon tetrachloride	ND	0.005	<0.0025	mg/kg	Q40514
Chlorobenzene	ND	0.005	<0.0025	mg/kg	Q40514
Chlorodibromomethane	ND	0.005	<0.0025	mg/kg	Q40514
Chloroethane	ND	0.01	<0.005	mg/kg	Q40514

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Level II QC Report

04/10/09

Martin & Slagle
Attn: Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison

COC Group Number: G0409207
Date/Time Submitted: 04/08/09 9:15

Method Blank

	Result	RL	Control Limit	Units	QC Batch ID
Chloroform	ND	0.005	<0.0025	mg/kg	Q40514
Chloromethane	ND	0.005	<0.0025	mg/kg	Q40514
cis-1,2-Dichloroethene	ND	0.005	<0.0025	mg/kg	Q40514
cis-1,3-Dichloropropene	ND	0.005	<0.0025	mg/kg	Q40514
Dichlorodifluoromethane	ND	0.005	<0.0025	mg/kg	Q40514
Ethylbenzene	ND	0.005	<0.0025	mg/kg	Q40514
Isopropyl ether (IPE)	ND	0.005	<0.0025	mg/kg	Q40514
Isopropylbenzene	ND	0.005	<0.0025	mg/kg	Q40514
m,p-Xylenes	ND	0.01	<0.005	mg/kg	Q40514
Methyl ethyl ketone (MEK)	ND	0.1	<0.05	mg/kg	Q40514
Methyl t-butyl ether (MTBE)	ND	0.01	<0.005	mg/kg	Q40514
Methylene chloride	ND	0.005	<0.0025	mg/kg	Q40514
n-Butylbenzene	ND	0.005	<0.0025	mg/kg	Q40514
n-Propylbenzene	ND	0.005	<0.0025	mg/kg	Q40514
Naphthalene	ND	0.01	<0.005	mg/kg	Q40514
o-Xylene	ND	0.005	<0.0025	mg/kg	Q40514
p-Isopropyltoluene	ND	0.005	<0.0025	mg/kg	Q40514
sec-Butylbenzene	ND	0.005	<0.0025	mg/kg	Q40514
Styrene	ND	0.005	<0.0025	mg/kg	Q40514
tert-Butylbenzene	ND	0.005	<0.0025	mg/kg	Q40514
Tetrachloroethene	ND	0.005	<0.0025	mg/kg	Q40514
Toluene	ND	0.005	<0.0025	mg/kg	Q40514
trans-1,2-Dichloroethene	ND	0.005	<0.0025	mg/kg	Q40514
trans-1,3-Dichloropropene	ND	0.005	<0.0025	mg/kg	Q40514
Trichloroethene	ND	0.005	<0.0025	mg/kg	Q40514
Trichlorofluoromethane	ND	0.005	<0.0025	mg/kg	Q40514
Vinyl acetate	ND	0.025	<0.0125	mg/kg	Q40514
Vinyl chloride	ND	0.005	<0.0025	mg/kg	Q40514

Laboratory Control Sample

	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	QC Batch ID
1,1-Dichloroethene	0.04295	0.05	mg/kg	86	57-122	Q40514
Benzene	0.03995	0.05	mg/kg	80	62-119	Q40514
Chlorobenzene	0.03785	0.05	mg/kg	76	61-124	Q40514
Toluene	0.03904	0.05	mg/kg	78	57-122	Q40514
Trichloroethene	0.04064	0.05	mg/kg	81	59-129	Q40514

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Level II QC Report

04/10/09

Martin & Slagle
Attn: Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison

COC Group Number: G0409207
Date/Time Submitted: 04/08/09 9:15

Matrix Spike Sample ID:	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	QC Batch ID
241886 1,1-Dichloroethene	0.06781	0.05	mg/kg	136	44-140	Q40514
Benzene	0.05635	0.05	mg/kg	113	46-136	Q40514
Chlorobenzene	0.05067	0.05	mg/kg	101	47-135	Q40514
Toluene	0.05472	0.05	mg/kg	109	47-136	Q40514
Trichloroethene	0.05419	0.05	mg/kg	108	45-141	Q40514

Matrix Spike Duplicate Sample ID:	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	RPD %	RPD Range %	QC Batch ID
241886 1,1-Dichloroethene	0.06964	0.05	mg/kg	139	44-140	3	0 - 23	Q40514
Benzene	0.0563	0.05	mg/kg	113	46-136	0	0 - 22	Q40514
Chlorobenzene	0.04933	0.05	mg/kg	99	47-135	3	0 - 22	Q40514
Toluene	0.0534	0.05	mg/kg	107	47-136	2	0 - 22	Q40514
Trichloroethene	0.05425	0.05	mg/kg	109	45-141	0	0 - 23	Q40514

#-See Case Narrative

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PRISM LABORATORIES, INC.

Full Service Analytical & Environmental Solutions

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CHAIN OF CUSTODY RECORD

PAGE ___ OF ___ QUOTE # TO ENSURE PROPER BILLING: ___

Project Name: Avery Dennison

Short Hold Analysis: (Yes) (No) UST Project: (Yes) (No)

*Please ATTACH any project specific reporting (QC LEVEL I II III IV) provisions and/or QC Requirements

Invoice To: Martin and Slagle

Address: PO BOX 1023 Black Mountain NC

Purchase Order No./Billing Reference ___

Requested Due Date ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days ☐ 5 Days

"Working Days" ☐ 6-9 Days ☐ Standard 10 days ☐ Rush Work Must Be Pre-Approved

Samples received after 15:00 will be processed next business day.

Turnaround time is based on business days, excluding weekends and holidays.

(SEE REVERSE FOR TERMS & CONDITIONS REGARDING SERVICES RENDERED BY PRISM LABORATORIES, INC. TO CLIENT)

LAB USE ONLY

Client Company Name: Martin & Slagle

Report To/Contact Name: Robert Martin

Reporting Address: P.O. BOX 1023 Black Mountain, NC 28711

Phone: ___ Fax (Yes) (No): ___

Email (Yes) (No) Email Address ___

EDD Type: PDF___ Excel___ Other___

Site Location Name: Avery Dennison - Lenoir

Site Location Physical Address: 950 German St Lenoir, NC

TO BE FILLED IN BY CLIENT/SAMPLING PERSONNEL

Certification: NELAC___ USACE___ FL___ NC___ SC___ OTHER___ N/A___

Water Chlorinated: YES___ NO___

Sample Iced Upon Collection: YES___ NO___

CLIENT SAMPLE DESCRIPTION	DATE COLLECTED	TIME COLLECTED MILITARY HOURS	MATRIX (SOIL, WATER OR SLUDGE)	SAMPLE CONTAINER *TYPE SEE BELOW	NO.	SIZE	PRESERVATIVES	ANALYSES REQUESTED 8260B						REMARKS	PRISM LAB ID NO.
AD-UT-1	4-7-09	1305	Soil	C	4	4oz/40ml	—	—						48hr TAT	242714
AD-Conc.	4-7-09	1600	Concrete		1	4oz	—	—						↓	242715
AD-UT-2	↓	1630	Soil		4			—							242716
AD UT-3	↓		Soil		4			—							242717

PRESS DOWN FIRMLY - 3 COPIES

Sampler's Signature Peter M Fahey Sampled By (Print Name) Peter Fahey Affiliation M&S

Upon relinquishing, this Chain of Custody is your authorization for Prism to proceed with the analyses as requested above. Any changes must be submitted in writing to the Prism Project Manager. There will be charges for any changes after analyses have been initialized.

Relinquished By: (Signature)	Received By: (Signature)	Date	Military/Hours
Peter M Fahey			
Relinquished By: (Signature)	Received By: (Signature)	Date	
Relinquished By: (Signature)	Received For Prism Laboratories By:	Date 4/8/09	0915

Method of Shipment: NOTE: ALL SAMPLE COOLERS SHOULD BE TAPED SHUT WITH CUSTODY SEALS FOR TRANSPORTATION TO THE LABORATORY. SAMPLES ARE NOT ACCEPTED AND VERIFIED AGAINST COC UNTIL RECEIVED AT THE LABORATORY.

COC Group No. G0409207

☐ Fed Ex ☐ UPS ☐ Hand-delivered ☐ Prism Field Service ☐ Other ___

Additional Comments:

PRISM USE ONLY

SEE REVERSE FOR TERMS & CONDITIONS

NPDES:	UST:	GROUNDWATER:	DRINKING WATER:	SOLID WASTE:	RCRA:	CERCLA	LANDFILL	OTHER:
☐ NC ☐ SC	☐ NC ☐ SC	☐ NC ☐ SC	☐ NC ☐ SC	☐ NC ☐ SC	☐ NC ☐ SC	☐ NC ☐ SC	☐ NC ☐ SC	☐ NC ☐ SC
☐ ___	☐ ___	☐ ___	☐ ___	☐ ___	☐ ___	☐ ___	☐ ___	☐ ___

*CONTAINER TYPE CODES: A = Amber C = Clear G = Glass P = Plastic; TL = Teflon-Lined Cap VOA = Volatile Organics Analysis (Zero Head Space)

ORIGINAL

Full Service Analytical & Environmental Solutions

NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-1
Prism Sample ID 242714
COC Group: G0409207
Time Collected: 04/07/09 13:05
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Percent Solids Determination									
Percent Solids	79.9	%			1	SM2540 G	04/08/09 14:30	dsullivan	
Sample Weight Determination									
Weight Bisulfate 1	6.50	g			1	5035	04/08/09 0:00	lbrown	
Weight Bisulfate 2	6.20	g			1	5035	04/08/09 0:00	lbrown	
Weight Methanol	5.42	g			1	5035	04/08/09 0:00	lbrown	
Volatile Organic Compounds by GC/MS									
1,1,1-Trichloroethane	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
1,1,2,2-Tetrachloroethane	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,1,2-Trichloroethane	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,1-Dichloroethane	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
1,1-Dichloroethene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
1,1-Dichloropropene	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
1,2,3-Trichlorobenzene	BRL	mg/kg	0.0050	0.0017	1	8260B	04/08/09 14:45	atintle	Q40514
1,2,3-Trichloropropane	BRL	mg/kg	0.0050	0.0021	1	8260B	04/08/09 14:45	atintle	Q40514
1,2,4-Trichlorobenzene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,2,4-Trimethylbenzene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
1,2-Dibromoethane (EDB)	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,2-Dichlorobenzene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
1,2-Dichloroethane	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
1,2-Dichloropropane	BRL	mg/kg	0.0050	0.0015	1	8260B	04/08/09 14:45	atintle	Q40514
1,3,5-Trimethylbenzene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
1,3-Dichlorobenzene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
1,3-Dichloropropane	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
1,4-Dichlorobenzene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
2,2-Dichloropropane	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
2-Chlorotoluene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-1
Prism Sample ID 242714
COC Group: G0409207
Time Collected: 04/07/09 13:05
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
2-Hexanone	BRL	mg/kg	0.050	0.0015	1	8260B	04/08/09 14:45	atintle	Q40514
4-Chlorotoluene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
4-Methyl-2-pentanone (MIBK)	BRL	mg/kg	0.050	0.0011	1	8260B	04/08/09 14:45	atintle	Q40514
Acetone	BRL	mg/kg	0.050	0.0022	1	8260B	04/08/09 14:45	atintle	Q40514
Benzene	BRL	mg/kg	0.0030	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Bromobenzene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
Bromochloromethane	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Bromodichloromethane	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
Bromoform	BRL	mg/kg	0.0050	0.0011	1	8260B	04/08/09 14:45	atintle	Q40514
Bromomethane	BRL	mg/kg	0.010	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Carbon tetrachloride	BRL	mg/kg	0.0050	0.0015	1	8260B	04/08/09 14:45	atintle	Q40514
Chlorobenzene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
Chlorodibromomethane	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Chloroethane	BRL	mg/kg	0.010	0.0026	1	8260B	04/08/09 14:45	atintle	Q40514
Chloroform	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Chloromethane	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
cis-1,2-Dichloroethene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
cis-1,3-Dichloropropene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
Dichlorodifluoromethane	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
Ethylbenzene	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
Isopropyl ether (IPE)	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Isopropylbenzene	BRL	mg/kg	0.0050	0.0011	1	8260B	04/08/09 14:45	atintle	Q40514
m,p-Xylenes	BRL	mg/kg	0.010	0.0027	1	8260B	04/08/09 14:45	atintle	Q40514
Methyl ethyl ketone (MEK)	BRL	mg/kg	0.10	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Methyl t-butyl ether (MTBE)	BRL	mg/kg	0.010	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
Methylene chloride	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
n-Butylbenzene	BRL	mg/kg	0.0050	0.0018	1	8260B	04/08/09 14:45	atintle	Q40514

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-1
Prism Sample ID 242714
COC Group: G0409207
Time Collected: 04/07/09 13:05
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
n-Propylbenzene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Naphthalene	BRL	mg/kg	0.010	0.0027	1	8260B	04/08/09 14:45	atintle	Q40514
o-Xylene	BRL	mg/kg	0.0050	0.0011	1	8260B	04/08/09 14:45	atintle	Q40514
p-Isopropyltoluene	BRL	mg/kg	0.0050	0.0015	1	8260B	04/08/09 14:45	atintle	Q40514
sec-Butylbenzene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Styrene	BRL	mg/kg	0.0050	0.00098	1	8260B	04/08/09 14:45	atintle	Q40514
tert-Butylbenzene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Tetrachloroethene	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514
Toluene	BRL	mg/kg	0.0050	0.0012	1	8260B	04/08/09 14:45	atintle	Q40514
trans-1,2-Dichloroethene	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
trans-1,3-Dichloropropene	BRL	mg/kg	0.0050	0.0010	1	8260B	04/08/09 14:45	atintle	Q40514
Trichloroethene	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Trichlorofluoromethane	BRL	mg/kg	0.0050	0.0014	1	8260B	04/08/09 14:45	atintle	Q40514
Vinyl acetate	BRL	mg/kg	0.025	0.0034	1	8260B	04/08/09 14:45	atintle	Q40514
Vinyl chloride	BRL	mg/kg	0.0050	0.0013	1	8260B	04/08/09 14:45	atintle	Q40514

Surrogate	% Recovery	Control Limits
Toluene-d8	101	81 - 128
Dibromofluoromethane	97	67 - 143
Bromofluorobenzene	106	77 - 128

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Full Service Analytical & Environmental Solutions

NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-1
Prism Sample ID 242714
COC Group: G0409207
Time Collected: 04/07/09 13:05
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID

Sample Comment(s):

BRL = Below Reporting Limit

J = Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-CONC
Prism Sample ID 242715
COC Group: G0409207
Time Collected: 04/07/09 16:00
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Percent Solids Determination									
Percent Solids	96.7	%			1	SM2540 G	04/08/09 14:30	dsullivan	
Volatile Organic Compounds by GC/MS									
1,1,1-Trichloroethane	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
1,1,2,2-Tetrachloroethane	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,1,2-Trichloroethane	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,1-Dichloroethane	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
1,1-Dichloroethene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
1,1-Dichloropropene	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
1,2,3-Trichlorobenzene	BRL	mg/kg	0.0058	0.0019	1	8260B	04/09/09 13:50	atintle	Q40514
1,2,3-Trichloropropane	BRL	mg/kg	0.0058	0.0024	1	8260B	04/09/09 13:50	atintle	Q40514
1,2,4-Trichlorobenzene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,2,4-Trimethylbenzene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
1,2-Dibromoethane (EDB)	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,2-Dichlorobenzene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
1,2-Dichloroethane	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
1,2-Dichloropropane	BRL	mg/kg	0.0058	0.0017	1	8260B	04/09/09 13:50	atintle	Q40514
1,3,5-Trimethylbenzene	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
1,3-Dichlorobenzene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
1,3-Dichloropropane	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
1,4-Dichlorobenzene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
2,2-Dichloropropane	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
2-Chlorotoluene	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
2-Hexanone	BRL	mg/kg	0.058	0.0017	1	8260B	04/09/09 13:50	atintle	Q40514
4-Chlorotoluene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
4-Methyl-2-pentanone (MIBK)	BRL	mg/kg	0.058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
Acetone	1.2 E	mg/kg	0.058	0.0025	1	8260B	04/09/09 13:50	atintle	Q40514

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Full Service Analytical & Environmental Solutions

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-CONC
Prism Sample ID 242715
COC Group: G0409207
Time Collected: 04/07/09 16:00
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Benzene	BRL	mg/kg	0.0035	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Bromobenzene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
Bromochloromethane	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Bromodichloromethane	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
Bromoform	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
Bromomethane	BRL	mg/kg	0.012	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Carbon tetrachloride	BRL	mg/kg	0.0058	0.0017	1	8260B	04/09/09 13:50	atintle	Q40514
Chlorobenzene	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
Chlorodibromomethane	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Chloroethane	BRL	mg/kg	0.012	0.0030	1	8260B	04/09/09 13:50	atintle	Q40514
Chloroform	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Chloromethane	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
cis-1,2-Dichloroethene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
cis-1,3-Dichloropropene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
Dichlorodifluoromethane	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
Ethylbenzene	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
Isopropyl ether (IPE)	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
Isopropylbenzene	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
m,p-Xylenes	BRL	mg/kg	0.012	0.0031	1	8260B	04/09/09 13:50	atintle	Q40514
Methyl ethyl ketone (MEK)	BRL	mg/kg	0.12	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Methyl t-butyl ether (MTBE)	BRL	mg/kg	0.012	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
Methylene chloride	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
n-Butylbenzene	BRL	mg/kg	0.0058	0.0021	1	8260B	04/09/09 13:50	atintle	Q40514
n-Propylbenzene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Naphthalene	BRL	mg/kg	0.012	0.0031	1	8260B	04/09/09 13:50	atintle	Q40514
o-Xylene	BRL	mg/kg	0.0058	0.0013	1	8260B	04/09/09 13:50	atintle	Q40514
p-Isopropyltoluene	BRL	mg/kg	0.0058	0.0017	1	8260B	04/09/09 13:50	atintle	Q40514

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Full Service Analytical & Environmental Solutions

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-CONC
Prism Sample ID 242715
COC Group: G0409207
Time Collected: 04/07/09 16:00
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
sec-Butylbenzene	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Styrene	BRL	mg/kg	0.0058	0.0011	1	8260B	04/09/09 13:50	atintle	Q40514
tert-Butylbenzene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Tetrachloroethene	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514
Toluene	BRL	mg/kg	0.0058	0.0014	1	8260B	04/09/09 13:50	atintle	Q40514
trans-1,2-Dichloroethene	BRL	mg/kg	0.0058	0.0011	1	8260B	04/09/09 13:50	atintle	Q40514
trans-1,3-Dichloropropene	BRL	mg/kg	0.0058	0.0012	1	8260B	04/09/09 13:50	atintle	Q40514
Trichloroethene	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Trichlorofluoromethane	BRL	mg/kg	0.0058	0.0016	1	8260B	04/09/09 13:50	atintle	Q40514
Vinyl acetate	BRL	mg/kg	0.029	0.0039	1	8260B	04/09/09 13:50	atintle	Q40514
Vinyl chloride	BRL	mg/kg	0.0058	0.0015	1	8260B	04/09/09 13:50	atintle	Q40514

Surrogate recovery was outside of the control limits. Matrix interference is suspected. E - Estimated concentration greater than the instrument calibration range.

Surrogate	% Recovery	Control Limits
Toluene-d8	99	81 - 128
Dibromofluoromethane	38 #	67 - 143
Bromofluorobenzene	101	77 - 128

Sample Comment(s):

BRL = Below Reporting Limit

J = Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-2
Prism Sample ID 242716
COC Group: G0409207
Time Collected: 04/07/09 16:30
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Percent Solids Determination									
Percent Solids	82.9	%			1	SM2540 G	04/08/09 14:30	dsullivan	
Sample Weight Determination									
Weight Bisulfate 1	5.97	g			1	5035	04/08/09 0:00	lbrown	
Weight Bisulfate 2	5.63	g			1	5035	04/08/09 0:00	lbrown	
Weight Methanol	6.14	g			1	5035	04/08/09 0:00	lbrown	
Volatile Organic Compounds by GC/MS									
1,1,1-Trichloroethane	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
1,1,2,2-Tetrachloroethane	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
1,1,2-Trichloroethane	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
1,1-Dichloroethane	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,1-Dichloroethene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
1,1-Dichloropropene	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
1,2,3-Trichlorobenzene	BRL	mg/kg	0.0054	0.0018	1	8260B	04/08/09 16:12	atintle	Q40514
1,2,3-Trichloropropane	BRL	mg/kg	0.0054	0.0022	1	8260B	04/08/09 16:12	atintle	Q40514
1,2,4-Trichlorobenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,2,4-Trimethylbenzene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
1,2-Dibromoethane (EDB)	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
1,2-Dichlorobenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,2-Dichloroethane	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,2-Dichloropropane	BRL	mg/kg	0.0054	0.0016	1	8260B	04/08/09 16:12	atintle	Q40514
1,3,5-Trimethylbenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
1,3-Dichlorobenzene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
1,3-Dichloropropane	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
1,4-Dichlorobenzene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
2,2-Dichloropropane	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
2-Chlorotoluene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-2
Prism Sample ID 242716
COC Group: G0409207
Time Collected: 04/07/09 16:30
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
2-Hexanone	BRL	mg/kg	0.054	0.0016	1	8260B	04/08/09 16:12	atintle	Q40514
4-Chlorotoluene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
4-Methyl-2-pentanone (MIBK)	BRL	mg/kg	0.054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
Acetone	0.097	mg/kg	0.054	0.0023	1	8260B	04/08/09 16:12	atintle	Q40514
Benzene	BRL	mg/kg	0.0032	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Bromobenzene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Bromochloromethane	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
Bromodichloromethane	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
Bromoform	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
Bromomethane	BRL	mg/kg	0.011	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Carbon tetrachloride	BRL	mg/kg	0.0054	0.0016	1	8260B	04/08/09 16:12	atintle	Q40514
Chlorobenzene	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
Chlorodibromomethane	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Chloroethane	BRL	mg/kg	0.011	0.0028	1	8260B	04/08/09 16:12	atintle	Q40514
Chloroform	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Chloromethane	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
cis-1,2-Dichloroethene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
cis-1,3-Dichloropropene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Dichlorodifluoromethane	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
Ethylbenzene	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
Isopropyl ether (IPE)	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
Isopropylbenzene	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
m,p-Xylenes	BRL	mg/kg	0.011	0.0028	1	8260B	04/08/09 16:12	atintle	Q40514
Methyl ethyl ketone (MEK)	BRL	mg/kg	0.11	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Methyl t-butyl ether (MTBE)	BRL	mg/kg	0.011	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
Methylene chloride	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
n-Butylbenzene	BRL	mg/kg	0.0054	0.0020	1	8260B	04/08/09 16:12	atintle	Q40514

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NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-2
Prism Sample ID 242716
COC Group: G0409207
Time Collected: 04/07/09 16:30
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
n-Propylbenzene	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
Naphthalene	BRL	mg/kg	0.011	0.0029	1	8260B	04/08/09 16:12	atintle	Q40514
o-Xylene	BRL	mg/kg	0.0054	0.0012	1	8260B	04/08/09 16:12	atintle	Q40514
p-Isopropyltoluene	BRL	mg/kg	0.0054	0.0016	1	8260B	04/08/09 16:12	atintle	Q40514
sec-Butylbenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Styrene	BRL	mg/kg	0.0054	0.0010	1	8260B	04/08/09 16:12	atintle	Q40514
tert-Butylbenzene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Tetrachloroethene	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514
Toluene	BRL	mg/kg	0.0054	0.0013	1	8260B	04/08/09 16:12	atintle	Q40514
trans-1,2-Dichloroethene	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
trans-1,3-Dichloropropene	BRL	mg/kg	0.0054	0.0011	1	8260B	04/08/09 16:12	atintle	Q40514
Trichloroethene	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
Trichlorofluoromethane	BRL	mg/kg	0.0054	0.0015	1	8260B	04/08/09 16:12	atintle	Q40514
Vinyl acetate	BRL	mg/kg	0.027	0.0037	1	8260B	04/08/09 16:12	atintle	Q40514
Vinyl chloride	BRL	mg/kg	0.0054	0.0014	1	8260B	04/08/09 16:12	atintle	Q40514

Surrogate	% Recovery	Control Limits
Toluene-d8	103	81 - 128
Dibromofluoromethane	98	67 - 143
Bromofluorobenzene	95	77 - 128

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NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-2
Prism Sample ID 242716
COC Group: G0409207
Time Collected: 04/07/09 16:30
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID

Sample Comment(s):

BRL = Below Reporting Limit

J = Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-3
Prism Sample ID 242717
COC Group: G0409207
Time Collected: 04/07/09
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
Percent Solids Determination									
Percent Solids	80.1	%			1	SM2540 G	04/08/09 14:30	dsullivan	
Sample Weight Determination									
Weight Bisulfate 1	6.25	g			1	5035	04/08/09 0:00	lbrown	
Weight Bisulfate 2	5.95	g			1	5035	04/08/09 0:00	lbrown	
Weight Methanol	5.78	g			1	5035	04/08/09 0:00	lbrown	
Volatile Organic Compounds by GC/MS									
1,1,1-Trichloroethane	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
1,1,2,2-Tetrachloroethane	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
1,1,2-Trichloroethane	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
1,1-Dichloroethane	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,1-Dichloroethene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
1,1-Dichloropropene	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
1,2,3-Trichlorobenzene	BRL	mg/kg	0.0052	0.0017	1	8260B	04/08/09 16:56	atintle	Q40514
1,2,3-Trichloropropane	BRL	mg/kg	0.0052	0.0022	1	8260B	04/08/09 16:56	atintle	Q40514
1,2,4-Trichlorobenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,2,4-Trimethylbenzene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
1,2-Dibromoethane (EDB)	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
1,2-Dichlorobenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,2-Dichloroethane	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,2-Dichloropropane	BRL	mg/kg	0.0052	0.0016	1	8260B	04/08/09 16:56	atintle	Q40514
1,3,5-Trimethylbenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
1,3-Dichlorobenzene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
1,3-Dichloropropane	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
1,4-Dichlorobenzene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
2,2-Dichloropropane	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
2-Chlorotoluene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514

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Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-3
Prism Sample ID 242717
COC Group: G0409207
Time Collected: 04/07/09
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
2-Hexanone	BRL	mg/kg	0.052	0.0016	1	8260B	04/08/09 16:56	atintle	Q40514
4-Chlorotoluene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
4-Methyl-2-pentanone (MIBK)	BRL	mg/kg	0.052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Acetone	0.13	mg/kg	0.052	0.0023	1	8260B	04/08/09 16:56	atintle	Q40514
Benzene	BRL	mg/kg	0.0031	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Bromobenzene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Bromochloromethane	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Bromodichloromethane	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
Bromoform	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Bromomethane	BRL	mg/kg	0.010	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Carbon tetrachloride	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
Chlorobenzene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
Chlorodibromomethane	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Chloroethane	BRL	mg/kg	0.010	0.0027	1	8260B	04/08/09 16:56	atintle	Q40514
Chloroform	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Chloromethane	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
cis-1,2-Dichloroethene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
cis-1,3-Dichloropropene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
Dichlorodifluoromethane	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Ethylbenzene	BRL	mg/kg	0.0052	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Isopropyl ether (IPE)	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Isopropylbenzene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
m,p-Xylenes	BRL	mg/kg	0.010	0.0028	1	8260B	04/08/09 16:56	atintle	Q40514
Methyl ethyl ketone (MEK)	BRL	mg/kg	0.10	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
Methyl t-butyl ether (MTBE)	BRL	mg/kg	0.010	0.0011	1	8260B	04/08/09 16:56	atintle	Q40514
Methylene chloride	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
n-Butylbenzene	BRL	mg/kg	0.0052	0.0019	1	8260B	04/08/09 16:56	atintle	Q40514

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Full Service Analytical & Environmental Solutions

NC Certification No. 402
SC Certification No. 99012
NC Drinking Water Cert. No. 37735

Laboratory Report

04/10/09

Martin & Slagle
Attn Robert Martin
PO Box 1023
Black Mountain, NC 28711

Project ID: Avery Dennison
Sample Matrix: Soil

Client Sample ID AD-UT-3
Prism Sample ID 242717
COC Group: G0409207
Time Collected: 04/07/09
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
n-Propylbenzene	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
Naphthalene	BRL	mg/kg	0.010	0.0028	1	8260B	04/08/09 16:56	atintle	Q40514
o-Xylene	BRL	mg/kg	0.0052	0.0012	1	8260B	04/08/09 16:56	atintle	Q40514
p-Isopropyltoluene	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
sec-Butylbenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Styrene	BRL	mg/kg	0.0052	0.0010	1	8260B	04/08/09 16:56	atintle	Q40514
tert-Butylbenzene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Tetrachloroethene	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514
Toluene	BRL	mg/kg	0.0052	0.0013	1	8260B	04/08/09 16:56	atintle	Q40514
trans-1,2-Dichloroethene	BRL	mg/kg	0.0052	0.0010	1	8260B	04/08/09 16:56	atintle	Q40514
trans-1,3-Dichloropropene	BRL	mg/kg	0.0052	0.0010	1	8260B	04/08/09 16:56	atintle	Q40514
Trichloroethene	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
Trichlorofluoromethane	BRL	mg/kg	0.0052	0.0015	1	8260B	04/08/09 16:56	atintle	Q40514
Vinyl acetate	BRL	mg/kg	0.026	0.0036	1	8260B	04/08/09 16:56	atintle	Q40514
Vinyl chloride	BRL	mg/kg	0.0052	0.0014	1	8260B	04/08/09 16:56	atintle	Q40514

Surrogate	% Recovery	Control Limits
Toluene-d8	99	81 - 128
Dibromofluoromethane	94	67 - 143
Bromofluorobenzene	102	77 - 128

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Prism Sample ID 242717
COC Group: G0409207
Time Collected: 04/07/09
Time Submitted: 04/08/09 9:15

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID

Sample Comment(s):

BRL = Below Reporting Limit

J = Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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Angela D. Overcash, V.P. Laboratory Services

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CHAIN OF CUSTODY RECORD

PAGE ___ OF ___ QUOTE # TO ENSURE PROPER BILLING: ___

LAB USE ONLY

Client Company Name: Martin & Slagle
Report To/Contact Name: Robert Martin
Reporting Address: P.O. Box 1023
Black Mountain, NC 28711
Phone: ___ Fax (Yes) (No): ___
Email (Yes) (No) Email Address ___
EDD Type: PDF___ Excel___ Other___
Site Location Name: Avery Dennison – Lenoir
Site Location Physical Address: 950 German St
Lenoir, NC

Project Name: Avery Dennison
Short Hold Analysis: (Yes) (No) UST Project: (Yes) (No)
*Please ATTACH any project specific reporting (QC LEVEL I II III IV) provisions and/or QC Requirements
Invoice To: Martin and Slagle
Address: PO Box 1023
Black Mountain NC
Purchase Order No./Billing Reference ___
Requested Due Date ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days ☐ 5 Days
"Working Days" ☐ 6-9 Days ☐ Standard 10 days ☐ Rush Work Must Be Pre-Approved
Samples received after 15:00 will be processed next business day.
Turnaround time is based on business days, excluding weekends and holidays.
(SEE REVERSE FOR TERMS & CONDITIONS REGARDING SERVICES RENDERED BY PRISM LABORATORIES, INC. TO CLIENT)

TO BE FILLED IN BY CLIENT/SAMPLING PERSONNEL
Certification: NELAC___ USACE___ FL___ NC___ SC___ OTHER___ N/A___
Water Chlorinated: YES___ NO___
Sample Iced Upon Collection: YES___ NO___

CLIENT SAMPLE DESCRIPTION	DATE COLLECTED	TIME COLLECTED MILITARY HOURS	MATRIX (SOIL, WATER OR SLUDGE)	SAMPLE CONTAINER *TYPE SEE BELOW	NO.	SIZE	PRESERVATIVES	8260B						REMARKS	PRISM LAB ID NO.
AD-UT-1	4-7-09	1305	Soil	C	4	40z/40ml	—	—						48hr TAT	242714
AD-Conc.	4-7-09	1600	Concrete		1	40z	—	—						↓	242715
AD-UT-2	↓	1630	Soil		4			—							242716
AD UT-3			Soil		4			—							242717

PRESS DOWN FIRMLY - 3 COPIES

Sampler's Signature: Peter M Fahey
Sampled By (Print Name): Peter Fahey
Affiliation: M & S

Upon relinquishing, this Chain of Custody is your authorization for Prism to proceed with the analyses as requested above. Any changes must be submitted in writing to the Prism Project Manager. There will be charges for any changes after analyses have been initialized.

		Date	Military/Hours
Relinquished By: (Signature) Peter M Fahey	Received By: (Signature)		
Relinquished By: (Signature)	Received By: (Signature)		
Relinquished By: (Signature)	Received For Prism Laboratories By:	4/8/09	0915

Method of Shipment: NOTE: ALL SAMPLE COOLERS SHOULD BE TAPED SHUT WITH CUSTODY SEALS FOR TRANSPORTATION TO THE LABORATORY. SAMPLES ARE NOT ACCEPTED AND VERIFIED AGAINST COC UNTIL RECEIVED AT THE LABORATORY.

COC Group No. G0409207

☐ Fed Ex ☑ UPS ☐ Hand-delivered ☐ Prism Field Service ☐ Other___

Additional Comments:

PRISM USE ONLY

SEE REVERSE FOR TERMS & CONDITIONS

NPDES:	UST:	GROUNDWATER:	DRINKING WATER:	SOLID WASTE:	RCRA:	CERCLA	LANDFILL	OTHER:
☐ NC ☐ SC ☐ ___	☐ NC ☐ SC ☐ ___	☐ NC ☐ SC ☐ ___	☐ NC ☐ SC ☐ ___	☐ NC ☐ SC ☐ ___	☐ NC ☐ SC ☐ ___	☐ NC ☐ SC ☐ ___	☐ NC ☐ SC ☐ ___	☐ NC ☐ SC ☐ ___

*CONTAINER TYPE CODES: A = Amber C = Clear G = Glass P = Plastic; TL = Teflon-Lined Cap VOA = Volatile Organics Analysis (Zero Head Space)

ORIGINAL

APPENDIX C

Groundwater VOC Analyte List

List of Groundwater VOC Analytes by GC/MS
SW-846 USEPA Method 8260B

Volatile Organic Compounds (VOC)	
1,1,1,2-Tetrachloroethane	Chloroethane
1,1,1-Trichloroethane	Chloroform
1,1,2,2-Tetrachloroethane	Chloromethane
1,1,2-Trichloroethane	cis-1,2-Dichloroethylene
1,1-Dichloroethane	cis-1,3-Dichloropropylene
1,1-Dichloroethylene	Dibromochloromethane
1,1-Dichloropropylene	Dibromomethane
1,2,3-Trichlorobenzene	Dichlorodifluoromethane
1,2,3-Trichloropropane	Ethylbenzene
1,2,4-Trichlorobenzene	Hexachlorobutadiene
1,2,4-Trimethylbenzene	Isopropyl Ether
1,2-Dibromo-3-chloropropane	Isopropylbenzene (Cumene)
1,2-Dibromoethane	m,p-Xylenes
1,2-Dichlorobenzene	Methyl Butyl Ketone (2-Hexanone)
1,2-Dichloroethane	Methyl Ethyl Ketone (2-Butanone)
1,2-Dichloropropane	Methyl Iodide
1,3,5-Trimethylbenzene	Methyl Isobutyl Ketone
1,3-Dichlorobenzene	Methylene Chloride
1,3-Dichloropropane	Methyl-tert-Butyl Ether
1,4-Dichlorobenzene	Naphthalene
2,2-Dichloropropane	n-Butylbenzene
2-Chlorotoluene	n-Propylbenzene
4-Chlorotoluene	o-Xylene
4-Isopropyltoluene	sec-Butylbenzene
Acetone	Styrene
Benzene	tert-Butylbenzene
Bromobenzene	Tetrachloroethylene
Bromochloromethane	Toluene
Bromodichloromethane	trans-1,2-Dichloroethylene
Bromoform	trans-1,3-Dichloropropylene
Bromomethane	trans-1,4-Dichloro-2-butene
Carbon disulfide	Trichloroethylene
Carbon Tetrachloride	Trichlorofluoromethane
Chlorobenzene	Vinyl chloride

APPENDIX D

Standard Operating Procedures and Field Forms

USEPA Region 4 Science and Ecosystem Support Division (SESD)

Field Branches Quality System and Technical Procedures

Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Packing, Marking, Labeling and Shipping of Environmental and Waste Samples**

Effective Date: April 20, 2011	**Number:** SESDPROC-209-R2

Authors

Name: Art Masters
Title: Environmental Scientist, Regional Expert
Signature: Date: 4/14/11

Approvals

Name: Archie Lee
Title: Chief, Enforcement and Investigations Branch
Signature: Date: 4/14/11

Name: Bill Cosgrove
Title: Chief, Ecological Assessment Branch
Signature: Date: 4/14/11

Name: Liza Montalvo
Title: Field Quality Manager, Science and Ecosystem Support Division
Signature: Date: 4/14/11

Revision History

This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by the SESD Document Control Coordinator.

History	Effective Date
SESDPROC-209-R2, *Packing, Marking, Labeling and Shipping of Environmental and Waste Samples*, replaces SESDPROC-209-R1. **Title Page:** Changed EIB Branch Chief from Antonio Quinones to Archie Lee. Changed Field Quality Manager from Laura Ackerman to Liza Montalvo. **Revision History:** Previous versions of the document will be maintained by the Document Control Coordinator (DCC). Changed from Field Quality Manager to DCC. **Section 1.2:** Added the following statement: Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use. **Section 1.3:** Changed requirement so that the DCC is responsible for ensuring the most recent version of the procedure is placed on the SESD LAN and for maintaining records of review conducted prior to its issuance. Deleted reference to the H: drive. **Section 3, fifth paragraph**: On item #2 on the list, replaced "be sure" with "ensure that." On item #3, deleted the last sentence that stated that only "Up to three VOA vials may be packed in one Whirl-Pak container or bag." Deleted outdated item #4 referencing shipment of VOA vials in metal cans. On items #5 and #6, removed references to vermiculite in favor of generic "absorbent material."	April 20, 2011
SESDPROC-209-R1, *Packing, Marking, Labeling and Shipping of Environmental and Waste Samples*, replaces SESDPROC-209-R0. **General** Corrected any typographical, grammatical and/or editorial errors. **Title Page** Changed title for Antonio Quinones from Environmental Investigations Branch to Enforcement and Investigations Branch. Changed Bill Cosgrove's title from Acting Chief to Chief.	November 1, 2007

Section 1.3 Updated information to reflect that the procedure is located on the H: drive of the LAN. Clarified Field Quality Manager (FQM) responsibilities. **Section 1.4** Alphabetized and revised the referencing style for consistency. Added reference to the SHEMP Procedures and Policy Manual. **Section 1.5.1** Corrected the title of the Safety, Health, and Environmental Management Program Procedures and Policy Manual.	
SESDPROC-209-R0, Packing, Marking, Labeling and Shipping of Environmental and Waste Samples, Original Issue	February 05, 2007

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1 General Information

1.1 Purpose

Regulations for packing, marking, labeling, and shipping of dangerous goods by air transport are promulgated by Department of Transportation under 49 CFR, Subchapter C, Hazardous Materials Regulations, and the International Air Transport Authority (IATA), which is equivalent to United Nations International Civil Aviation Organization (UN/ICAO). Transportation of hazardous materials (dangerous goods) by EPA personnel is covered by EPA Order 1000. This document describes general and specific procedures, methods and considerations to be used and observed by SESD field investigators when packing, marking, labeling and shipping environmental and waste samples to ensure that all shipments are in compliance with the above regulations and guidance.

1.2 Scope/Application

The procedures contained in this document are to be used by field personnel when packing, marking, labeling, and shipping environmental samples and dangerous goods by air transport. Samples collected during field investigations or in response to a hazardous materials incident must be classified prior to shipment, as either environmental or hazardous materials (dangerous goods) samples.

In general, environmental samples include drinking water, most groundwater and ambient surface water, soil, sediment, treated municipal and industrial wastewater effluent, biological specimens, or any samples not expected to be contaminated with high levels of hazardous materials. Samples collected from process wastewater streams, drums, bulk storage tanks, soil, sediment, or water samples from areas suspected of being highly contaminated may require shipment as dangerous goods.

Government employees transporting samples or hazardous materials (i.e., preservatives or waste samples) in government vehicles are not subject to the requirements of this section in accordance with 49 CFR 171.1(d)(5). EPA contractors, however, are not covered by this exemption and may not transport these materials without full compliance with 49 CFR.

Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD local area network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.4 References

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version.

Title 40 Code of Federal Regulations (CFR), Pt. 136.3, Identification of Test Procedures, July 1, 2001. See Table II, Footnote 3.

Title 49 CFR, Pt. 171.1(d)(5), Applicability of Hazardous Materials Regulations (HMR) to Persons and Functions.

United States Department of Transportation (US DOT). 2003. Letter from Edward T. Mazzullo, Director, Office of Hazardous Materials Standards, to Henry L. Longest II, Acting Assistant Administrator, USEPA, Ref No. 02-0093, February 13, 2003.

US Environmental Protection Agency (US EPA) Order 1000.18, February 16, 1979.

US EPA. 1981. "Final Regulation Package for Compliance with DOT Regulations in the Shipment of Environmental Laboratory Samples," Memo from David Weitzman, Work Group Chairman, Office of Occupational Health and Safety (PM-273), April 13, 1981.

US EPA. 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Region 4 Science and Ecosystem Support Division (SESD), Athens, GA.

US EPA. Analytical Support Branch Laboratory Operations and Quality Assurance Manual. Region 4 SESD, Athens, GA, Most Recent Version.

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version.

1.5 General Precautions

1.5.1 Safety

Proper safety precautions must be observed when packing, marking, labeling, and shipping environmental or waste samples. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional.

2 Shipment of Dangerous Goods

The project leader is responsible for determining if samples collected during a specific field investigation meet the definitions for dangerous goods. If a sample is collected of a material that is listed in the Dangerous Goods List, Section 4.2, IATA, then that sample must be identified, packaged, marked, labeled, and shipped according to the instructions given for that material. If the composition of the collected sample(s) is unknown, and the project leader knows or suspects that it is a regulated material (dangerous goods), the sample may not be offered for air transport. If the composition and properties of the waste sample or highly contaminated soil, sediment, or water sample are unknown, or only partially known, the sample may not be offered for air transport.

In addition, the shipment of pre-preserved sample containers or bottles of preservatives (e.g., NaOH pellets, HCL, etc.) which are designated as dangerous goods by IATA is regulated. Shipment of nitric acid is strictly regulated. Consult the IATA Dangerous Goods Regulations for guidance. ***Dangerous goods must not be offered for air transport by any personnel except SESD's dangerous goods shipment designee or other personnel trained and certified by IATA in dangerous goods shipment.***

3 Shipment of Environmental Samples

Guidance for the shipment of environmental laboratory samples by personnel is provided in a memorandum dated March 6, 1981, subject "Final National Guidance Package for Compliance with Department of Transportation Regulations in the Shipment of Laboratory Samples". By this memorandum, the shipment of the following unpreserved samples is not regulated:

- Drinking water
- Treated effluent
- Biological specimens
- Sediment
- Water treatment plant sludge
- POTW sludge

In addition, the shipment of the following preserved samples is not regulated, provided the amount of preservative used does not exceed the amounts found in 40 CFR 136.3 or the USEPA Region 4 Analytical Support Branch Laboratory Operations and Quality Assurance Manual (ASBLOQAM), Most Recent Version. This provision is also discussed in correspondence between DOT and EPA (Department of Transportation, Letter from Edward T. Mazzullo, Director, Office of Hazardous Materials Standards, to Henry L. Longest II, Acting Assistant Administrator, USEPA, Ref No.: 02-0093, February 13, 2003). It is the shippers' (individual signing the air waybill) responsibility to ensure that proper amounts of preservative are used:

- Drinking water
- Ambient water
- Treated effluent
- Biological specimens
- Sediment
- Wastewater treatment plant sludge
- Water treatment plant sludge

Samples determined by the project leader to be in these categories are to be shipped using the following protocol, developed jointly between USEPA, OSHA, and DOT. This procedure is documented in the "Final National Guidance Package for Compliance with Department of Transportation Regulations in the Shipment of Environmental Laboratory Samples."

Untreated wastewater and sludge from Publicly Owned Treatment Works (POTWs) are considered to be "diagnostic specimens" (not environmental laboratory samples). However, because they are not considered to be etiologic agents (infectious) they are not restricted and may be shipped using the procedures outlined below.

Environmental samples should be packed prior to shipment by air using the following procedures:

1. Allow sufficient headspace (ullage) in all bottles (except VOA containers with a septum seal) to compensate for any pressure and temperature changes (approximately 10 percent of the volume of the container).

2. Ensure that the lids on all bottles are tight (will not leak).

3. Place bottles in separate and appropriately sized polyethylene bags and seal the bags. If available, the use of Whirl-Pak bags is preferable, if unavailable seal regular bags with tape (plastic electrical tape).

4. Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber or duct tape inside and outside. Line the cooler with a large heavy duty plastic bag.

5. Place cushioning/absorbent material in the bottom of the cooler and then place the containers in the cooler with sufficient space to allow for the addition of cushioning between the containers.

6. Put "blue ice" (or ice that has been "double bagged" in heavy duty polyethylene bags and properly sealed) on top of and/or between the containers. Fill all remaining space between the containers with absorbent material.

7. Securely fasten the top of the large garbage bag with tape (preferably plastic electrical tape).

8. Place the Chain-of-Custody Record or the CLP Traffic Report Form (if applicable) into a plastic bag, and tape the bag to the inner side of the cooler lid.

9. Close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. Chain-of-custody seals should be affixed to the top and sides of the cooler within the securing tape so that the cooler cannot be opened without breaking the seal.

Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Field Equipment Cleaning and Decontamination**

Effective Date: December 20, 2011	**Number:** SESDPROC-205-R2

Authors

Name: Donald Hunter
Title: Environmental Scientist, Regional Expert
Signature: Donald Hunter Date: 12/16/11

Name: Doug Jager
Title: Environmental Scientist
Signature: Doug Jager Date: 12/16/11

Approvals

Name: Archie Lee
Title: Chief, Enforcement and Investigations Branch
Signature: Archie Lee Date: 12/19/11

Name: Bill Cosgrove
Title: Chief, Ecological Assessment Branch
Signature: Bill Cosgrove Date: 12/19/11

Name: Bobby Lewis
Title: Field Quality Manager, Science and Ecosystem Support Division
Signature: Bobby Lewis Date: 12/19/11

Revision History

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History	Effective Date
SESDPROC-205-R2, *Field Equipment Cleaning and Decontamination*, replaces SESDPROC-205-R1. **General:** Corrected any typographical, grammatical and/or editorial errors. **Title Page:** Changed the Enforcement and Investigations Branch Chief from Antonio Quinones to Archie Lee. Changed the Field Quality Manager form Laura Ackerman to Bobby Lewis. **Revision History:** Changed Field Quality Manager to Document Control Coordinator. **Section 1.2:** Added the following statement: Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use. **Section 1.3:** Omitted reference to the H: drive. Changed the Field Quality Manager to the Document Control Coordinator. **Section 1.4:** In definitions (third bullet), replaced "soap" with "detergent." Changed all references in document from "soap" to "detergent." **Section 1.5:** Updated references. **Section 2.1:** On the 2nd paragraph, removed the last two sentences and replaced with new language. The new language clarifies that any deviations from the standard decon procedures that need to be made during the course of the field investigation will be documented in the field logbook. **Section 3.5**: Revised to clarify that it is only necessary to decontaminate the wetted portion of the sounder or tape. **Section 3.6**: Rewritten to reflect updated RediFlo2® internal cleaning procedures. **Section 3.7:** Added Section 3.7.5*, Field Decontamination Procedure for Direct Push Technology (DPT) Equipment.*	December 20, 2011

SESDPROC-205-R1, *Field Equipment Cleaning and Decontamination*, replaces SESDPROC-205-R0. **General** Corrected any typographical, grammatical and/or editorial errors. **Title Page** Changed title for Antonio Quinones from Environmental Investigations Branch to Enforcement and Investigations Branch. Changed Bill Cosgrove's title from Acting Chief to Chief. **Section 1.3** Updated information to reflect that the procedure is located on the H: drive of the LAN. Clarified Field Quality Manager (FQM) responsibilities. **Section 1.5** Alphabetized and revised the referencing style for consistency. **Section 1.6.1** Corrected the title of the Safety, Health, and Environmental Management Program Procedures and Policy Manual.	November 1, 2007
SESDPROC-205-R0, *Field Equipment Cleaning and Decontamination*, Original Issue	February 05, 2007

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1 General Information

1.1 Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when cleaning and decontaminating sampling equipment during the course of field investigations.

1.2 Scope/Application

The procedures contained in this document are to be followed when field cleaning sampling equipment, for both re-use in the field, as well as used equipment being returned to the Field Equipment Center (FEC). On the occasion that SESD field investigators determine that any of the procedures described in this section are either inappropriate, inadequate or impractical and that other procedures must be used to clean or decontaminate sampling equipment at a particular site, the variant procedure will be documented in the field logbook, along with a description of the circumstances requiring its use. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD Local Area Network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on LAN and for maintaining records of review conducted prior to its issuance.

1.4 Definitions

- Decontamination: The process of cleaning dirty sampling equipment to the degree to which it can be re-used, with appropriate QA/QC, in the field.

- Deionized water: Tap water that has been treated by passing through a standard deionizing resin column. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds (i.e., at or above analytical detection limits) as defined by a standard inductively coupled Argon Plasma Spectrophotometer (ICP) (or equivalent) scan. Deionized water obtained by other methods is acceptable, as long as it meets the above analytical criteria. Organic-free water may be substituted for deionized water.

- Detergent: A standard brand of phosphate-free laboratory detergent, such as Luminox®.

- Drilling Equipment: All power equipment used to collect surface and sub-surface soil samples or install wells. For purposes of this procedure, direct push is also included in this definition.

- Field Cleaning: The process of cleaning dirty sampling equipment such that it can be returned to the FEC in a condition that will minimize the risk of transfer of contaminants from a site.

- Organic-free water: Tap water that has been treated with activated carbon and deionizing units. At a minimum, the finished water must meet the analytical criteria of deionized water and it should contain no detectable pesticides, herbicides, or extractable organic compounds, and no volatile organic compounds above minimum detectable levels as determined by the Region 4 laboratory for a given set of analyses. Organic-free water obtained by other methods is acceptable, as long as it meets the above analytical criteria.

- Tap water: Water from any potable water supply. Deionized water or organic-free water may be substituted for tap water.

1.5 References

SESD Operating Procedure for Management of Investigation Derived Waste, SESDPROC-202, Most Recent Version

SESD Operating Procedure for Equipment Cleaning and Decontamination at the FEC, SESDPROC-206, Most Recent Version

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version

1.6 General Precautions

1.6.1 Safety

Proper safety precautions must be observed when field cleaning or decontaminating dirty sampling equipment. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant

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

- When conducting field cleaning or decontamination using laboratory detergent, safety glasses with splash shields or goggles, and latex gloves will be worn.

- No eating, smoking, drinking, chewing, or any hand to mouth contact should be permitted during cleaning operations.

1.6.2 Procedural Precaution

Prior to mobilization to a site, the expected types of contamination should be evaluated to determine if the field cleaning and decontamination activities will generate rinsates and other waste waters that might be considered RCRA hazardous waste or may require special handling.

2 Introduction to Field Equipment Cleaning and Decontamination

2.1 General

The procedures outlined in this document are intended for use by field investigators for cleaning and decontaminating sampling and other equipment in the field. These procedures should be followed in order that equipment is returned to the FEC in a condition that will minimize the risk of transfer of contaminants from a site.

Sampling and field equipment cleaned in accordance with these procedures must meet the minimum requirements for the Data Quality Objectives (DQOs) of the study or investigation. If deviations from these procedures need to be made during the course of the field investigation, they will be documented in the field logbook along with a description of the circumstances requiring the use of the variant procedure.

Cleaning procedures for use at the Field Equipment Center (FEC) are found in SESD Operating Procedure for Equipment Cleaning and Decontamination at the FEC (SESDPROC-206).

2.2 Handling Practices and Containers for Cleaning Solutions

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

- Detergent must be kept in clean plastic, metal, or glass containers until used. It should be poured directly from the container during use.

- Tap water may be kept in tanks, hand pressure sprayers, squeeze bottles, or applied directly from a hose.

- Deionized water must be stored in clean, glass or plastic containers that can be closed prior to use. It can be applied from plastic squeeze bottles.

- Organic-free water must be stored in clean glass or Teflon® containers prior to use. It may be applied using Teflon® squeeze bottles, or with the portable system.

2.3 Disposal of Cleaning Solutions

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

2.4 Sample Collection Equipment Contaminated with Concentrated Materials

Equipment used to collect samples of concentrated materials from investigation sites must be field cleaned before returning from the study. At a minimum, this should consist of washing with detergent and rinsing with tap water. When the above procedure cannot be followed, the following options are acceptable:

1. Leave with facility for proper disposal;

2. If possible, containerize, seal and secure the equipment and leave on-site for later disposal;

3. Containerize, bag or seal the equipment so that no odor is detected and return to the SESD.

It is the project leader's responsibility to evaluate the nature of the sampled material and determine the most appropriate cleaning procedures for the equipment used to sample that material.

2.5 Sample Collection Equipment Contaminated with Environmental Media

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

1. Wipe the equipment clean;

2. Water-rinse the equipment;

3. Wash the equipment in detergent and water followed by a tap water rinse.

4. For grossly contaminated equipment, the procedures set forth in Section 2.4 must be followed.

Under extenuating circumstances such as facility limitations, regulatory limitations, or during residential sampling investigations where field cleaning operations are not feasible, equipment can be containerized, bagged or sealed so that no odor is detected and returned to the FEC without being field cleaned. If possible, FEC personnel should be notified that equipment will be returned without being field cleaned. It is the project leader's responsibility to evaluate the nature of the sampled material and determine the most appropriate cleaning procedures for the equipment used to sample that material.

2.6 Handling of Decontaminated Equipment

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

3 Field Equipment Decontamination Procedures

3.1 General

Sufficient equipment should be transported to the field so that an entire study can be conducted without the need for decontamination. When equipment must be decontaminated in the field, the following procedures are to be utilized.

3.2 Specifications for Decontamination Pads

Decontamination pads constructed for field cleaning of sampling and drilling equipment should meet the following minimum specifications:

- The pad should be constructed in an area known or believed to be free of surface contamination.
- The pad should not leak.
- If possible, the pad should be constructed on a level, paved surface and should facilitate the removal of wastewater. This may be accomplished by either constructing the pad with one corner lower than the rest, or by creating a sump or pit in one corner or along one side. Any sump or pit should also be lined.
- Sawhorses or racks constructed to hold equipment while being cleaned should be high enough above ground to prevent equipment from being splashed.
- Water should be removed from the decontamination pad frequently.
- A temporary pad should be lined with a water impermeable material with no seams within the pad. This material should be either easily replaced (disposable) or repairable.

At the completion of site activities, the decontamination pad should be deactivated. The pit or sump should be backfilled with the appropriate material designated by the site project leader, but only after all waste/rinse water has been pumped into containers for disposal. See SESD Operating Procedure for Management of Investigation Derived Waste (SESDPROC-202) for proper handling and disposal of these materials. If the decontamination pad has leaked excessively, soil sampling may be required.

3.3 "Classical Parameter" Sampling Equipment

"Classical Parameters" are analyses such as oxygen demand, nutrients, certain inorganic compounds, sulfide, flow measurements, etc. For routine operations involving classical parameter analyses, water quality sampling equipment such as Kemmerers, buckets, dissolved oxygen dunkers, dredges, etc., may be cleaned with the sample water or tap water between sampling locations as appropriate.

Flow measuring equipment such as weirs, staff gages, velocity meters, and other stream gauging equipment may be cleaned with tap water between measuring locations, if necessary.

Note: The procedures described in Section 3.3 are not to be used for cleaning field equipment to be used for the collection of samples undergoing trace organic or inorganic constituent analyses.

3.4 Sampling Equipment used for the Collection of Trace Organic and Inorganic Compounds

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

1. Clean with tap water and Luminox® detergent using a brush, if necessary, to remove particulate matter and surface films. Equipment may be steam cleaned (Luminox® detergent and high pressure hot water) as an alternative to brushing. Sampling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. PVC or plastic items should not be steam cleaned.

2. Rinse thoroughly with tap water.

3. Rinse thoroughly with organic-free water and place on a clean foil-wrapped surface to air-dry.

4. All equipment must be wrapped with foil. If the equipment is to be stored overnight before it is wrapped in foil, it should be covered and secured with clean, unused plastic sheeting.

3.5 Well Sounders or Tapes

The following procedures are recommended for decontaminating well sounders (water level indicators) and tapes. Unless conditions warrant, it is only necessary to decontaminate the wetted portion of the sounder or tape.

1. Wash with detergent and tap water.

2. Rinse with tap water.

3. Rinse with deionized water.

3.6 Redi-Flo2® Pump

CAUTION – Do not wet the controller. Always disconnect power from the pump when handling the pump body.

The Redi-Flo2® pump and any associated connected hardware (e.g., check valve) should be decontaminated between each monitoring well. The following procedures are required, depending on whether the pump is used solely for purging or used for purging and sampling.

3.6.1 Purge Only (Pump and Wetted Portion of Tubing or Hose)

1. Disconnect power and wash exterior of pump and wetted portion of the power lead and tubing or hose with detergent and water solution.

2. Rinse with tap water.

3. Final rinse with deionized water.

4. Place pump and reel in a clean plastic bag and keep tubing or hose contained in clean plastic or galvanized tub between uses.

3.6.2 Purge And Sample

Grundfos Redi-Flo2® pumps are extensively decontaminated and tested at the FEC to prevent contamination from being transmitted between sites. The relevant sections of SESDPROC-206, *Field Equipment Cleaning and Decontamination at the FEC,* should be implemented in the field where a high risk of cross-contamination exists, such as where NAPL or high-concentration contaminants occur. In most cases, the abbreviated cleaning procedure described below will suffice.

1. Disconnect and discard the previously used sample tubing from the pump. Remove the check valve and tubing adapters and clean separately (See Section 3.6.3 for check valve). Wash the pump exterior with detergent and water.

2. Prepare and fill three containers with decontamination solutions, consisting of Container #1, a tap water/detergent washing solution; Container #2, a tap water rinsing solution; and Container #3, a deionized or organic-free water final rinsing solution. Choice of detergent and final rinsing solution for all steps in this procedure is dependent upon project objectives (analytes and compounds of interest). The containers should be large enough to hold the pump and one to two liters of solution.

3. Place the pump in Container #1. Turn the pump on and circulate the detergent and water solution through the pump and then turn the pump off.

4. Place the pump in Container #2. Turn the pump on and circulate the tap water through the pump and then turn the pump off.

5. Place the pump in Container #3. Turn the pump on and circulate deionized or organic-free water through the pump and then turn the pump off.

6. Disconnect power and remove pump from Container #3. Rinse exterior and interior of pump with fresh deionized or organic-free water.

7. Decontaminate the power lead by washing with detergent and water, followed by tap water and deionized water rinses. This step may be performed before washing the pump if desired.

8. Reassemble check valve and tubing adapters to pump. ALWAYS use Teflon® tape to prevent galling of threads. Firm hand-tightening of fittings or light wrench torque is generally adequate.

9. Place the pump and reel in a clean plastic bag.

3.6.3 Redi-Flo2® Ball Check Valve

1. Remove the ball check valve from the pump head. Check for wear and/or corrosion, and replace as needed. During decontamination check for free-flow in forward direction and blocking of flow in reverse direction.

2. Using a brush, scrub all components with detergent and tap water.

3. Rinse with deionized water.

4. Replace the ball check valve to the Redi-Flo2® pump head.

3.7 Downhole Drilling Equipment

These procedures are to be used for drilling activities involving the collection of soil samples for trace organic and inorganic constituent analyses and for the construction of monitoring wells to be used for the collection of groundwater samples for trace organic and inorganic constituent analyses.

3.7.1 Introduction

Cleaning and decontamination of all equipment should occur at a designated area (decontamination pad) on the site. The decontamination pad should meet the specifications of Section 3.2 of this procedure.

Tap water brought on the site for drilling and cleaning purposes should be contained in a pre-cleaned tank.

A steam cleaner and/or high pressure hot water washer capable of generating a pressure of at least 2500 PSI and producing hot water and/or steam (200° F plus), with a detergent compartment, should be obtained.

3.7.2 Preliminary Cleaning and Inspection

Drilling equipment should be clean of any contaminants that may have been transported from off-site to minimize the potential for cross-contamination. The drilling equipment should not serve as a source of contaminants. Associated drilling and decontamination equipment, well construction materials, and equipment handling procedures should meet these minimum specified criteria:

- All downhole augering, drilling, and sampling equipment should be sandblasted before use if painted, and/or there is a buildup of rust, hard or caked matter, etc., that cannot be removed by steam cleaning (detergent and high pressure hot water), or wire brushing. Sandblasting should be performed <u>prior to arrival</u> on site, or well away from the decontamination pad and areas to be sampled.

- Any portion of the drilling equipment that is over the borehole (kelly bar or mast, backhoe buckets, drilling platform, hoist or chain pulldowns, spindles, cathead, etc.) should be steam cleaned (detergent

and high pressure hot water) and wire brushed (as needed) to remove all rust, soil, and other material which may have come from other sites before being brought on site.

- Printing and/or writing on well casing, tremie tubing, etc., should be removed before use. Emery cloth or sand paper can be used to remove the printing and/or writing. Most well material suppliers can provide materials without the printing and/or writing if specified when ordered. Items that cannot be cleaned are not acceptable and should be discarded.

- Equipment associated with the drilling and sampling activities should be inspected to insure that all oils, greases, hydraulic fluids, etc., have been removed, and all seals and gaskets are intact with no fluid leaks.

3.7.3 Drill Rig Field Cleaning Procedure

Any portion of the drill rig, backhoe, etc., that is over the borehole (kelly bar or mast, backhoe buckets, drilling platform, hoist or chain pulldowns, spindles, cathead, etc.) should be steam cleaned (detergent and high pressure hot water) between boreholes.

3.7.4 Field Decontamination Procedure for Drilling Equipment

The following is the standard procedure for field cleaning augers, drill stems, rods, tools, and associated equipment. This procedure does <u>not</u> apply to well casings, well screens, or split-spoon samplers used to obtain samples for chemical analyses, which should be decontaminated as outlined in Section 3.4 of this procedure.

1. Wash with tap water and detergent, using a brush if necessary, to remove particulate matter and surface films. Steam cleaning (high pressure hot water with detergent) may be necessary to remove matter that is difficult to remove with the brush. Drilling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. Hollow-stem augers, drill rods, etc., that are hollow or have holes that transmit water or drilling fluids, should be cleaned on the inside with vigorous brushing.

2. Rinse thoroughly with tap water.

3. Remove from the decontamination pad and cover with clean, unused plastic. If stored overnight, the plastic should be secured to ensure that it stays in place.

3.7.5 Field Decontamination Procedure for Direct Push Technology (DPT) Equipment

1. Certain specific procedures for the decontamination of DPT tools are described in the various sampling procedures, but the following general guidelines apply:

2. Prior to return to the Field Equipment Center, all threaded tool joints should be broken apart and the equipment cleaned per the provisions of *Section 2.5, Sample Collection Equipment Contaminated with Environmental Media* of this procedure.

3. Equipment that contacts the sample media and is cleaned in the field for reuse should be cleaned per the provisions of *Section 3.4, Sampling Equipment used for the Collection of Trace Organic and Inorganic Compounds* of this procedure. This would include piston sampler points and shoes, screen point sampler screens and sheaths, and the drive rods when used for groundwater sampling.

4. Equipment that does not directly contact the sample media and is cleaned in the field for reuse can generally be cleaned per the provisions of Section *3.7.4, Field Decontamination Procedure for Drilling Equipment* of this procedure.

Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Field Sampling Quality Control**

Effective Date: February 5, 2013	**Number:** SESDPROC-011-R4

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Revision History

This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by the Document Control Coordinator.

History	Effective Date
SESDPROC-011-R4, *Field Sampling Quality Control*, replaces SESDPROC-011-R3 **General:** Corrected any typographical, grammatical and/or editorial errors. **Cover Page:** The Enforcement and Investigations Branch Chief was changed from Archie Lee to Danny France. The Ecological Assessment Branch Chief was changed from Bill Cosgrove to John Deatrick. The FQM was changed from Liza Montalvo to Bobby Lewis. **Section 2.5:** Modified the statement to read: Chemical preservatives used will be supplied by the Region 4 laboratory or purchased by the BFEM. **Section 3.3.3**:Modified section to read that SESD will generally use chemical preservatives stored in individual single-use vials. The chemical preservative will be tested prior to use for the appropriate analytes. The use of pre-tested, single-use vials eliminates the need to routinely collect preservative blanks in the field. If the preservatives are stored in containers that will be used to preserve multiple samples, blanks will be collected to evaluate the potential for cross-contamination resulting from the preservation process. Added Note for bullet 1. Modified bullet number 9 to read Water Filter Blank. **Section 4.1:** Modified first sentence to read - Records will be kept by FEC personnel. Modified bullet 1 to only apply to the FEC water system. Section 4.1, #5: - Added tubing to bullet number 5. Created bullet number 6. Moved last two sentences from bullet number 5 to create bullet number 7. **Section 4.2:** Moved testing requirements for Teflon® tubing from bullet number 1 to bullet number 6. Added requirements to bullets 2 and 4 that organic-free water for VOC samples is provided by the ASB laboratory. **Section 4.4.1:** Changed requirement for the EAB QA Officer from submitting an annual QA report to a quarterly report. Modified paragraph to read - Each branch QAO will compile a quarterly report of field quality assurance data and forward the report to the FQM.	February 5, 2013
SESDPROC-011-R3, *Field Sampling Quality Control*, replaces SESDPROC-011-R2 **Cover Page:** The Enforcement and Investigations Branch Chief was changed from Antonio Quinones to Archie Lee. The FQM was changed from Laura Ackerman to Liza Montalvo.	October 15, 2010

Section 1.2: Added the following statement: Mention of trade names or commercial products does not constitute endorsement or recommendation for use. **Section 1.3:** Omitted reference to the H: drive of the LAN. **Section 2.9**: On the first paragraph, replaced the word "will" with "should" on the two instances where "will" was mentioned. **Section 4.2, Subsection 1**: Removed volatiles from list of analyses for 1-liter amber containers. Added volatile organic compound to list of analyses for 8-oz. clear glass containers.	
SESDPROC-011-R2, *Field Sampling Quality Control*, replaces SESDPROC-011-R1 **Revision History** Changed Field Quality Manager to Document Control Coordinator. **Section 1.3** Changed Field Quality Manager to Document Control Coordinator. **Section 2.6** Added item #8. **Section 4.1** Added clarifying language to item #5. **Section 4.2** Added "volatiles" to item #1. Added "Note" at end of item #1. **Section 4.4.1** Changed "quarter" to "year" in second paragraph.	January 28, 2008
SESDPROC-011-R1, *Field Sampling Quality Control*, replaces SESDPROC-011-R0. **Section 1.3** Modified requirements for maintaining official copy of procedure. **Section 1.4** Stated that variability should be accounted for depending on the data quality objectives for the study. Added definitions for branch field equipment manager and de-ionized water. Removed definitions for representative sample, sample representativeness, accuracy, precision, and bias. **Section 2.5** Records of sample preservation, including ice, should be documented in the field log books. **Section 2.6**	October 19, 2007

Added the SESD glove and bottle return policy. The glove and bottle return policy was previously in SESDPROC-108-R0, *Equipment and Supply Management*. **Section 3.3** Stated that variability samples will be collected in accordance to project DQOs. Removed definition for "major project". **Section 3.5** Added double volume requirement for SVOC/pesticide/PCB MS/MSD sample collection. **Section 4.1** Modified requirements for servicing both field and FEC organic-free water systems from quarterly to at least once per 180 days. **Section 4.2, Subsection 1** Added analytical requirements for testing of Teflon® tubing. **Section 4.2, Subsection 5** Modified Silastic® or Tygon® tubing testing requirements to state that new lot are required to be tested quarterly. **Section 4.4.2** Modified requirements that project leaders provide final report to QAO. Project Leaders will provide QA data to QAO.	
SESDPROC-011-R0, *Field Sampling Quality Control*, Original Issue	February 5, 2007

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Contents

1 General Information

1.1 Purpose

This document describes procedures established to ensure the quality of SESD field sampling activities, including Field Equipment Center (FEC) operations involving preparation of sampling and support equipment for field operations. Collectively, these procedures ensure that field sampling teams are provided with equipment that is suitable for sampling use, and that field sampling is conducted using proper procedures, resulting in the collection of representative samples. Strict adherence to these procedures forms the basis for an acceptable field sampling quality assurance program.

1.2 Scope/Application

The procedures contained in this document are to be used by field investigators when collecting and handling samples in the field and when preparing sampling equipment for SESD field investigations. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD local area network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.4 Definitions

1.4.1 Sample

A part of a larger lot, usually a volume, area, period or population.

1.4.2 Variability

The range or "distribution" of results around the mean value obtained from samples within a population. There are three types of variability which should be measured or otherwise accounted for in field sampling, depending on the data quality objectives (DQO) for the study:

1. Temporal Variability

   Temporal variability is the range of results due to changes in contaminant concentrations over time. An example would be the range of concentrations obtained for a given parameter in wastewater samples collected at different times from an outfall where contaminant concentrations vary over time.

2. Spatial Variability

   Spatial variability is the range of results due to changes in contaminant concentrations as a function of their location. An example would be the range of concentrations obtained for a given parameter in surface soil from a site where discreet "hot spots" are present due to localized releases of contaminants on otherwise uncontaminated soil.

3. Sample Handling Variability

   Sample handling variability is the range of results due to the sample collection and handling techniques used by the sampler. This variability manifests itself as a positive bias due to errors such as unclean sampling equipment, cross contamination, etc., or a negative bias due to improper containers or sample preservation.

1.4.3 Grab Sample

An individual sample collected from a single location at a specific time or period of time. Grab samples are generally authoritative in nature.

1.4.4 Composite Sample

A sample collected over a temporal or spatial range that typically consists of a series of discrete, equal samples (or “aliquots”) which are combined or "composited." A composite sample represents the average characteristics of the population under consideration. Four types of composite samples are listed below:

1. Time Composite (TC) – a sample comprised of a varying number of discrete samples or “aliquots” collected at equal time intervals during the compositing period. The TC sample is typically used to sample wastewater or streams.

2. Flow Proportional Composite (FPC) – A sample consisting of discrete samples or “aliquots” collected at a rate proportional to flow. The aliquots are collected during the compositing period by either a time-varying/constant volume (TV/CV) method (“automated flow proportioning”) or a time-constant/varying volume (TC/VV) method (“manual flow proportioning”). The TV/CV method is typically used with automatic

samplers that are paced by a flow meter. The TC/VV method is a manual method that individually proportions a series of discretely collected aliquots. The FPC is typically used when sampling wastewater.

3. Areal Composite – a sample composited from individual, equal aliquots collected on an areal or horizontal cross-sectional basis. Each aliquot is collected in an identical manner. Examples include sediment composites from quarter-point sampling of streams and soil samples from within grids.

4. Vertical Composite – a sample composited from individual, equal aliquots collected from a vertical cross section. Each aliquot is collected in an identical manner. Examples include vertical profiles of soil/sediment columns, lakes, and estuaries.

1.4.5 De-ionized Water

Tap water that has been treated by passing it through a standard de-ionizing resin column. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds (i.e., at or above analytical detection limits) as defined by a standard Inductively Coupled Argon Plasma Spectrophotometer (ICP) (or equivalent) scan. De-ionized water obtained by other methods is acceptable, as long as it meets the above analytical criteria. Organic-free water may be substituted for de-ionized water.

1.4.6 Branch Field Equipment Manager

Staff, designated by management, who are responsible for ensuring that the procedures for Equipment Inventory and Management are followed. At least one Branch Field Equipment Manager (BFEM) will be designated for the Enforcement and Investigations Branch (EIB) and the Ecological Assessment Branch (EAB).

1.5 References

SESD Safety, Health and Environmental Management Program (SHEMP) Manual, Most Recent Version

SESD Operating Procedure for Sample and Evidence Management (SESDPROC-005-most recent version)

SESD Operating Procedure for Competency and Proficiency Testing, (SESDPROC-006, most recent version)

SESD Operating Procedure for Equipment Inventory and Management (SESDPROC-108-most recent version)

SESD Operating Procedure for Sediment Sampling (SESDPROC-200-most recent version)

SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205-most recent version)

SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206-most recent version)

SESD Operating Procedure for Soil Sampling (SESDPROC-300-most recent version)

SESD Operating Procedure for Waste Sampling (SESDPROC-302-most recent version)

USEPA Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), November 2001

USEPA Region 4 Analytical Support Branch Laboratory Operations and Quality Assurance Manual (ASBLOQAM), Most Recent Version

Loan-In Form (SESDFORM-011, most recent version)

SESD Operating Procedure for Packing, Marking, Labeling, and Shipping of Environmental and Waste Samples (SESDPROC-209, most recent version)

SESD Operating Procedure for Training (SESDPROC-007-most recent version)

SESD Operating Procedure for Corrective Action (SESDPROC-009-most recent version)

SESD Guidance for Design and Installation of Monitoring Wells (SESDGUID-101-most recent version)

2 Field Sampling Quality Control Considerations

This section provides guidelines for establishing quality control procedures for sampling activities. Strict adherence to all of the standard operating procedures outlined in this subsection forms the basis for an acceptable sampling quality assurance program.

2.1 Experience Requirements

There is no substitute for field experience. This field experience will be gained by on-the-job training using the "buddy" system. Each new investigator will accompany an experienced employee on as many different types of field studies as possible. During this training period, the new employee will be permitted to perform all facets of field investigations, including sampling, under the direction and supervision of senior investigators. Specific requirements covering experience, competency and proficiency are found in the SESD Operating Procedure for Competency and Proficiency Testing (SESDPROC-006) and SESD Operating Procedure for Training (SESDPROC-007).

2.2 Traceability Requirements

All sample collection and measurement activities will be traceable through field records to the person collecting the sample or making the measurement. All maintenance and calibration records for sampling and measurement equipment (where appropriate) will be kept so that they are similarly traceable. The SESD Operating Procedure for Equipment Inventory and Management (SESDPROC-108) contain specific procedures to be followed that ensure traceability.

2.3 Chain-of-Custody

Specific chain-of-custody procedures are included in SESD Operating Procedure for Sample and Evidence Management (SESDPROC-005). These procedures will ensure that evidence collected during an investigation will withstand scrutiny during litigation. To assure that procedures are being followed, it is recommended that field investigators or their designees audit chain-of-custody entries, tags or labels, field notes, and any other recorded information for accuracy. Additionally, the SESD FQM will randomly conduct reviews of project files to ensure that quality procedures are being followed.

2.4 Sampling Equipment Construction Material

Sampling equipment construction materials can affect sample analytical results. Field investigators will ensure the sample equipment construction material will not introduce contaminants to the sample being collected.

2.5 Sample Preservation

Samples for some analyses must be preserved in order to maintain their integrity. Preservatives required for routine analyses of samples collected are found in the USEPA Region 4 Analytical Support Branch Laboratory Operations and Quality Assurance Manual (ASBLOQAM). Chemical preservatives used will be supplied by the Region 4 laboratory or purchased by the BFEM. All samples requiring preservation should be preserved immediately upon collection in the field. Records of sample preservation, including ice, will be documented in the field log books.

Samples that **should not** be preserved in the field are:

1. Those collected within a hazardous waste site that are known or thought to be highly contaminated with toxic materials which may be highly reactive. Barrel, drum, closed container, spillage or other source samples from hazardous waste sites are not to be preserved with any chemical.

2. Those that have extremely low or high pH or samples that may generate potentially dangerous gases if they were preserved according to the ASBLOQAM.

All samples preserved with chemicals will be clearly identified by indication on the sample tag or label that the sample is preserved. If samples normally requiring preservation were not preserved, field records should clearly specify the reason. Samples shipped by air will not be preserved with nitric acid, hydrochloric acid, sodium hydroxide or sulfuric acid in excess of the amount specified in the ASBLOQAM.

2.6 Sample Collection Precautions

In order to prevent cross-contamination during sample collection, the following precautions will be taken:

1. A clean pair of new, non-powdered, disposable latex gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come into contact with the media being sampled.

2. Sample containers for source samples or samples suspected of containing high concentrations of contaminants will be placed in separate plastic bags immediately after collecting, tagging, etc.

3. If possible, environmental (low concentration) samples and source or waste samples (high concentration) should be collected by different field teams. If different field teams cannot be used, all environmental samples should be collected first and placed in separate ice chests or shipping containers. Samples

of waste or highly contaminated samples should never be placed in the same ice chest as environmental samples. Ice chests or shipping containers for source or waste samples or any samples suspected to contain high concentrations of contaminants will be lined with new, clean, plastic bags.

4. If possible, one member of the field sampling team should record all of the field notes, collect GPS data, etc., while the other members collect the samples.

5. When sampling surface water and sediment at the same location, the water sample should always be collected before the sediment sample is collected.

6. Sample collection activities should proceed progressively from the least suspected contaminated area to the most suspected contaminated area.

7. Investigators should use equipment constructed of Teflon®, stainless steel, or glass that has been properly pre-cleaned according to either the SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205) or the SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206) for collection of samples for trace metals or organic compounds analyses. Teflon® or glass is preferred for collecting samples where trace metals are of concern. Equipment constructed of plastic or PVC should <u>not</u> be used to collect samples for trace organic compounds analyses.

8. Field investigators should ensure the sample containers they are using have been verified as suitable for the analyses that will be conducted on the samples through the quality control procedures discussed in Section 4 of this procedure.

Upon returning from the field, un-used sample containers will be examined by project leaders to determine whether bottles should be discarded, recycled or re-shelved for use on other projects. A load-in form (SESDFORM-011) will be completed and signed by project leaders to identify the future use of sample containers returning from the field. Opened boxes of sampling containers that can be re-used, will be segregated from sealed boxes of new containers.

Opened bags of latex gloves returning from the field will be segregated from unopened gloves and will not be re-used for sample collection on other projects.

2.7 Sample Handling and Mixing

Once a sample has been collected, it may have to be transferred into separate containers for different analyses. Sample transfer should be done as soon as possible. If necessary, aqueous samples may be collected into a single, larger container for homogenization and transferred into individual sample containers. However, aqueous samples collected for volatile organic compounds, oil and grease, bacteria, sulfides and phenols analyses may not be transferred using this procedure.

It is extremely important that waste (when appropriate), soil and sediment samples be mixed thoroughly to ensure that the sample is representative of the sample media. The most common method of mixing is referred to as quartering. The quartering procedure should be performed as follows:

1. The material in the sample pan should be divided into quarters and each quarter should be mixed individually.

2. Two quarters should then be mixed to form halves.

3. The two halves should be mixed to form a homogenous matrix.

This procedure should be repeated several times until the sample is adequately mixed. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction and occasionally turning the material over.

2.8 Special Handling of Samples for Volatile Organic Compounds Analysis

Water samples to be analyzed for volatile organic compounds should be stored in 40-ml septum vials with screw cap and Teflon®-silicone disk in the cap to prevent contamination of the sample by the cap. The disks should be placed in the caps (Teflon® side to be in contact with the sample) in the laboratory prior to the beginning of the field investigation.

The vials should be completely filled to prevent volatilization, and extreme caution should be exercised when filling a vial to avoid any turbulence which could also produce volatilization. The sample should be carefully poured down the side of the vial to minimize turbulence. As a rule, it is best to gently pour the last few drops into the vial so that surface tension holds the water in a convex meniscus. The cap is then applied and some overflow is lost, but the air space in the bottle is eliminated. After capping, turn the bottle over and tap it to check for bubbles. If a bubble or bubbles are present, the vial should be topped off using a minimal amount of sample to re-establish the meniscus. Care should be taken not to flush any preservative out of the vial during topping off. If, after topping off and capping the vial, bubbles are still present, a new vial should be obtained and the sample re-collected.

Soil and sediment samples for VOC analyses should be collected and handled as specified in the SESD Operating Procedure for Soil Sampling (SESDPROC-300), Waste Sampling (SESDPROC-302) or the SESD Operating Procedure for Sediment Sampling (SESDPROC-200). Soil and sediment samples collected for VOC analyses should <u>not</u> be mixed.

2.9 Sample Storage and Transport

After collection, sample handling should be minimized. Field investigators should use extreme care to ensure that samples are not contaminated during storage. Environmental and waste samples are typically stored in coolers. To reduce the risk of cross contamination, smaller sample containers such as 8 ounce glass jars, 40 ml VOA vials, and one-liter amber bottles should be placed inside of sealed, plastic bags before being placed in the cooler. If ice is required for preservation of the samples, the ice should be contained in a plastic bag or some equivalent container to prevent the potential for cross contamination of the samples by water produced from melting ice. If ice is used, the coolers should be checked regularly and water should be drained as needed. Custody of samples will be maintained according to the SESD Operating Procedure for Sample and Evidence Management (SESDPROC-005).

Samples will either be transported to the analytical laboratory by field investigators or shipped by common carrier. Shipping of samples will be conducted in accordance with the SESD Operating Procedure for Packing, Marking, labeling, and Shipping of Environmental and Waste Samples (SESDPROC-209).

3 Quality Control Samples

Quality control samples are collected during field studies for various purposes, among which are to isolate site effects (control samples), to define background conditions (background sample), and to evaluate field/laboratory variability (spikes and blanks, trip blanks, duplicate, split samples, etc.).

3.1 Control Sample

A control sample is typically a discrete grab sample collected to isolate a source of contamination. Isolation of a source could require the collection of both an upstream sample at a location where the medium being studied is unaffected by the site being studied, as well as a downstream control which could be affected by contaminants contributed from the site under study.

3.2 Background Sample

A background sample (usually a grab sample) is collected from an area, water body or site similar to the one being studied, but located in an area known or thought to be free from pollutants of concern.

3.3 Variability Samples

Variability may be defined as a variation in concentrations of compounds or analytes across a site or area of investigation or variations, across time, of waste streams or surface water bodies. Variation can also be introduced during sample handling. The following procedures are used to assess and evaluate variability. When appropriate, spatial duplicate grab and/or composite samples should be collected during investigations and studies in accordance to the project DQOs. In general, no more than ten percent of all samples should be collected as spatial duplicates.

3.3.1 Spatial Variability Duplicate

The following spatial duplicate sampling procedures should be used during the collection of samples as a measure of variability within the area represented by the sample. These samples should be collected at the same time, using the same procedures, the same type of equipment, and in the same types of containers as the original samples. They should also be preserved in the same manner and submitted for the same analyses as the required samples.

Spatial variability duplicate samples are typically collected during investigations where samples are collected from grids that are positioned at fixed intervals over the study area and a sample collection pattern is established within the grids. Spatial variability duplicate samples are collected using the same compositing pattern as the original sample and are collected within the same general area of representativeness, however the pattern is shifted relative to the original aliquot locations. This amount and direction of shift for the duplicate sample is

dependent upon the size of the grid or area being sampled and should be specified in the QAPP for the investigation. Data from spatial duplicates will be examined by the investigation project leader to determine if the observed spatial variability is acceptable, based on the investigation or study objectives.

3.3.2 Temporal Variability Duplicate

When appropriate, temporal variability at a given sampling location will be measured by collecting temporal duplicate samples. These samples will be collected from the same sampling location, using the same techniques and the same type of equipment, but at a time different from the original sample. The time selected for the temporal duplicate sample will be similar to the time or span of time specified for the original sample in the project work plan. Data from temporal duplicates will be examined by the project leader to determine if samples represent the time span intended in the project work plan.

3.3.3 Sample Handling Variability

The effectiveness of sample handling techniques will be measured by collecting split and blank samples.

Split Samples

Split samples will be collected by initially collecting twice as much volume as is normally collected. The material will be apportioned, after mixing, if appropriate, into two sets of containers. Both sets of containers will be submitted for analyses with one set designated as an "original sample," the other designated as a "split sample." Data from the split samples will be examined by the project leader to assess sample handling variability. On large studies (more than 20 samples collected), a minimum of 5 percent, but no more than 10 percent, of all samples will be collected as split samples unless required by site data quality objectives.

Blank Samples

The following blank samples will be prepared by the laboratory and obtained by the project leader prior to traveling to a sample site.

1. Water Sample VOC Trip Blank - A water sample VOC trip blank is required for every study where water samples are collected for VOC analysis. Sealed preserved (or unpreserved, if unpreserved vials were used during the investigation) 40-ml VOC vials will be transported to the field. Two sealed VOC vials will be submitted per trip blank sample. At least one trip blank sample will be submitted per sample shipment. Trip blanks will be prepared by lab personnel. Investigators should submit their request for trip blanks at least one week in advance of scheduled field investigations and inspections and never (except in emergency situations) less than two days in advance of scheduled field investigations and inspections. These samples should not be picked up earlier than the morning of departure for the scheduled

inspection/investigation. These trip blanks will be handled and treated in the same manner as the water samples collected for volatile organic compounds analysis on that particular study. These samples will be clearly identified on sample labels and Chain-of-Custody Records as trip blanks.

2. Soil/Sediment Sample VOC Trip Blank - A soil/sediment sample VOC trip blank is required for every study where soil and/or sediment samples are collected for VOC analysis. The required containers are specified the USEPA Region 4 ASBLOQAM. The request and pick up of the soil blank sample will be the same as for the water trip blank. En Core® containers will be transported to the field. These blanks will be handled and treated by field investigators in the same manner as the soil samples collected for VOC analysis on that particular study. These samples will be clearly identified on sample labels and Chain-Of-Custody Records as trip blanks. Two sealed En Core® containers will be submitted per trip blank sample. At least one set of trip blank samples will be submitted per sample shipment.

The following blanks are prepared in the field:

1. Sample Preservative Blanks - SESD will generally use chemical preservatives stored in individual single-use vials. The chemical preservative will be tested prior to use for the appropriate analytes. The use of pre-tested, single-use vials eliminates the need to routinely collect preservative blanks in the field. If the preservatives are stored in containers that will be used to preserve multiple samples, blanks will be collected to evaluate the potential for cross-contamination resulting from the preservation process. If preservative blanks are collected, sample containers will be filled with de-ionized water by SESD personnel and transported to the field and preserved and submitted for the same analyses as the other inorganic samples collected. These samples will be clearly identified as preservatives blanks on sample labels and the Chain-Of-Custody Record(s). At least one preservative blank for each type of preserved sample should be collected at the end of routine field investigations. In addition, one preservative blank will be collected for each multi-use bottle of preservative used.

   Note: The deionized water will be generated from a water treatment unit provided by the SESD laboratory.

2. Equipment Rinsate Blanks - Equipment rinsate blanks will be collected whenever field decontamination of equipment to be re-used in sampling activities is performed.

   When field cleaning of equipment is required during a sampling investigation, a piece of the field-cleaned equipment will be selected for collection of a rinse blank. At least one rinse blank will be collected during each week of sampling operations. After the piece of equipment has been field cleaned and prior to its being used for sample operations, it will be rinsed with organic-free water. The rinse water will be collected and submitted for analyses of all

constituents for which normal samples collected with that piece of equipment are being analyzed.

3. Organic-Free Water System Blanks - When using a portable organic-free water generating system in the field, a sample of the water generated by the system will be collected at least once during each week of operations. Based on the objectives of the study or investigation, it may be appropriate to collect a sample of the raw source water. The collected water sample will be submitted for analyses of all constituents for which normal samples are being analyzed.

4. Material Blanks - When construction materials are being used on a site in such a way as to have a potential impact on constituent concentrations in the sample, a sample of each material will be submitted for analysis.

   Note: For drilling operations where materials are shipped directly to the site from the supplier, see SESD Guidance for Design and Installation of Monitoring Wells (SESDGUID-101) for material blank collection and reporting requirements.

5. Automatic Sampler Blanks - In general, cleaning procedures outlined in the SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206) should be adequate to ensure sample integrity. However, it is the standard practice of the Environmental Investigations Branch to submit automatic sampler blanks for analyses when automatic samplers are used to collect samples for organic compounds and metals analyses. Automatic sampler blanks for other standard analyses may be submitted in the event of a special investigation (e.g., criminal or civil).

6. Field Blank - A field blank is a sample that is prepared in the field to evaluate the potential for contamination of a sample by site contaminants from a source not associated with the sample collected (for example air-borne dust or organic vapors which could contaminate a soil sample). Organic-free water is taken to the field in sealed containers or generated on-site. The water is poured into the appropriate sample containers at pre-designated locations at the site. Field blanks should be collected in dusty environments and/or from areas where volatile organic contamination is present in the atmosphere and originating from a source other than the source being sampled.

7. Temperature Blank - A temperature blank is a container of water shipped with each cooler of samples requiring preservation by cooling to 6EC (ice). The temperature of the blank is measured at the time of sample receipt by the laboratory. No temperature blank is necessary for waste samples since waste samples do not require ice for preservation.

8. Wipe Sample Blank - A wipe sample blank is a sample of the material and solvent used for collecting wipe samples. The blank is handled, packaged and transported in the same manner as all other wipe samples with the exception that it is not exposed to actual contact with the sample medium.

9. Water Filter Blank - When filters are used for sampling a dissolved constituent, de-ionized water should be run through at least one filter from each lot and the filtered water submitted for the same analyses. When filters are used for chlorophyll sampling, the filter should be prepared using de-ionized water and submitted for the same chlorophyll analysis.

3.4 Spikes

Spike samples are used to measure bias due to sample handling or analytical procedures. Spike samples are typically used by SESD to evaluate the performance of contract laboratories and are shipped directly to the CLP laboratory by the ESAT contractor.

3.5 Matrix Spike/Matrix Spike Duplicate Samples for Water and Soil Samples for Organic Compounds Analyses

Matrix spike and matrix spike duplicate (MS/MSD) samples will be submitted to the laboratory for volatile organic compounds, extractable organic compounds, pesticides/PCBs and/or herbicides analyses from at least one sampling location per project and laboratory used. One MS/MSD sample should be collected per 20 samples per media collected.

Additional volume will be required for the soil MS/MSD samples. Semi-volatile organic compounds, pesticides, and PCB analyses of soil/sediment samples require the collection of one additional eight ounce glass jar. For VOC soil/sediment samples, triple volume, i.e., nine En Cores® or nine 40 ml vials with syringe collected sample, is needed for the MS/MSD samples.

Additional volume will be required for the water MS/MSD samples. For routine full scan analysis, i.e., extractable organic compounds, pesticides and PCBs, four one-liter amber containers provide the required sample volume. Eight containers, therefore, should be submitted for the MS/MSD sample. For VOC water samples, a total of six 40-ml vials should be collected.

MS/MSD samples should be collected from a location expected to be relatively free from contamination, since the samples will be used for laboratory quality control purposes. The duplicate samples should be clearly identified as "Duplicate Sample for Matrix Spike" or “MS/MSD” on the Chain-Of-Custody Record, in the field logbook and on the Contract Laboratory Program (CLP) Traffic Report Form (if appropriate). This procedure will be followed for all projects where water samples are collected for the indicated analyses. For non-routine sampling events, the Region 4 SESD laboratory should be consulted for specific sample volume and container requirements.

3.6 Matrix Spike/Matrix Spike Duplicate Samples for Water and Soil Samples for Inorganic Analyses

A matrix spike sample and a duplicate sample (MS/MSD) will be submitted to the laboratory for inorganic analyses from at least one sampling location per project and laboratory used. One matrix spike and duplicate sample should be collected per 20 samples per media collected per laboratory.

Soil/sediment and water samples collected for inorganic analyses will normally have sufficient sample volume to perform the matrix spike analyses without requiring the collection of extra sample volume. The project leader should designate a sample, typically one considered to be representative of background or relatively uncontaminated conditions, as the matrix spike sample. For water samples, the sample volume collected will normally provide adequate volume for the MS/MSD analyses.

MS/MSD samples should be collected from a location expected to be relatively free from contamination, since the samples will be used for laboratory quality control purposes. MS/MSD samples should be clearly identified as "Duplicate Sample for Matrix Spike" or "MS/MSD" on the Chain-Of-Custody Record, in the field logbook and on the Contract Laboratory Program (CLP) Traffic Report Form (if appropriate). This procedure will be followed for all projects where water samples are collected for the indicated analyses. For non-routine sampling events, the Region 4 SESD laboratory should be consulted for specific sample volume and container requirements.

3.7 Special Quality Control Procedures for EPA Contract Laboratories

On a case-by-case basis, field investigators may be required to collect split samples (or duplicate samples if appropriate) for analyses by either the Region 4 SESD laboratory or contract laboratories. The split samples are to be submitted to the Region 4 laboratory using established procedures. The contract laboratory involved <u>will not be notified</u> that samples were split, i.e., there should be no indication on Chain-Of-Custody Records or CLP Traffic Report Forms submitted to the contract laboratories that these samples were split with the Region 4 SESD laboratory.

3.8 Special Quality Control Procedures for Dioxins and Furans

The Region 4 laboratory does <u>not</u> conduct in-house analyses for dioxins and furans. Dioxin and furans analyses are conducted by contract laboratories. The Region 4 laboratory may accept environmental samples (soil, sediment, groundwater and surface water) suspected of being contaminated with polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), as long as suspected PCDD and PCDF contamination is not due to RCRA hazardous waste classified as F020-023 and/or F026-028. If these environmental samples are not contaminated with an F020-023 and/or F026-028 waste, it may be analyzed for parameters other than dioxin and furans. Environmental samples known or suspected to be contaminated with the RCRA hazardous waste F020-023 and or F026-028 will not be accepted.

NOTE: Environmental samples suspected of being contaminated with RCRA hazardous waste classified in 40 CFR, 261.31 as F032 will be accepted. The F032 waste is defined as wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations. The F032 listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and or pentachlorophenol. Prior to a sampling event, the project leaders should consult with the Analytical Support Branch Sample Control Coordinator to determine if the Region 4 laboratory can accept the samples. The Region 4 SESD laboratory should also be consulted for the current quality control procedures for dioxins and furans samples prior to a sampling investigation.

4 Internal Quality Control Procedures

The focus of this section is on Field Equipment Center (FEC) operations involving preparation of sampling and support equipment for field operations, as well as, field data generated under the specific sample collection quality control procedures discussed in Section 2. Quality control checks of these operations ensure that field sampling teams are provided with equipment that is suitable for sampling use, and that field sampling is conducted using proper procedures.

4.1 Traceability Requirements

Records, will be kept by FEC personnel documenting the dates of operations and the person performing operations for the following:

1. Organic-Free Water System Maintenance (FEC System) - Maintenance on the FEC organic-free water system will be performed at least once per 180 days.

2. Air Monitoring Safety Instrumentation Checkouts - Pre-loadout checks on safety monitoring instrumentation will be recorded each time they are performed. Discrepancies will be immediately reported to the Branch Safety Officer.

3. Self Contained Breathing Apparatus (SCBA) Checkouts - Pre-loadout checks on SCBAs will be recorded when they are performed. SCBA checkouts will be performed at least once per calendar quarter in the absence of loadout requests. Any discrepancies will be reported immediately to the Branch Safety Officer.

4. Other Equipment Maintenance - Maintenance performed on equipment other than that listed above will be accordance to the SESD Operating Procedure for Equipment Inventory and Management (SESDPROC-108). All required repairs will be reported to appropriate Branch Field Equipment Manager.

5. Tubing, Sampling Containers and Latex Gloves - The Enforcement and Investigations Branch Quality Assurance Officer (EIB QAO) is responsible for conducting verification sampling for tubing, sample containers, and latex gloves that are used during field investigations. Upon receipt, the tubing, containers and gloves are placed in the quarantine room at the FEC. A record is kept of the lot numbers for each shipment received. The EIB QAO will collect blank samples from tubing, containers and gloves within each lot received and will review the results to ensure the sample containers and gloves are suitable for use during field investigations. Once the supplies are deemed suitable, the EIB QAO will release the items for use.

6. Chemical preservatives commercially purchased will be tested prior to use. Each lot of chemical preservative will be tested for the appropriate analytes by either the BFEM or Branch QAO. Once released by Branch QAO, the preservatives can be used in the field.

7. Equipment - All equipment cleaned and wrapped for field use will be marked with the date on which preparation was completed. Equipment will be stored at the FEC in specified areas to minimize the risk of contamination while awaiting use.

4.2 Specific Quality Control Checks

When collecting samples during field investigations, it is necessary to take measures to prevent cross contamination to ensure the integrity of the data generated. The field branches conduct verification sampling of sample containers, gloves, sampling equipment, tubing and water utilized during field investigations as one of these measures. At least once per calendar quarter, the EIB QAO will conduct the following checks and issue a written report to the EIB Branch Chief and Field Quality Manager with the results.

1. Collect and submit for analyses samples of each new lot of containers received, Bottles from each lot will be tagged and sealed, then submitted for the following analyses:

    1. 1-liter Amber – extractable organics, pesticides, and PCBs.

    2. 8-oz. Clear Glass – metals, cyanide, extractable organics, pesticides, PCBs, and volatile organic compounds.

    3. 1-Liter Polyethylene – metals and cyanide.

    NOTE: In addition to the quality control checks listed above, samples may be collected during field investigations for classical inorganic parameters such as nitrates, nitrites, sulfides, etc. Due to the detection levels generally required for these parameters, it is unlikely that cross contamination may occur in association with the sample containers and sampling equipment used during sample collection. Therefore, classical inorganic analyses are not conducted as part of the routine quality control checks. If the data quality objectives require additional quality control checks, bottles will be submitted to the laboratory for analyses.

2. Collect and submit for analyses a rinsate blank for each new lot of latex gloves received during the calendar quarter. Samples will be collected as rinse blanks using organic-free water. The rinsate will be submitted for analyses of VOCs, metals, cyanide, extractable organics, pesticides and PCBs. A new glove will be rinsed for each parameter (e.g., one glove for the VOC sample, another glove for metals, etc.) to avoid dilution of potential contaminants on the gloves. Water for the VOC samples should be provided by the ASB laboratory.

3. Collect and submit for analyses a sample of water from the FEC organic-free water system. The sample will be submitted for analyses of VOCs, metals, cyanide, extractable organics, pesticides and PCBs.

4. Collect and submit for analyses a rinsate blank of at least one piece of sampling or sample related equipment stored at the FEC. The sample will submitted for analyses of VOCs, metals, cyanide, extractable organics, pesticides and PCBs. Water for the VOC samples should be provided by the ASB laboratory.

5. Collect and submit for analyses a rinsate blank for each new lot of Silastic® or Tygon® tubing used in peristaltic pump head. The sample will be submitted for metals and cyanide analysis.

6. Teflon® tubing – Collect and submit for analyses a rinsate blank for each new lot of Teflon® tubing received. Rinse blanks will be collected through the Teflon tubing The sample will be submitted for metals, cyanide, extractable organics, volatile organic compounds, pesticides and PCBs. Water for the VOC samples should be provided by the ASB laboratory.

4.3 Quality Control for Special Order Equipment and Supplies

Some equipment and supplies ordered for specific projects are received in what can be considered ready to use condition. In order to ensure the integrity of these materials, an equipment rinsate blank will be collected from at least one item in each lot. The equipment and supplies will not be used until the QAO has reviewed the analytical data for the blanks and released the items.

4.4 Quality Control Evaluation and Corrective Action

All field investigation reports will contain a clearly identified section where the results for all field generated quality control (QC) samples are discussed and reported. Quality control data review includes but is not limited to detections of organic and inorganic compounds at any concentration in quality control blanks (i.e., trip blanks, equipment rinsate blanks, portable organic-free water system blanks, etc.).

All detections of organic and inorganic compounds will be immediately reported to the appropriate branch QAO. The project leader will analyze of the results to determine if the source of contamination can be identified. If the source of contamination cannot be determined by the project leader, the branch QAO will conduct an additional review of the results to assess the source of contamination. If the source of contamination cannot be determined, the branch QAO will monitor all quality control results generated by the branch and assess the data for trends of contamination.

If it is determined by the project leader and the branch QAO that the contamination adversely impacts the data collected during the investigation, the project leader will report the results to their Section Chief and the FQM. The project leader, in consultation

with management, will determine whether the impacted data are usable or should be rejected. If data are rejected, the project leader and their management will determine whether samples must be recollected.

Data reported to the FQM will be analyzed to determine if the contamination is due to non-conforming work. If it is determined by the FQM, in consultation with management, that the contamination is due to non-conforming work, a corrective action is warranted and will be selected and implemented in a timely manner. If a corrective action is required, it must be implemented and reported according to the SESD Operating Procedure for Corrective Action (SESDPROC-009). If contamination is not due to non-conforming field work, then the source of contamination will be identified, if possible, and documented by the FQM. If the source of contamination cannot be determined, FQM will monitor all quality control results generated by SESD and assess the data for trends of contamination.

4.4.1 Quality Assurance Reports

It is each project leader's responsibility to ensure that a copy of the quality assurance data from each field investigation report is provided to their respective branch QAO. Each branch QAO will compile a quarterly report of field quality assurance data and forward the report to the FQM.

The FQM will prepare an annual quality assurance report based on the reports provided by the branch QAOs. This report will be distributed to all field investigators each year and will document and discuss all quality control issues or trends identified during the data review. This report will be retained by the FQM to document that QC measures have been taken, that the QC measures are appropriate, that the QC results are acceptable or, if not, that corrective actions were taken.

Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Groundwater Sampling**

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Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the SESD Document Control Coordinator on the SESD local area network (LAN).

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SESDPROC-301-R3, Groundwater Sampling, replaces SESDPROC-301-R2. **General:** Corrected any typographical, grammatical and/or editorial errors. **Title Page:** Changed author from Donald Hunter to Jonathan Vail. Changed Enforcement and Investigations Branch Chief from Archie Lee to Danny France. **Revision History:** Changes were made to reflect the current practice of only including the most recent changes in the revision history. **Section 2.3**: Item 4 was revised to reflect practice of using individual single-use preservative vials instead of preservatives prepared by ASB.	**March 6, 2013**
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SESDPROC-301-R0, Groundwater Sampling, Original Issue	**February 05, 2007**

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1 General Information

1.1 Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when collecting groundwater samples for field screening or laboratory analysis.

1.2 Scope/Application

The procedures contained in this document are to be used by field personnel when collecting and handling groundwater samples in the field. On the occasion that SESD field personnel determine that any of the procedures described are either inappropriate, inadequate or impractical and that another procedure must be used to obtain a groundwater sample, the variant procedure will be documented in the field logbook, along with a description of the circumstances requiring its use. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD Local Area Network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.4 References

Columbia Analytical Services, Lab Science News, Passive Diffusion Devices & Polyethylene Diffusion Bag (PDB) Samplers.

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

Puls, Robert W., and Michael J. Barcelona. 1989. Filtration of Ground Water Samples for Metals Analysis. Hazardous Waste and Hazardous Materials 6(4), pp.385-393.

Puls, Robert W., Don A. Clark, and Bert Bledsoe. 1992. Metals in Ground Water: Sampling Artifacts and Reproducibility. Hazardous Waste and Hazardous Materials 9(2), pp. 149-162.

SESD Guidance Document, Design and Installation of Monitoring Wells, SESDGUID-001, Most Recent Version

SESD Operating Procedure for Control of Records, SESDPROC-002, Most Recent Version

SESD Operating Procedure for Sample and Evidence Management, SESDPROC-005, Most Recent Version

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

SESD Operating Procedure for Field Sampling Quality Control, SESDPROC-011, Most Recent Version

SESD Operating Procedure for Field pH Measurement, SESDPROC-100, Most Recent Version

SESD Operating Procedure for Field Specific Conductance Measurement, SESDPROC-101, Most Recent Version

SESD Operating Procedure for Field Temperature Measurement, SESDPROC-102, Most Recent Version

SESD Operating Procedure for Field Turbidity Measurement, SESDPROC-103, Most Recent Version

SESD Operating Procedure for Groundwater Level and Well Depth Measurement, SESDPROC-105, Most Recent Version

SESD Operating Procedure for Management of Investigation Derived Waste, SESDROC-202, Most Recent Version

SESD Operating Procedure for Pump Operation, SESDPROC-203, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC, SESDPROC-206, Most Recent Version

SESD Operating Procedure for Potable Water Supply Sampling, SESDPROC-305, Most Recent Version

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United States Environmental Protection Agency (US EPA). 1975. Handbook for Evaluating Water Bacteriological Laboratories. Office of Research and Development (ORD), Municipal Environmental Research Laboratory, Cincinnati, Ohio.

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US EPA. 1981. "Final Regulation Package for Compliance with DOT Regulations in the Shipment of Environmental Laboratory Samples," Memo from David Weitzman, Work Group Chairman, Office of Occupational Health and Safety (PM-273), April 13, 1981.

US EPA. 1995. Ground Water Sampling - A Workshop Summary. Proceedings from the Dallas, Texas November 30 – December 2, 1993 Workshop. ORD, Robert S. Kerr Environmental Research Laboratory. EPA/600/R-94/205, January 1995.

US EPA. Analytical Support Branch Laboratory Operations and Quality Assurance Manual. Region 4 SESD, Athens, GA, Most Recent Version

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version

1.5 General Precautions

1.5.1 Safety

Proper safety precautions must be observed when collecting groundwater samples. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASP) for guidelines on safety precautions. These guidelines should be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.5.2 Procedural Precautions

The following precautions should be considered when collecting groundwater samples.

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Always sample from the anticipated cleanest, i.e., least contaminated location, to the most contaminated location. This minimizes the opportunity for cross-contamination to occur during sampling.
- Collected samples must remain in the custody of the sampler or sample custodian until the samples are relinquished to another party.

- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.
- Documentation of field sampling is done in a bound logbook.
- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as air bills, bills of lading, etc., shall be retained by the project leader and placed in the project files.

2 Special Sampling Considerations

2.1 Volatile Organic Compounds (VOC) Analysis

Groundwater samples for VOC analysis must be collected in 40 ml glass vials with Teflon® septa. The vial may be either preserved with concentrated hydrochloric acid or they may be unpreserved. Preserved samples have a two-week holding time, whereas unpreserved samples have only a seven-day holding time. In the great majority of cases, the preserved vials are used to take advantage of the extended holding time. In some situations, however, it may be necessary to use the unpreserved vials. For example, if the groundwater has a high amount of dissolved limestone, i.e., is highly calcareous, there will most likely be an effervescent reaction between the hydrochloric acid and the water, producing large numbers of fine bubbles. This will render the sample unacceptable. In this case, unpreserved vials should be used and arrangements must be confirmed with the laboratory to ensure that they can accept the unpreserved vials and meet the shorter sample holding times.

The samples should be collected with as little agitation or disturbance as possible. The vial should be filled so that there is a meniscus at the top of the vial and absolutely no bubbles or headspace should be present in the vial after it is capped. After the cap is securely tightened, the vial should be inverted and tapped on the palm of one hand to see if any undetected bubbles are dislodged. If a bubble or bubbles are present, the vial should be topped off using a minimal amount of sample to re-establish the meniscus. Care should be taken not to flush any preservative out of the vial during topping off. If, after topping off and capping the vial, bubbles are still present, a new vial should be obtained and the sample re-collected.

Samples for VOC analysis must be collected using either stainless steel or Teflon® equipment, such as:

- Bailers must be constructed of stainless steel or Teflon®
- RediFlo2® submersible pumps used for sampling should be equipped with Teflon® sample delivery tubing
- Peristaltic pump/vacuum jug assemblies should be outfitted with Teflon® tubing from the water column to the transfer cap, which should also be constructed of Teflon®

2.2 Special Precautions for Trace Contaminant Groundwater Sampling

- A clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- Sample containers for samples suspected of containing high concentrations of contaminants shall be stored separately.

- Sample collection activities shall proceed progressively from the least suspected contaminated area to the most suspected contaminated area if sampling devices are to be reused. Samples of waste or highly contaminated media must not be placed in the same ice chest as environmental (i.e., containing low contaminant levels) or background samples.
- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.
- Clean plastic sheeting will be placed on the ground at each sample location to prevent or minimize contaminating sampling equipment by accidental contact with the ground surface.
- Samplers must use new, verified certified-clean disposable or non-disposable equipment cleaned according to procedures contained in SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205) or SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206) for collection of samples for trace metals or organic compound analyses.

2.3 Sample Handling and Preservation Requirements

1. Groundwater samples will typically be collected from the discharge line of a pump or from a bailer, either from the pour stream of an up-turned bailer or from the stream from a bottom-emptying device. Efforts should be made to reduce the flow from either the pump discharge line or the bailer during sample collection to minimize sample agitation.

2. During sample collection, make sure that the pump discharge line or the bailer does not contact the sample container.

3. Place the sample into appropriate, labeled containers. Samples collected for VOC, acidity and alkalinity analysis must not have any headspace. All other sample containers must be filled with an allowance for ullage.

4. All samples requiring preservation must be preserved as soon as practically possible, ideally immediately at the time of sample collection. If preserved VOC vials are used, these will be preserved with concentrated hydrochloric acid by ASB personnel prior to departure for the field investigation. For all other chemical preservatives, SESD will use the appropriate chemical preservative generally stored in an individual single-use vial as described in the SESD Operating Procedure for Field Sampling Quality Control (SESDPROC-011). The adequacy of sample preservation will be checked after the addition of the preservative for all samples except for the samples collected for VOC analysis. If additional preservative is needed, it should be added to achieve adequate preservation. Preservation requirements for groundwater samples are found in the USEPA Region 4 Analytical Support Branch Laboratory Operations and Quality Assurance Manual (ASBLOQAM).

2.4 Quality Control

If possible, a control sample should be collected from a location not affected by the possible contaminants of concern and submitted with the other samples. This control sample should be collected as close to the sampled area as possible and from the same water-bearing formation. Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by pumps, bailers or other sampling equipment.

2.5 Records

Information generated or obtained by SESD personnel will be organized and accounted for in accordance with SESD records management procedures found in SESD Operating Procedure for Control of Records, SESDPROC-002. Field notes, recorded in a bound field logbook, will be generated, as well as chain-of-custody documentation in accordance with SESD Operating Procedure for Logbooks, SESDPROC-010 and SESD Procedure for Sample and Evidence Management, SESDPROC-005.

3 Groundwater Sampling Methods – Purging

3.1 General

Purging is the process of removing stagnant water from a well, immediately prior to sampling, causing its replacement by groundwater from the adjacent formation that is representative of actual aquifer conditions. In order to determine when a well has been adequately purged, field investigators should monitor, at a minimum, the pH, specific conductance and turbidity of the groundwater removed during purging and, in the case of permanent monitoring wells, observe and record the volume of water removed.

There are several purging strategies that may be used, depending on specific conditions encountered for given well sampling situations. When a specific well is characterized, based on the field investigators experience and knowledge, as having fairly typical water levels, depths and purge volumes, as determined according to the procedures in Section 3.2.1, below, SESD will normally use the multiple volume purging procedures and equipment described in Sections 3.2.1 and 3.3 of this procedure for purging the well.

When the traditional multiple volume purge method is considered and it is determined that excessive quantities of IDW would be generated using this method, it may be appropriate, under very limited and specific circumstances, to use an alternate method that reduces the time and amount of purge water to be removed prior to sampling the well. The field project leader will select the alternate method only after careful consideration of the conditions presented by the well and the impact these conditions have on all aspects of the sampling event (time required to sample, quantities of IDW requiring management, etc.).

The alternate purge procedures or sampling strategies available are the "Tubing-in-Screened Interval" method and the MicroPurge or No-Purge methods. These are described and discussed in Sections 3.2.2 and 4.5 of this operating procedure, respectively.

3.2 Purging Methods and Strategies

3.2.1 Traditional Multiple Volume Purge

3.2.1.1 Purging and Purge Adequacy

3.2.1.1.1 Purge Volume Determination

Prior to initiating the purge, the amount of water standing in the water column (water inside the well riser and screen) should be determined, if possible. To do this, the diameter of the well should be determined and the water level and total depth of the well should be measured and recorded. Specific methodology for obtaining these measurements is found in SESD Operating Procedure for Groundwater Level and Well Depth Measurement (SESDPROC-105).

Once this information is obtained, the volume of water to be purged can be determined using one of several methods. One is the equation:

$V = 0.041\ d^2h$

Where: h = depth of water in feet
d = diameter of well in inches
V = volume of water in gallons

Alternatively, the volume of standing water in the well and the volume of three water columns may be determined using a casing volume per foot factor for the appropriate diameter well, similar to that in Table 3.2.1. The water level is subtracted from the total depth, providing the length of the water column. This length is multiplied by the appropriate factor in the Table 3.2.1, corresponding to either the single well volume or the triple well volume, to determine both the single well volume and triple well volumes, in gallons, for the well in question. Other acceptable methods include the use of nomographs or other equations or formulae.

TABLE 3.2.1: WELL CASING DIAMETER VOLUME FACTORS

Casing Diameter (inches)	Gallons/ft, One Water Column	Gallons/ft, Three Water Columns
1	0.04	0.12
2	0.16	0.48
3	0.37	1.11
4	0.65	1.98
5	1.02	3.06
6	1.47	4.41
7	1.99	5.97
8	2.61	7.83
9	3.30	9.90
10	4.08	12.24
11	4.93	14.79
12	5.87	17.61

With respect to volume, an adequate purge is normally achieved when three to five well volumes have been removed. The field notes should reflect the single well volume calculations or determinations, according to one of the above methods, and a reference to the appropriate

multiplication of that volume, i.e., a minimum three well volumes, clearly identified as a purge volume goal.

3.2.1.1.2 Chemical Parameter Stabilization Criteria

With respect to the ground water chemistry, an adequate purge is achieved when the pH and specific conductance of the ground water have stabilized and the turbidity has either stabilized or is below 10 Nephelometric Turbidity Units (NTUs) (twice the Primary Drinking Water Standard of 5 NTUs). Although 10 NTUs is normally considered the minimum goal for most ground water sampling objectives, lower turbidity has been shown to be easily achievable in most situations and reasonable attempts should be made to achieve these lower levels. (Note: Because groundwater temperature is subject to rapid changes when collected for parameter measurement, its usefulness is subject to question for the purpose of determining parameter stability. As such, it has been removed from the list of parameters used for stability determination. Even though temperature is not used to determine stability during well purging, it is still advisable to record the sample temperature, along with the other groundwater chemistry parameters during well purging, as it may be needed to interpret other chemical parameter results in some situations.)

Stabilization occurs when, for at least three consecutive measurements, the pH remains constant within 0.1 Standard Unit (SU) and specific conductance varies no more than approximately 5 percent. Other parameters, such as dissolved oxygen (DO), may also be used as a purge adequacy parameter. Normal goals for DO are 0.2 mg/L or 10% saturation, whichever is greater. DO measurements must be conducted using either a flow-through cell or an over-topping cell to minimize or reduce any oxygenation of the sample during measurement. Oxidation Reduction Potential (ORP) should not be used as a purge stabilization parameter but may be measured during purging to obtain the measurement of record for ORP for the sampling event.

There are no set criteria for establishing how many total sets of measurements are adequate to document stability of parameters. If the calculated purge volume is small, the measurements should be taken frequently enough to provide a sufficient number of measurements to evaluate stability. If the purge volume is large, measurements taken every 15 minutes, for example, may be sufficient. See the SESD Operating Procedures for Field pH Measurement (SESDPROC-100), Field Specific Conductance Measurement (SESDPROC-101), Field Temperature Measurement (SESDPROC-102), Field Turbidity Measurement (SESDPROC-103), Field Measurement of Dissolved Oxygen (SESDPROC-106) and Field Measurement of Oxidation-Reduction Potential (SESDPROC-113) for procedures for conducting these measurements.

If, after three well volumes have been removed, the chemical parameters have not stabilized according to the above criteria, additional well volumes (up to five well volumes), should be removed. If the parameters have not stabilized within five volumes, it is at the discretion of the project leader whether or not to collect a sample or to continue purging. If, after five well volumes, pH and conductivity have stabilized and the turbidity is still decreasing and approaching an acceptable level, additional purging should be considered to obtain the best sample possible, with respect to turbidity. The conditions of sampling should be noted in the field log.

3.2.1.1.3 Purge Adequacy Considerations

In some situations, even with slow purge rates, a well may be pumped or bailed dry (evacuated). In these situations, this generally constitutes an adequate purge and the well can be sampled following sufficient recovery (enough volume to allow filling of all sample containers). ***It is not necessary that the well be evacuated three times before it is sampled***. The pH, specific conductance, temperature, and turbidity should be measured and recorded, during collection of the sample from the recovered volume, as the measurements of record for the sampling event.

For wells with slow recovery, attempts should be made to avoid purging them to dryness. This can be accomplished, for example, by slowing the purge rate. As water enters a well that has been purged to dryness, it may cascade down the sand pack and/or the well screen, stripping volatile organic constituents that may be present and/or introducing soil fines into the water column.

It is particularly important that wells be sampled as soon as possible after purging. If adequate volume is available immediately upon completion of purging, the well must be sampled immediately. If not, sampling should occur as soon as adequate volume has recovered. If possible, sampling of wells which have a slow recovery should be scheduled so that they can be purged and sampled in the same day, after adequate volume has recovered. Wells of this type should, unless it is unavoidable, not be purged at the end of one day and sampled the following day.

3.2.2 "Tubing-in-Screened-Interval" Method

The "Tubing-in-Screen" method, sometimes referred to as the "Low Flow" method, is used primarily when calculated purge volumes for the traditional purging method are excessive and present issues related to timely completion of the project and/or management of investigation derived waste.

3.2.2.1 Purge Criteria

3.2.2.1.1 Placement of Pump Tubing or Intake

The peristaltic pump tubing or intake point of the submersible pump is placed in the approximate mid-portion of the screened interval of the well. By definition, this method cannot be applied for purging with a bailer.

3.2.2.1.2 Conditions of Pumping

Prior to initiation of pumping, a properly decontaminated well sounder should be lowered into the well being sampled to monitor the static water level prior to and during the purging process. Ideally, there should be only a slight and stable drawdown of the water column after pumping begins. If this condition cannot be met, then one of the other methods should be employed.

3.2.2.1.3 Stability of Chemical Parameters

As with the traditional purging method described in Section 3.2.1, it is important that all chemical parameters be stable as defined in Section 3.2.1.1 prior to sampling.

3.3 Equipment Considerations for Purging

Monitoring well purging is accomplished by using in-place plumbing and dedicated pumps or by using portable pumps/equipment when dedicated systems are not present. The equipment utilized by Branch personnel will usually consist of peristaltic pumps and variable speed electric submersible pumps, but may also include bladder pumps or inertial pumps. The pump of choice is usually a function of the well diameter, the depth to water, the depth of the well and the amount of water that is to be removed during purging. Whenever the head difference between the sampling location and the water level is less than the limit of suction and the volume to be removed is reasonably small, a peristaltic pump should be used for purging. For wells where the water level is below the limit of suction (approximately 25’ to 30’, and/or where there is a large volume of water to be purged), the variable speed electric submersible pump would be the pump of choice. SESD Operating Procedure for Pump Operation (SESDPROC-203) contains the use and operating instructions for all pumps commonly used during SESD ground water investigations.

Bailers may also be used for purging in appropriate situations, however, their use is discouraged. Bailers tend to disturb any sediment that may be present in the well, creating or increasing sample turbidity. Bailers, if improperly used, may also strip volatile organic compounds from the water column being sampled. If a bailer is used, it should be a closed-top Teflon® bailer.

3.3.1 Wells Without Plumbing or In-Place Pumps

For permanent monitoring wells, the depth to water (water level) and depth of the well (total depth) should be determined before purging. Caution should be exercised during this procedure to prevent cross-contamination between wells. This is a critical concern when samples for trace organic compounds or metals analyses are collected. See SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205) for cleaning procedures for well sounders. After cleaning, the well sounding device should be protected to keep it clean until its next use.

3.3.1.1 Purging with Pumps

3.3.1.1.1 Peristaltic Pumps

The following step-by-step procedures describe the process of purging with a peristaltic pump:

1. Cut a length of standard-cleaned (SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206)) Teflon® tubing, equal to the well depth plus an additional five to ten feet. Enough tubing is needed to run from the ground surface up to the top of the well casing and back down to the bottom of the well. This will allow for operation of the pump at all possible water level conditions in the well.

2. Place one end of the tubing into the vacuum side of the peristaltic pump head. Proper sizing of the Teflon® and Silastic® or Tygon® tubing should allow for a snug fit of the Teflon® tubing inside the flexible tubing mounted in the pump head.

3. Run a short section of tubing (does not have to be Teflon®) from the discharge side of the pump head to a graduated bucket.

4. Place the free end of the Teflon® tubing into the well until the end of the tubing is just below the surface of the water column.

5. Secure the Teflon® tubing to the well casing or other secure object using electrician's tape or other suitable means. This will prevent the tubing from being lost in the well should the tubing detach from the pump head.

6. Turn on the pump to produce a vacuum on the well side of the pump head and begin the purge. Observe pump direction to ensure that a vacuum is being applied to the purge line. If the purge line is being pressurized, either switch the tubing at the pump head or reverse the polarity of the cables on the pump or on the battery.

7. If the pumping rate exceeds the recovery rate of the well, continue to lower the tubing into the well, as needed, until the drawdown stabilizes or the well is evacuated to dryness. If the pump is a variable speed peristaltic pump, and the water level in the well is being drawn down, reduce the speed of the pump in an attempt to stabilize the drawdown. If the well can be purged without evacuating the well to dryness, a sample with greater integrity can be obtained.

8. For wells which are not evacuated to dryness, particularly those with recovery rates equal to or very nearly equal to the purge rate, there may not be a complete exchange and removal of stagnant water in that portion of the water column above the tubing intake. For this reason, it is important that the tubing intake be placed in the very uppermost portion of the water column while purging. Standard field measurements should frequently be taken during this process to verify adequacy of the purge and readiness for sampling, as described in Section 3.

3.3.1.1.2 Submersible Pumps

When a submersible pump is used for well purging, the pump itself is lowered into the water column. The pump must be cleaned as specified in SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205).

The pump/hose assembly used in purging should be lowered into the top of the standing water column and not deep into the column. This is done so that the purging will "pull" water from the formation into the screened area of the well and up through the casing so that the entire static volume can be removed. If the pump is placed deep into the water column, the water above the pump may not be removed, and the subsequent samples, particularly if collected with a bailer, may not be representative of the aquifer conditions. It is recommended that the pump not be lowered more than three to five feet into the water column. If the recovery rate of the well is faster than the pump rate and no observable draw down occurs, the pump should be raised until the intake is within one foot of the top of the water column for the duration of purging. If the pump rate exceeds the recovery rate of the well, the pump will have to be lowered, as needed, to accommodate the drawdown. After the pump is removed from the well, the hose and the pump should be cleaned as outlined in SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205).

3.3.1.2 Purging with Bailers

Standard-cleaned (SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205) or SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206)), closed top Teflon® bailers with Teflon® coated stainless steel leaders and new nylon rope are lowered into the top of the water column, allowed to fill, and removed. It is critical that bailers be slowly and gently immersed into the top of the water column, particularly during final stages of purging, to minimize turbidity and disturbance of volatile organic constituents. The use of bailers for purging and sampling is discouraged because the correct technique is highly operator dependent and improper use may result in an unrepresentative sample.

3.3.2 Wells With In-Place Plumbing

Wells with in-place plumbing are commonly found at municipal water treatment plants, industrial water supplies, private residences, etc. Many permanent monitoring wells at active facilities are also equipped with dedicated, in-place pumps. The objective of purging wells with in-place pumps is the same as with monitoring wells without in-place pumps, i.e., to ultimately collect a ground water sample representative of aquifer conditions. Among the types of wells identified in this section, two different approaches are necessary.

A permanent monitoring well with an in-place pump should, in all respects, be treated like a monitoring well without a pump. One limitation is that in most cases the in-place pump is “hard” mounted, that is, the pump is suspended in the well at a pre-selected depth and cannot be moved up or down during purging and sampling. In these cases, well volumes are calculated, parameters are measured and the well is sampled from the pump discharge, after volume removal and parameter conditions have been met.

In the case of the other types of wells, i.e., municipal, industrial and residential supply wells, however, not enough is generally known about the construction aspects of the wells to apply the same criteria as used for monitoring wells, i.e., 3 to 5 well volumes. The volume to be purged in these situations, therefore, depends on several factors: whether the pumps are running continuously or intermittently and whether or not any storage/pressure tanks are located between the sampling point and the pump. The following considerations and procedures should be followed when purging wells with in-place plumbing under the conditions described.

3.3.2.1 Continuously Running Pumps

If the pump runs more or less continuously, no purge (other than opening a valve and allowing it to flush for a few minutes) is necessary. If a storage tank is present, a spigot, valve or other sampling point should be located between the

pump and the storage tank. If not, locate the valve closest to the tank. Measurements of pH, specific conductance, temperature, and turbidity are recorded at the time of sampling.

3.3.2.2 Intermittently or Infrequently Running Pumps

If the pump runs intermittently or infrequently, best judgment should be utilized to remove enough water from the plumbing to flush standing water from the piping and any storage tanks that might be present. Generally, under these conditions, 15 to 30 minutes will be adequate. Measurements of pH, specific conductance, temperature and turbidity should be made and recorded at intervals during the purge and the final measurements made at the time of sampling should be considered the measurements of record for the event.

3.3.3 Temporary Monitoring Wells

3.3.3.1 General Considerations

Procedures used to purge temporary ground water monitoring wells differ from permanent wells because temporary wells are installed for immediate sample acquisition. Wells of this type may include standard well screen and riser placed in boreholes created by hand augering, power augering, or by drilling. They may also consist of a rigid rod and screen that is pushed, driven, or hammered into place to the desired sampling interval, such as a direct push Wellpoint®, a Geoprobe® Screen Point 15/16 sampler or a Hydropunch® sampler. As such, the efforts to remove several volumes of water to replace stagnant water do not necessarily apply because stagnant water is not present. It is important to note, however, that the longer a temporary well is in place and not sampled, the more stagnant the water column becomes and the more appropriate it becomes to apply, to the extent possible, standard permanent monitoring well purging criteria to it to re-achieve aquifer conditions.

In cases where the temporary well is to be sampled immediately after installation, purging is conducted primarily to mitigate the impacts of installation. In most cases, temporary well installation procedures disturb the existing aquifer conditions, resulting primarily in increased turbidity. Therefore, the goal of purging is to reduce the turbidity and remove the volume of water in the area directly impacted by the installation procedure. Low turbidity conditions in these types of wells that are completed within the limit of suction are typically and routinely achieved by the use of low-flow/low stress purging techniques using variable speed peristaltic pumps.

3.3.3.2 Purging When Water Level Is Within Limit of Suction

In situations where the elevation of the top of the water column is within the limit of suction (no greater than about 25 feet head difference between the pump and the water level), a variable speed peristaltic pump may be used to purge

temporary wells. Enough tubing is deployed to reach the bottom of the temporary well screen. At the onset of purging, the tubing is slowly lowered to the bottom of the screen and is used to remove any formation material which may have entered the well screen during installation. This is critical to ensuring rapid achievement of low turbidity conditions. After the formation material is removed from the bottom of the screen, the tubing is slowly raised through the water column to near the top of the column. The tubing can be held at this level to determine if the pump rate is drawing down the water level in the well. If the water level remains the same, secure the tubing at the surface to maintain this pumping level.

If drawdown is observed on initiation of pumping, reduce the pump speed and attempt to match the drawdown of the well. Sustained pumping at these slow rates will usually result in a relatively clear, low turbidity sample. If the drawdown stabilizes, maintain that level, however, if it continues to lower, "chase" the water column until the well is evacuated. In this case, the recovered water column may be relatively free of turbidity and can be sampled. It may take several episodes of recovery to provide enough volume for a complete sample.

3.3.3.3 Purging When Water Level Is Greater Than Limit of Suction

In situations where the elevation of the water table is greater than the limit of suction, peristaltic pumps cannot be used to purge temporary wells. If the temporary well is a ScreenPoint15® sampler with small diameter probe rod riser, the only practical choices for water removal are a small diameter bailer, a small diameter bladder pump or an inertial pump. If the well is to be used strictly for VOC screening, it may be acceptable to use the bailer to bail as much sediment from the well as possible prior to sampling. If metals are the analytes of concern, the bladder pump is the best choice for lowering the turbidity of the water column prior to sampling, followed next by the inertial pump. For larger diameter temporary wells, two-inch diameter or greater, bailers and the Grundfos® RediFlo2 may be used although excessive silt or other “fines” may present problems with the operation of the pump.

3.3.3.4 Considerations for Direct Push Groundwater Sampling

With many of the direct push sampling techniques, purging is either not practical or possible, therefore, no purging is conducted. The sampling device is simply pushed or driven to the desired depth and opened and the sample is collected and retrieved. As a result, some samples collected in this way may not be satisfactory or acceptable for certain analyses, i.e., the subject procedure may yield a turbid sample that is not appropriate for metals analyses.

3.4 Field Care of Purging Equipment

New plastic sheeting should be placed on the ground surface around the well casing to prevent contamination of the pumps, hoses, ropes, etc., in the event they accidentally

come into contact with the ground surface or, for some reason, they need to be placed on the ground during the purging event. It is preferable that hoses used in purging that come into contact with the ground water be kept on a spool or contained in a large wash tub lined with plastic sheeting, both during transportation and during field use, to further minimize contamination by the transporting vehicle or the ground surface.

Careful consideration shall be given to using submersible pumps to purge wells which are excessively contaminated with oily compounds, because it may be difficult to adequately decontaminate severely contaminated pumps under field conditions. When wells of this type are encountered, alternative purging methods, such as bailers, should be considered.

3.5 Investigation Derived Waste

Purging generates quantities of purge water or investigation derived waste (IDW), the disposition of which must be considered. See SESD Operating Procedure for Management of Investigation Derived Waste (SESDPROC-202) for guidance on management or disposal of this waste.

4 Groundwater Sampling Methods – Sampling

4.1 General

Sampling is the process of obtaining, containerizing, and preserving (if required) a ground water sample after the purging process is complete. Non-dedicated pumps for sample collection generally should not be used. Many pumps are made of materials such as brass, plastic, rubber, or other elastomeric products which may cause chemical interferences with the sample. Their principle of operation may also render them unacceptable as a sample collection device. It is recognized that there are situations, such as industrial or municipal supply wells or private residential wells, where a well may be equipped with a dedicated pump from which a sample would not normally be collected. Discretion should always be used in obtaining a sample.

4.2 Sampling Wells With In-Place Plumbing

Samples should be collected following purging from a valve or cold water tap as near to the well as possible, preferably prior to any storage/pressure tanks or physical/chemical treatment system that might be present. Remove any hose that may be present before sample collection and reduce the flow to a low level to minimize sample disturbance, particularly with respect to volatile organic constituents. Samples should be collected directly into the appropriate containers as specified in the ASBLOQAM. It may be necessary to use a secondary container, such as a clean 8 oz. or similar size sample jar or a stainless steel scoop, to obtain and transfer samples from spigots with low ground clearance. Also, refer to the discussion in the SESD Operating Procedure for Potable Water Supply Sampling (SESDPROC-305), Sec. 4.2, Potable Water Samples Collected from Wells with In-Place Plumbing**.** Potable well measurements for pH, specific conductance and turbidity and possibly temperature, if warranted, should be recorded at the time of sample collection.

4.3 Sampling Wells Without Plumbing, Within the Limit of Suction

4.3.1 Equipment Available

The pump of choice for sampling ground water within the limit of suction is the variable-speed peristaltic pump. Its use is described in the following sections. Other acceptable alternatives that may be used under these conditions are the RediFlo2® electric submersible pump (with Teflon® tubing) and a closed-top Teflon® bailer.

4.3.1.1 Peristaltic Pump, Direct from Pump Head Tubing

Samples for some constituents, primarily inorganic analytes such as metals and cyanide, may be collected directly from the pump head tubing. This method is acceptable under the following conditions:

- The pump head tubing must be changed between sampling locations;

- The pump head tubing must be either be certified clean according to SESD's internal quality control program described in Section 3.2 of the SESD Operating Procedure for Field Sampling Quality Control (SESDPROC-011) or
- An equipment rinsate blank is collected by pumping de-ionized water through a piece of the tubing.

4.3.1.2 Peristaltic Pump/Vacuum jug

It is not acceptable to collect samples for organic compound analyses through the flexible tubing used in the pump head. When collecting samples for organic compound analyses it is necessary to use a vacuum container, placed between the pump and the well for sample collection. The following step-by-step procedures describe the process of sampling with a peristaltic pump and vacuum jug (see note following these procedures for collection of VOC samples):

1. Disconnect the purge tubing from the pump. Make sure the tubing is securely attached to the protective casing or other secure object.

2. Insert the tubing into one of the ferrule nut fittings of a Teflon® vacuum container transfer cap assembly.

3. Place a suitable length of Teflon® tubing between the remaining transfer cap assembly ferrule nut fitting and the vacuum side of the flexible tubing in the peristaltic pump head. Securely hand-tighten both fittings.

4. Turn the pump on. Water should begin to collect in the transfer container (typically a 1-liter sample container) within a few minutes. If water does not begin to flow into the container within several minutes, check the transfer cap fittings and make sure the assembly is tightly attached to the container. It may be necessary to tighten the ferrule nuts with a wrench or pliers to achieve a vacuum in the system, particularly when approaching the maximum head difference between the pump and water table (limit of suction).

5. When the transfer container is nearly full, turn off the pump, remove the transfer cap assembly, and pour the sample into the appropriate containers. Because the 1-liter containers used by the Branch are rinsed with nitric acid during cleaning, they cannot be used for collecting samples to be analyzed for nitrogen sensitive parameters.

6. If additional sample volume is needed, replace the transfer cap assembly, turn the pump on, and collect additional volume. The use of Teflon® valves or ball check devices to retain the water column in the sample delivery tubing during the transfer phase, when large volumes of sample are required, is acceptable. These devices, however, must be constructed so that they may be completely disassembled and cleaned according to the procedures in SESD

Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205).

7. When sampling is completed, all Teflon® tubing should be discarded.

   NOTE: Samples for volatile organic compound analyses cannot be collected using this method. If samples for VOC analyses are required, they must be collected with a Teflon® or stainless steel bailer or by other approved methods, such as the "soda straw" method. The "soda straw" method involves allowing the tubing to fill, by either lowering it into the water column (A) or by filling it via suction applied by the pump head (B). If method (A) is used, the tubing is removed from the well after filling and the captured sample is allowed to drain into the sample vial. If method (B) is used, after running the pump and filling the tubing with sample, the pump speed is reduced and the direction reversed to push the sample out of the tubing into the vials. Avoid completely emptying the tubing when filling the sample vials when using method (B) to prevent introducing water that was in contact with the flexible pump head tubing. Either method is repeated, as necessary, until all vials are filled.

4.3.1.3 RediFlo2® Electric Submersible Pump (with Teflon® Tubing)

After purging has been accomplished with RediFlo2® electric submersible pump, the sample may be obtained directly from the pump discharge, provided that Teflon® tubing was used for the sample delivery line. The discharge rate of the pump should be reduced during volatile organic compound sample collection to minimize sample disturbance. Note, if the RediFlo2® electric submersible pump is used for sampling, the pump must undergo a full external and internal cleaning. In addition, pump rinsate blanks must be collected, at the appropriate frequency, to demonstrate that the pump has been adequately cleaned between wells.

4.3.1.4 Bailers

New bailer rope should be attached to the bailer via a Teflon® coated stainless steel wire. (If a bailer was used to purge the well, it may also be used to sample the well and new bailer rope is not required between purging and sampling). The bailer should be gently immersed in the top of the water column until just filled. At this point, the bailer should be slowly removed and the contents emptied into the appropriate sample containers.

4.4 Sampling Wells without Plumbing, Exceeding the Limit of Suction

All methods described previously in Section 4.3.2.1.3, RediFlo2® Electric Submersible Pumps, and Section 4.3.2.1.4, Bailers, are suitable sample methods where the water table is too deep to consider the use of a peristaltic pump for sampling.

4.5 Micro-Purge or No Purge Sampling Procedures

The Micro-Purge or No Purge sampling procedures are usually employed when it necessary to keep purge volumes to an absolute minimum. Among the Micro-Purge or No Purge procedures that might be employed are:

- Low pump rate sampling with peristaltic or submersible pumps (typical Micro-Purge sampling),
- HydraSleeve™ or
- Passive diffusion bag (PDB) sampling

The use of these procedures is acceptable only when the site hydrogeology is well understood, with respect to the hydraulic conductivity of geologic materials within the well screen interval. The underlying assumption, when employing these procedures, is that the formation in which the well is screened has a high hydraulic conductivity ($K>10^{-5}$ cm/sec, for example), resulting in a state of equilibrium existing between the water standing in the screened interval and the formation water in which the well is screened. In this situation, the well is considered to be in a perpetually "purged" state and purging is not required.

These procedures are generally impractical for SESD to implement because of the general lack of hydrogeologic information for the sampled wells and the real necessity, in some cases, that the pumps be pre-deployed to overcome issues related to turbidity resulting from pump placement prior to sampling.

4.5.1 Sampling with Pumps

The peristaltic pump tubing or intake point of the submersible pump is placed in the approximate mid-portion of the screened interval of the well or other interval selected by the field team leader. If turbidity and its impact on metals analyses are a concern, a period of time sufficient should be allowed to mitigate effects of pump or tubing placement. After it has been determined that sampling may proceed, the pump is turned on and operated at a rate that does not cause significant drawdown of the water column, as measured using a water level sounder. During sampling, sufficient water to supply enough volume for the analytes of concern and the purge parameters is pumped. Purging should continue until purge parameters stabilize, generally three consecutive stable sets of readings, before samples are collected.

4.5.2 HydraSleeves™

HydraSleeeves™ are grab sampling devices that are deployed in a closed configuration then opened in the desired interval for sample collection. The following is a summary of its operation:

1. Sampler placement - Reusable weight is attached and the HydraSleeve™ is lowered and placed at the desired position in the well screen. In-situ water pressure keeps the reed valve closed, preventing water from entering the sampler. Well is allowed to return to equilibrium.

2. Sample collection - The reed valve opens to allow filling when the sampler is moved upward faster than 1 foot per second, either in one continuous upward pull or by cycling the sampler up and down to sample a shorter interval. There is no change in water level, and only minimal agitation during collection.

3. Sample retrieval - When the flexible sleeve is full, the reed valve closes and the sampler can be recovered without entry of extraneous overlying fluids. Samples are removed by puncturing the sleeve with the pointed discharge tube and draining the contents into containers for sampling or field measurement.

4.5.3 Passive Diffusion Bags

Passive diffusion bag (PDB) samplers are bags comprised of low-density polyethylene (LDPE) plastic and containing analyte-free water, preferably with no headspace. The bags are deployed, with stainless steel weights, to the desired sample interval and are allowed to equilibrate with the water at the point of deployment in the well. A deployment period of a minimum of 14 days is recommended to ensure equilibration prior to removal.

After 14 days, the bags and opened with a puncture device or other cutting implement and the contents transferred to containers for sampling or field measurement.

4.5.4 General Considerations for Micro-Purge or No-Purge Sampling

When using the Micro-Purge method, it may be advisable to deploy the tubing or pump in advance of sample collection. Introducing the tubing or pump into the screened interval is likely to dislodge sediment and other fines that have settled or bridged on the well screen material and the gravel pack media behind the screen. If sampling is conducted immediately, turbidity issues may render this method impractical from a parameter stability standpoint.

HydraSleevesTM and PDBs must be evaluated for appropriateness for analytes of concern.

4.6 Sample Preservation

After sample collection, all samples requiring preservation must be preserved as soon as practical. Consult the ASBLOQAM for the correct preservative for the particular analytes of interest. All samples preserved using a pH adjustment (except VOCs) must be checked, using pH strips, to ensure that they were adequately preserved. This is done by pouring a small volume of sample over the strip. Do not place the strip in the sample. Samples requiring reduced temperature storage should be placed on ice immediately.

4.7 Special Sample Collection Procedures

4.7.1 Trace Organic Compounds and Metals

Special sample handling procedures should be instituted when trace contaminant samples are being collected. All sampling equipment, including pumps, bailers, water level measurement equipment, etc., which comes into contact with the water in the well must be cleaned in accordance with the cleaning procedures described in the SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205) or SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206). Pumps should not be used for sampling unless the interior and exterior portions of the pump and the discharge hoses are thoroughly cleaned. Blank samples should be collected to determine the adequacy of cleaning prior to collection of any sample using a pump other than a peristaltic pump.

4.7.2 Order of Sampling with Respect to Analytes

In many situations when sampling permanent or temporary monitoring wells, an adequate purge, with respect to turbidity, is often difficult to achieve. Removal and insertion of equipment after the purge and prior to actual sampling may negate the low turbidities achieved during purging and elevate turbidity back to unacceptable levels. For this reason, it is important that special efforts be used to minimize any disturbance of the water column after purging and to collect the aliquot for metals first. Therefore, the preferred order of sampling is metals first, followed by other inorganic analytes, extractable organic compounds and volatile organic compounds.

4.7.3 Filtering

As a standard practice, ground water samples will not be filtered for routine analysis. Filtering will usually only be performed to determine the fraction of major ions and trace metals passing the filter and used for flow system analysis and for the purpose of geochemical speciation modeling. Filtration is not allowed to correct for improperly designed or constructed monitoring wells, inappropriate sampling methods, or poor sampling technique.

When samples are collected for routine analyses and are filtered, both filtered and non-filtered samples will be submitted for analyses. Samples for organic compounds analysis should not be filtered. Prior to filtration of the ground water sample for any reason other than geochemical speciation modeling, the following criteria must be demonstrated to justify the use of filtered samples for inorganic analysis:

1. The monitoring wells, whether temporary or permanent, have been constructed and developed in accordance with the SESD Guidance Document, Design and Installation of Monitoring Wells (SESDGUID-001).

2. The ground water samples were collected using sampling techniques in accordance with this section, and the ground water samples were analyzed in accordance with USEPA approved methods.

3. Efforts have been undertaken to minimize any persistent sample turbidity problems. These efforts may consist of the following:

   - Redevelopment or re-installation of permanent ground water monitoring wells.
   - Implementation of low flow/low stress purging and sampling techniques.

4. Turbidity measurements should be taken during purging and sampling to demonstrate stabilization or lack thereof. These measurements should be documented in the field notes. If the ground water sample appears to have either a chemically-induced elevated turbidity, such as would occur with precipitate formation, or a naturally elevated colloid or fine, particulate-related turbidity, filtration will not be allowed.

If filtration is necessary for purposes of geochemical modeling or other **pre-approved** cases, the following procedures are suggested:

1. Accomplish in-line filtration through the use of disposable, high capacity filter cartridges (barrel-type) or membrane filters in an in-line filter apparatus. The high capacity, barrel-type filter is preferred due to the higher surface area associated with this configuration. If a membrane filter is utilized, a minimum diameter of 142 mm is suggested.

2. Use a 5 µm pore-size filter for the purpose of determining the colloidal constituent concentrations. A 0.1 µm pore-size filter should be used to remove most non-dissolved particles.

3. Rinse the cartridge or barrel-type filter with 500 milliliters of the solute (groundwater to be sampled) prior to collection of sample. If a membrane filter is used, rinse with 100 milliliters of solute prior to sample collection.

Potential differences could result from variations in filtration procedures used to process water samples for the determination of trace element concentrations. A number of factors associated with filtration can substantially alter "dissolved" trace element concentrations; these include filter pore size, filter type, filter diameter, filtration method, volume of sample processed, suspended sediment concentration, suspended sediment grain-size distribution, concentration of colloids and colloidally-associated trace elements, and concentration of organic matter. Therefore, consistency is critical in the comparison of short-term and long-term results. Further guidance on filtration may be obtained from the following: 1) Metals in Ground Water: Sampling Artifacts and Reproducibility; 2) Filtration of Ground Water Samples for Metals Analysis; and 3) Ground Water Sampling - A Workshop Summary. See Section 1.4, References, for complete citation for these documents.

Bacterial Sampling

Whenever wells (normally potable wells) are sampled for bacteriological parameters, care must be taken to ensure the sterility of all sampling equipment and all other equipment entering the well. Further information regarding bacteriological sampling is available in the following: 1) Sampling for Organic Chemicals and Microorganisms in the Subsurface; 2) Handbook for Evaluating Water Bacteriological Laboratories; and 3) Microbiological Methods for Monitoring the Environment, Water and Wastes. See Section 1.4, References, for complete citation for these documents.

4.8 Specific Sampling Equipment Quality Assurance Techniques

All equipment used to collect ground water samples shall be cleaned as outlined in the SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205) or SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206) and repaired, if necessary, before being stored at the conclusion of field studies. Cleaning procedures utilized in the field or field repairs shall be thoroughly documented in field records.

4.9 Auxiliary Data Collection

During ground water sample collection, it is important to record a variety of ground water related data. Included in the category of auxiliary data are water levels measured according to the SESD Operating Procedure for Groundwater Level and Well Depth Measurement (SESDPROC-105), well volume determinations (Section 3.1.1, Purging and Purge Adequacy), pumping rates during purging (see below), and occasionally, drillers or boring logs. This information should be documented in the field records.

4.9.1 Well Pumping Rate – Bucket/Stop Watch Method

The pumping rate for a pump can be determined by collecting the discharge from the pump in a bucket of known volume and timing how long it takes to fill the bucket. The pumping rate should be in gallons per minute. This method shall be used primarily with pumps with a constant pump rate, such as gasoline-powered or electric submersible pumps. Care should be taken when using this method with some battery-powered pumps. As the batteries' charge decreases, the pump rate also decreases so that pumping rate calculations using initial, high pump rates may be erroneously high. If this method is used with battery-powered pumps, the rate should be re-checked frequently to ensure accuracy of the pumping rate calculations.

Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Management of Investigation Derived Waste**

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Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the SESD Document Control Coordinator on the SESD local area network (LAN).

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SESDPROC-202-R3, *Management of Investigation Derived Waste*, replaces SESDPROC-202-R2. **General:** Corrected typographical, grammatical and/or editorial errors. **Cover Page:** The Enforcement and Investigations Branch Chief was changed from Archie Lee to Acting Chief John Deatrick. The Ecological Assessment Branch Chief was changed from Bill Cosgrove to Acting Chief Mike Bowden. The FQM was changed from Liza Montalvo to Bobby Lewis. **Revision History:** Changes were made to reflect the current practice of only including the most recent changes in the revision history.	July 3, 2014
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1 General Information

1.1 Purpose

This document describes general and specific procedures and considerations to be used and observed when managing investigation derived waste (IDW) generated during the course of hazardous waste site investigations.

1.2 Scope/Application

The procedures and management options for the different categories of IDW described in this document are to be used by SESD field personnel to manage IDW generated during site investigations. On the occasion that SESD field personnel determine that any of the procedures described in this section are inappropriate, inadequate or impractical and that another procedure must be used to manage IDW generated at a particular site, the variant procedure will be documented in the field logbook, along with a description of the circumstances requiring its use. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD Local Area Network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.4 References

SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, Most Recent Version

United States Environmental Protection Agency (US EPA). 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Region 4 Science and Ecosystem Support Division (SESD), Athens, GA

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version

1.5 General Precautions

1.5.1 Safety

Proper safety precautions must be observed when managing IDW. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASP) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.5.2 Procedural Precautions

The following precautions should be considered when managing IDW:

- Due to time limitations and restrictions posed by RCRA regulations on storage of hazardous waste, accumulation start dates should be identified on all drums, buckets or other containers used to hold IDW so that it can be managed in a timely manner.
- During generation of both non-hazardous and hazardous IDW, keep hazardous IDW segregated from non-hazardous IDW to minimize the volume of hazardous IDW that must be properly managed.

2 Types of Investigation Derived Waste

Materials which may become IDW include, but are not limited to:

- Personal protective equipment (PPE) - This includes disposable coveralls, gloves, booties, respirator canisters, splash suits, etc.
- Disposable equipment and items - This includes plastic ground and equipment covers, aluminum foil, conduit pipe, composite liquid waste samplers (COLIWASAs), Teflon® tubing, broken or unused sample containers, sample container boxes, tape, etc.
- Soil cuttings from drilling or hand augering.
- Drilling mud or water used for mud or water rotary drilling.
- Groundwater obtained through well development or well purging.
- Cleaning fluids such as spent solvents and wash water.
- Packing and shipping materials.

Table 1, found at the end of this procedure, lists the types of IDW commonly generated during field investigations and the current disposal practices for these materials.

For the purpose of determining the ultimate disposition of IDW, it is typically distinguished as being either hazardous or non-hazardous. This determination is based on either clear regulatory guidance or by subsequent analysis. This determination and subsequent management is the responsibility of the program site manager.

3 Management of Non-Hazardous IDW

Disposal of non-hazardous IDW should be addressed in the study plan or QAPP for the investigation. To reduce the volume of any IDW transported back to the Field Equipment Center (FEC), it may be necessary to compact the waste into a reusable container, such as a 55-gallon drum.

If the waste is from an active facility, permission should be sought from the operator of the facility to place the non-hazardous PPE, disposable equipment, and/or paper/cardboard into the facility's dumpsters. If necessary, these materials may be placed into municipal dumpsters, with the permission of the owner. These materials may also be taken to a nearby permitted landfill. On larger studies, waste hauling services may be obtained and a dumpster located at the study site.

Disposal of non-hazardous IDW such as drill cuttings, drilling mud, purge or development water, decontamination wash water, etc., should be specified in the approved study plan or QAPP. It is recommended that these materials be placed into a unit with an environmental permit, such as a landfill or sanitary sewer. These materials must not be placed into dumpsters. If the facility at which the study is being conducted is active, permission should be sought to place these types of IDW into the facility's treatment system. It may be feasible to spread drill cuttings around the borehole, or, if the well is temporary, to place the cuttings back into the borehole. Non-hazardous monitoring well purge or development water may also be poured onto the ground down gradient of the monitoring well when site conditions permit. Purge water from private potable wells which are in service may be discharged directly onto the ground surface.

The minimum requirements for this subsection are:

- Non-hazardous liquid and soil/sediment IDW may be placed on the ground or returned to the source if doing so does not endanger human health or the environment or violate federal or state regulations. Under no circumstances, however, should monitoring well purge water be placed back into the well from which it came.
- Soap and water decontamination fluids and rinsates of such cannot be placed in any water bodies and must be collected and returned to the FEC for disposition.
- The collection, handling and proposed disposal method must be specified in the approved study plan or QAPP.

4 Management of Hazardous IDW

Disposal of hazardous or suspected hazardous IDW must be specified in the approved study plan or QAPP for the study or investigation. Hazardous IDW must be disposed as specified in USEPA regulations. If appropriate, these wastes may be placed back in an active facility waste treatment system. These wastes may also be disposed in the source area from which they originated if doing so does not endanger human health or the environment.

If on-site disposal is not feasible, and if the wastes are suspected to be hazardous, appropriate tests must be conducted to make that determination. If they are determined to be hazardous wastes, they must be properly contained and labeled. They may be stored on the site for a maximum of 90 days before they must be manifested and shipped to a permitted treatment or disposal facility. Generation of hazardous IDW must be anticipated, if possible, to allow arrangements for proper containerization, labeling, transportation and disposal/treatment in accordance with USEPA regulations.

The generation of hazardous IDW should be minimized to conserve Division resources. Most routine studies should not produce any hazardous IDW, with the possible exception of spent solvents and, possibly, purged groundwater. The use of solvents during field cleaning of equipment should be minimized by using solvent-free cleaning procedures for routine cleaning and decontamination (see SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205). If solvents are needed, the volume should be minimized by using only the amount necessary and by capturing the residual solvent separately from the aqueous decontamination fluids (detergent/wash water mixes and water rinses).

At a minimum, the requirements of the management of hazardous IDW are as follows:

- Spent solvents must be left on-site with the permission of site operator and proper disposal arranged.
- All hazardous IDW must be containerized. Proper handling and disposal should be arranged prior to commencement of field activities.

Table 1: Disposal of IDW

TYPE	HAZARDOUS	NON - HAZARDOUS
PPE-Disposable	Containerize in plastic 5-gallon bucket with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise return to FEC for proper disposal.	Place waste in trash bag. Place in dumpster with permission of site operator, otherwise return to FEC for disposal in dumpster.
PPE-Reusable	Decontaminate as per SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, if possible. If the equipment cannot be decontaminated, containerize in plastic 5-gallon bucket with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise return to FEC for proper disposal.	Decontaminate as per SESDPROC-205, and return to FEC.
Spent Solvents	Containerize in original containers. Clearly identify contents. Leave on-site with permission of site operator and arrange for proper disposal.	N/A
Soil Cuttings	Containerize in DOT-approved container with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise arrange with program site manager for testing and disposal.	Containerize in a 55-gallon steel drum with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise arrange with program site manager for testing and disposal. **
Groundwater	Containerize in DOT-approved container with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise arrange with program site manager for testing and disposal.	Containerize in an appropriate container with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise arrange with program site manager for testing and disposal. **
Decontamination Water	Containerize in DOT-approved container with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise arrange with program site manager for testing and disposal.	Containerize in an appropriate container with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise arrange with program site manager for testing and disposal. Decontamination water may also be disposed in a sanitary sewer system, with permission from the wastewater treatment plant representative, and if doing so does not endanger human health or the environment, or violate federal or state regulations.
Disposable Equipment	Containerize in DOT-approved container or 5-gallon plastic bucket with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise arrange with program site manager for testing and disposal.	Containerize in an appropriate container with tight-fitting lid. Identify and leave on-site with permission of site operator, otherwise arrange with program site manager for testing and disposal. If unfeasible, return to FEC for disposal in dumpster.
Trash	N/A	Place waste in trash bag. Place in dumpster with permission of site operator, otherwise return to FEC for disposal in dumpster.

**** These materials may be placed on the ground if doing so does not endanger human health or the environment or violate federal or state regulations.**

Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Soil Sampling**

Effective Date: August 21, 2014	**Number:** SESDPROC-300-R3

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Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the SESD Document Control Coordinator on the SESD local area network (LAN).

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SESDPROC-300-R3, *Soil Sampling*, replaces SESDPROC-300-R2. **General:** Corrected any typographical, grammatical and/or editorial errors. **Title Page:** Updated the author from Fred Sloan to Kevin Simmons. Updated the Enforcement and Investigations Branch Chief from Archie Lee to Acting Chief, John Deatrick. Section 1.5.1: Added "The reader should" to last sentence of the paragraph. Section 1.5.2: Omitted "When sampling in landscaped areas," from first sentence of eighth bullet. Section 3.2.4: In the first paragraph, first sentence, added "(rapidly form bubbles)." Omitted "(rapidly form bubbles)" from second paragraph, second sentence. Any reference to "Percent Moisture and Preservation Compatibility (MOICA)" or "Percent Moisture" was changed to "Percent Solids", both in the text and in Table 1.	August 21, 2014
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1 General Information

1.1 Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when collecting soil samples for field screening or laboratory analysis.

1.2 Scope/Application

The procedures contained in this document are to be used by field personnel when collecting and handling soil samples in the field. On the occasion that SESD field personnel determine that any of the procedures described in this section are inappropriate, inadequate or impractical and that another procedure must be used to obtain a soil sample, the variant procedure will be documented in the field logbook and subsequent investigation report, along with a description of the circumstances requiring its use. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD local area network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the LAN, and for maintaining records of review conducted prior to its issuance.

1.4 References

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC, SESDPROC-206, Most Recent Version

SESD Operating Procedure for Field Sampling Quality Control, SESDPROC-011, Most Recent Version

SESD Operating Procedure for Field X-Ray Fluorescence (XRF) Measurement, SESDPROC-107, Most Recent Version

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

SESD Operating Procedure for Sample and Evidence Management, SESDPROC-005, Most Recent Version

Title 49 Code of Federal Regulations, Pts. 171 to 179, Most Recent Version

US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, Most Recent Version (Method 5035)

US EPA. Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version

1.5 General Precautions

1.5.1 Safety

Proper safety precautions must be observed when collecting soil samples. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASP) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. The reader should address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.5.2 Procedural Precautions

The following precautions should be considered when collecting soil samples:

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.
- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association

(IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.

- Documentation of field sampling is done in a bound logbook.
- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as air bills, bills of lading, etc., shall be retained by the project leader in the project files.
- Sampling in landscaped areas: Cuttings should be placed on plastic sheeting and returned to the borehole upon completion of the sample collection. Any 'turf plug' generated during the sampling process should be returned to the borehole.
- Sampling in non-landscaped areas: Return any unused sample material back to the auger, drill or push hole from which the sample was collected.

2 Special Sampling Considerations

2.1 Special Precautions for Trace Contaminant Soil Sampling

- A clean pair of new, non-powdered, disposable gloves will be worn each time a different sample is collected and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- Sample containers with samples suspected of containing high concentrations of contaminants shall be handled and stored separately.
- All background samples shall be segregated from obvious high-concentration or waste samples. Sample collection activities shall proceed progressively from the least suspected contaminated area to the most suspected contaminated area. Samples of waste or highly-contaminated media must not be placed in the same ice chest as environmental (i.e., containing low contaminant levels) or background samples.
- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other member(s) collect the samples.
- Samplers must use new, verified/certified-clean disposable or non-disposable equipment cleaned according to procedures contained in the SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205), for collection of samples for trace metals or organic compound analyses.

2.2 Sample Homogenization

1. If sub-sampling of the primary sample is to be performed in the laboratory, transfer the entire primary sample directly into an appropriate, labeled sample container(s). Proceed to step 4.

2. If sub-sampling the primary sample in the field or compositing multiple primary samples in the field, place the sample into a glass or stainless steel homogenization container and mix thoroughly. Each aliquot of a composite sample should be of the same approximate volume.

3. All soil samples must be thoroughly mixed to ensure that the sample is as representative as possible of the sample media. ***Samples for VOC analysis are not homogenized.*** The most common method of mixing is referred to as quartering. The quartering procedure should be performed as follows:

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

  This procedure should be repeated several times until the sample is adequately mixed. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over.

4. Place the sample into an appropriate, labeled container(s) by using the alternate shoveling method and secure the cap(s) tightly. The alternate shoveling method involves placing a spoonful of soil in each container in sequence and repeating until the containers are full or the sample volume has been exhausted. Threads on the container and lid should be cleaned to ensure a tight seal when closed.

2.3 Dressing Soil Surfaces

Any time a vertical or near vertical surface is sampled, such as achieved when shovels or similar devices are used for subsurface sampling, the surface should be dressed (scraped) to remove smeared soil. This is necessary to minimize the effects of contaminant migration interferences due to smearing of material from other levels.

2.4 Quality Control

If possible, a control sample should be collected from an area not affected by the possible contaminants of concern and submitted with the other samples. This control sample should be collected as close to the sampled area as possible and from the same soil type. Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by sampling tools. SESD Operating Procedure for Field Sampling Quality Control (SESDPROC-011) contains other procedures that may be applicable to soil sampling investigations.

2.5 Records

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

3 Method 5035

The procedures outlined here are summarized from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, Method 5035.*

3.1 Soil Samples for Volatile Organic Compounds (VOC) Analysis

If samples are to be analyzed for VOCs, they should be collected in a manner that minimizes disturbance of the sample. For example, when sampling with an auger bucket, the sample for VOC analysis should be collected directly from the auger bucket (preferred) or from minimally disturbed material immediately after an auger bucket is emptied into the pan. The sample shall be containerized by filling an En Core® Sampler or other Method 5035 compatible container. ***Samples for VOC analysis are not homogenized.*** Preservatives may be required for some samples with certain variations of Method 5035. Consult the method or the principal analytical chemist to determine if preservatives are necessary.

3.2 Soil Sampling (Method 5035)

The following sampling protocol is recommended for site investigators assessing the extent of VOCs in soils at a project site. Because of the large number of options available, careful coordination between field and laboratory personnel is needed. The specific sampling containers and sampling tools required will depend upon the detection levels and intended data use. Once this information has been established, selection of the appropriate sampling procedure and preservation method best applicable to the investigation can be made.

3.2.1 Equipment

Soil for VOC analyses may be retrieved using any of the SESD soil sampling methods described in Sections 4 through 8 of this procedure. Once the soil has been obtained, the En Core® Sampler, syringes, stainless steel spatula, standard 2-oz. soil VOC container, or pre-prepared 40 mL vials may be used/required for sub-sampling. The specific sample containers and the sampling tools required will depend upon the data quality objectives established for the site or sampling investigation. The various sub-sampling methods are described below.

3.2.2 Sampling Methodology - Low Concentrations (<200 µg/kg)

When the total VOC concentration in the soil is expected to be less than 200 µg/kg, the samples may be collected directly with the En Core® Sampler or syringe. If using the syringes, the sample must be placed in the sample container (40 mL pre-prepared vial) immediately to reduce volatilization losses. The 40 mL vials should contain 10 mL of organic-free water for an un-preserved sample or approximately

10 mL of organic-free water and a preservative. It is recommended that the 40 mL vials be prepared and weighed by the laboratory (commercial sources are available which supply preserved and tared vials). When sampling directly with the En Core® Sampler, the vial must be immediately capped and locked.

A soil sample for VOC analysis may also be collected with conventional sampling equipment. A sample collected in this fashion must either be placed in the final sample container (En Core® Sampler or 40 mL pre-prepared vial) immediately or the sample may be immediately placed into an intermediate sample container with no head space. If an intermediate container (usually 2-oz. soil jar) is used, the sample must be transferred to the final sample container (En Core® Sampler or 40 mL pre-prepared vial) as soon as possible, not to exceed 30 minutes.

NOTE: After collection of the sample into either the En Core® Sampler or other container, the sample must immediately be stored in an ice chest and cooled.

Soil samples may be prepared for shipping and analysis as follows:

En Core® Sampler - the sample shall be capped, locked, and secured in the original foil bag. All foil bags containing En Core® samplers are then placed in a plastic bag and sealed with custody tape, if required.

Syringe - Add about 3.7 cc (approximately 5 grams) of sample material to 40-mL pre-prepared containers. Secure the containers in a plastic bag. Do not use a custody seal on the container; place the custody seal on the plastic bag. Note: When using the syringes, it is important that no air is allowed to become trapped behind the sample prior to extrusion, as this will adversely affect the sample.

Stainless Steel Laboratory Spatulas - Add between 4.5 and 5.5 grams (approximate) of sample material to 40 mL containers. Secure the containers in a plastic bag. Do not use a custody seal on the container; place the custody seal on the plastic bag.

3.2.3 Sampling Methodology - High Concentrations (>200 µg/kg)

Based upon the data quality objectives and the detection level requirements, this high level method may also be used. Specifically, the sample may be packed into a single 2-oz. glass container with a screw cap and septum seal. The sample container must be filled quickly and completely to eliminate head space. Soils\sediments containing high total VOC concentrations may also be collected as described in Section 3.2.2, Sampling Methodology - Low Concentrations, and preserved using 10 mL methanol.

3.2.4 Special Techniques and Considerations for Method 5035

Effervescence

If low concentration samples effervesce (rapidly form bubbles) from contact with the acid preservative, then either a test for effervescence must be performed prior to sampling, or the investigators must be prepared to collect each sample both preserved or un-preserved, as needed, or all samples must be collected unpreserved.

To check for effervescence, collect a test sample and add to a pre-preserved vial. If preservation (acidification) of the sample results in effervescence then preservation by acidification is not acceptable, and the sample must be collected un-preserved.

If effervescence occurs and only pre-preserved sample vials are available, the preservative solution may be placed into an appropriate hazardous waste container and the vials triple rinsed with organic free water. An appropriate amount of organic free water, equal to the amount of preservative solution, should be placed into the vial. The sample may then be collected as an un-preserved sample. Note: the amount of organic free water placed into the vials will have to be accurately measured.

Sample Size

While this method is an improvement over earlier ones, field investigators must be aware of an inherent limitation. Because of the extremely small sample size and the lack of sample mixing, sample representativeness for VOCs may be reduced compared to samples with larger volumes collected for other constituents. The sampling design and objectives of the investigation should take this into consideration.

Holding Times

Sample holding times are specified in the Analytical Support Branch *Laboratory Operations and Quality Assurance Manual* (ASBLOQAM), Most Recent Version. Field investigators should note that the holding time for an un-preserved VOC soil/sediment sample on ice is 48 hours. Arrangements should be made to ship the soil/sediment VOC samples to the laboratory by overnight delivery the day they are collected so the laboratory may preserve and/or analyze the sample within 48 hours of collection.

Percent Solids

Samplers must ensure that the laboratory has sufficient material to determine percent solids in the VOC soil/sediment sample to correct the analytical results to dry weight. If other analyses requiring percent solids determination are being performed upon the sample, these results may be used. If not, a separate sample (minimum of 2 oz.) for percent solids determination will be required. The sample collected for percent solids may also be used by the laboratory to check for preservative compatibility.

Safety

Methanol is a toxic and flammable liquid. Therefore, methanol must be handled with all required safety precautions related to toxic and flammable liquids. Inhalation of methanol vapors must be avoided. Vials should be opened and closed quickly during the sample preservation procedure. Methanol must be handled in a ventilated area. Use protective gloves when handling the methanol vials. Store methanol away from sources of ignition such as extreme heat or open flames. The vials of methanol should be stored in a cooler with ice at all times.

Shipping

Methanol and sodium bisulfate are considered dangerous goods, therefore shipment of samples preserved with these materials by common carrier is regulated by the U.S. Department of Transportation and the International Air Transport Association (IATA). The rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179) and the current edition of the IATA Dangerous Goods Regulations must be followed when shipping methanol and sodium bisulfate. Consult the above documents or the carrier for additional information. Shipment of the quantities of methanol and sodium bisulfate used for sample preservation falls under the exemption for small quantities.

The summary table on the following page lists the options available for compliance with SW846 Method 5035. The advantages and disadvantages are noted for each option. SESD's goal is to minimize the use of hazardous material (methanol and sodium bisulfate) and minimize the generation of hazardous waste during sample collection.

Table 1: Method 5035 Summary

OPTION	PROCEDURE	ADVANTAGES	DISADVANTAGES
1	Collect two 40 mL vials with ≈ 5 grams of sample, and one 2 oz. glass jar w/septum lid for screening, % moisture and preservative compatibility.	Screening conducted by lab.	Presently a 48-hour holding time for unpreserved samples. Sample containers must be tared.
2	Collect three En Core® samplers, and one 2 oz. glass jar w/septum lid for screening, % solids.	Lab conducts all preservation/preparation procedures.	Presently a 48- hour holding time for preparation of samples.
3	Collect two 40 mL vials with 5 grams of sample and preserve w/methanol or sodium bisulfate, and one 2-oz. glass jar w/septum lid for screening, % solids .	High level VOC samples may be composited. Longer holding time.	Hazardous materials used in the field. Sample containers must be tared.
4	Collect one 2-oz. glass jar w/septum lid for analysis, % solids (high level VOC only).	Lab conducts all preservation/preparation procedures.	May have significant VOC loss.

4 Manual Soil Sampling Methods

4.1 General

These methods are used primarily to collect surface and shallow subsurface soil samples. Surface soils are generally classified as soils between the ground surface and 6 to 12 inches below ground surface. The most common interval is 0 to 6 inches; however, the data quality objectives of the investigation may dictate another interval, such as 0 to 3 inches for risk assessment purposes. The shallow subsurface interval may be considered to extend from approximately 12 inches below ground surface to a site-specific depth at which sample collection using manual collection methods becomes impractical.

If a thick, matted root zone, gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials.

When compositing, make sure that each composite location (aliquot) consist of equal volumes, i.e., same number of equal spoonfuls.

4.2 Spoons

Stainless steel spoons may be used for surface soil sampling to depths of approximately 6 inches below ground surface where conditions are generally soft and non-indurated, and there is no problematic vegetative layer to penetrate.

4.2.1 Special Considerations When Using Spoons

- When using stainless steel spoons, consideration must be given to the procedure used to collect the volatile organic compound sample. If the soil being sampled is cohesive and holds its in situ texture in the spoon, the En Core® Sampler or syringe used to collect the sub-sample for Method 5035 should be plugged directly from the spoon. If, however, the soil is not cohesive and crumbles when removed from the ground surface for sampling, consideration should be given to plugging the sample for Method 5035 directly from the ground surface at a depth appropriate for the investigation Data Quality Objectives.

4.3 Hand Augers

Hand augers may be used to advance boreholes and collect soil samples in the surface and shallow subsurface intervals. Typically, 4-inch stainless steel auger buckets with cutting heads are used. The bucket is advanced by simultaneously pushing and turning using an attached handle with extensions (if needed).

4.3.1 Surface Soil Sampling

When conducting surface soil sampling with hand augers, the auger buckets may be used with a handle alone or with a handle and extensions. The bucket is advanced to the appropriate depth and the contents are transferred to the homogenization container for processing. Observe precautions for volatile organic compound sample collection found in Section 3, Method 5035.

4.3.2 Subsurface Soil Sampling

Hand augers are the most common equipment used to collect shallow subsurface soil samples. Auger holes are advanced one bucket at a time until the sample depth is achieved. When the sample depth is reached, the bucket used to advance the hole is removed and a clean bucket is attached. The clean auger bucket is then placed in the hole and filled with soil to make up the sample and removed.

The practical depth of investigation using a hand auger depends upon the soil properties and depth of investigation. In sand, augering is usually easily performed, but the depth of collection is limited to the depth at which the sand begins to flow or collapse. Hand augers may also be of limited use in tight clays or cemented sands. In these soil types, the greater the depth attempted, the more difficult it is to recover a sample due to increased friction and torqueing of the hand auger extensions. At some point these problems become so severe that power equipment must be used.

4.3.3 Special Considerations for Soil Sampling with the Hand Auger

- Because of the tendency for the auger bucket to scrape material from the sides of the auger hole while being extracted, the top several inches of soil in the auger bucket should be discarded prior to placing the bucket contents in the homogenization container for processing.
- Observe precautions for volatile organic compound (VOC) sample collection found in Section 3, Method 5035. Collect the VOC sample directly from the auger bucket, if possible.
- Power augers, such as the Little Beaver® and drill rigs may be used to advance boreholes to depths for subsurface soil sampling with the hand auger. They may not be used for sample collection. When power augers are used to advance a borehole to depth for sampling, care must be taken that exhaust fumes, gasoline and/or oil do not contaminate the borehole or area in the immediate vicinity of sampling.
- When moving to a new sampling location, the entire hand auger assembly must be replaced with a properly decontaminated hand auger assembly.

5 Direct Push Soil Sampling Methods

5.1 General

These methods are used primarily to collect shallow and deep subsurface soil samples. Three samplers are available for use within the Division's direct push tooling inventory. All of the sampling tools involve the collection and retrieval of the soil sample within a thin-walled liner. The following sections describe each of the specific sampling methods that can be accomplished using direct push techniques, along with details specific to each method. While SESD currently uses the sample tooling described, tooling of similar design and materials is acceptable.

If gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials. Turf grass is not typically removed prior to sampling with these devices.

5.2 Large Bore® Soil Sampler

The Large Bore® (LB) sampler is a solid barrel direct push sampler equipped with a piston-rod point assembly used primarily for collection of depth-discrete subsurface soil samples. The sample barrel is approximately 30-inches (762 mm) long and has a 1.5-inch (38 mm) outside diameter. The LB® sampler is capable of recovering a discrete sample core 22 inches x 1.0 inch (559 mm x 25 mm) contained inside a removable liner. The resultant sample volume is a maximum of 283 mL.

After the LB® sample barrel is equipped with the cutting shoe and liner, the piston-rod point assembly is inserted, along with the drive head and piston stop assembly. The assembled sampler is driven to the desired sampling depth, at which time the piston stop pin is removed, freeing the push point. The LB® sampler is then pushed into the soil a distance equal to the length of the LB® sample barrel. The probe rod string, with the LB® sampler attached, is then removed from the subsurface. After retrieval, the LB® sampler is then removed from the probe rod string. The drive head is then removed to allow removal of the liner and soil sample.

5.3 Macro-Core® Soil Sampler

The Macro-Core® (MC) sampler is a solid barrel direct push sampler equipped with a piston-rod point assembly used primarily for collection of either continuous or depth-discrete subsurface soil samples. Although other lengths are available, the standard MC® sampler has an assembled length of approximately 52 inches (1321 mm) with an outside diameter of 2.2 inches (56 mm). The MC® sampler is capable of recovering a discrete sample core 45 inches x 1.5 inches (1143 mm x 38 mm) contained inside a removable liner. The resultant sample volume is a maximum of 1300 mL. The MC® sampler may be used

in either an open-tube or closed-point configuration. Although the MC® sampler can be used as an open-barrel sampler, in SESD usage, the piston point is always used to prevent the collection of slough from the borehole sides.

5.4 Dual Tube Soil Sampling System

The Dual Tube 21 soil sampling system is a direct push system for collecting continuous core samples of unconsolidated materials from within a sealed outer casing of 2.125-inch (54 mm) OD probe rod. The samples are collected within a liner that is threaded onto the leading end of a string of 1.0-inch diameter probe rod. Collected samples have a volume of up to 800 mL in the form of a 1.125-inch x 48-inch (29 mm x 1219 mm) core. Use of this method allows for collection of continuous core inside a cased hole, minimizing or preventing cross-contamination between different intervals during sample collection. The outer casing is advanced, one core length at a time, with only the inner probe rod and core being removed and replaced between samples. If the sampling zone of interest begins at some depth below ground surface, a solid drive tip must be used to drive the dual tube assembly and core to its initial sample depth.

5.5 Special Considerations When Using Direct Push Sampling Methods

- *Liner Use and Material Selection* – Direct Push Soil Samples are collected within a liner to facilitate removal of sample material from the sample barrel. The liners may only be available in a limited number of materials for a given sample tool, although overall, liners are available in brass, stainless steel, cellulose acetate butyrate (CAB), polyethylene terepthalate glycol (PETG), polyvinyl chloride (PVC) and Teflon®. For most SESD investigations, the standard polymer liner material for a sampling tool will be acceptable. When the study objectives require very low reporting levels or unusual contaminants of concern, the use of more inert liner materials such as Teflon® or stainless steel may be necessary.

- *Sample Orientation* – When the liners and associated sample are removed from the sample tubes, it is important to maintain the proper orientation of the sample. This is particularly important when multiple sample depths are collected from the same push. It is also important to maintain proper orientation to define precisely the depth at which an aliquot was collected. Maintaining proper orientation is typically accomplished using vinyl end caps. Convention is to place red caps on the top of the liner and black caps on the bottom to maintain proper sample orientation. Orientation can also be indicated by marking on the exterior of the liner with a permanent marker.

- *Core Catchers* – Occasionally the material being sampled lacks cohesiveness and is subject to crumbling and falling out of the sample liner. In cases such as these, the use of core catchers on the leading end of the sampler may help

retain the sample until it is retrieved to the surface. Core catchers may only be available in specific materials and should be evaluated for suitability. However, given the limited sample contact that core-catchers have with the sample material, most standard core-catchers available for a tool system will be acceptable.

- *Decontamination* – The cutting shoe and piston rod point are to be decontaminated between each sample, using the procedures specified for the collection of trace organic and inorganic compounds found in Field Equipment and Decontamination – SESDPROC-205, most recent version. Within a borehole, the sample barrel, rods, and drive head may be subjected to an abbreviated cleaning to remove obvious and loose material, but must be cleaned between boreholes using the procedures specified for downhole drilling equipment in Field Equipment and Decontamination – SESDPROC-205, most recent version.

- *Decommissioning* – Boreholes must be decommissioned after the completion of sampling. Boreholes less than 10 feet deep that remain open and do not approach the water table may be decommissioned by pouring 30% solids bentonite grout from the surface or pouring bentonite pellets from the surface, hydrating the pellets in lifts. Boreholes deeper than 10 feet, or any borehole that intercepts groundwater, must be decommissioned by pressure grouting with 30% solids bentonite grout, either through a re-entry tool string or through tremie pipe introduced to within several feet of the borehole bottom.

- *VOC Sample Collection* – Observe precautions for volatile organic compound sample collection found in Section 3 of this procedure.

6 Split Spoon/Drill Rig Methods

6.1 General

Split spoon sampling methods are used primarily to collect shallow and deep subsurface soil samples. All split spoon samplers, regardless of size, are basically split cylindrical barrels that are threaded on each end. The leading end is held together with a beveled threaded collar that functions as a cutting shoe. The other end is held together with a threaded collar that serves as the sub used to attach the spoon to the string of drill rod. Two basic methods are available for use, including the smaller diameter standard split spoon, driven with the drill rig safety hammer, and the larger diameter continuous split spoon, advanced inside and slightly ahead of the lead auger during hollow stem auger drilling. The following sections describe each of the specific sampling methods, along with details specific to each method.

If gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials. Turf grass is not typically removed prior to sampling with these devices.

6.2 Standard Split Spoon

A drill rig is used to advance a borehole to the target depth. The drill string is then removed and a standard split spoon is attached to a string of drill rod. Split spoons used for soil sampling must be constructed of stainless steel and are typically 2.0-inches OD (1.5-inches ID) and 18-inches to 24-inches in length. Other diameters and lengths are common and may be used if constructed of the proper material. After the spoon is attached to the string of drill rod, it is lowered into the borehole. The safety hammer is then used to drive the split spoon into the soil at the bottom of the borehole. After the split spoon has been driven into the soil, filling the spoon, it is retrieved to the surface, where it is removed from the drill rod string and opened for sample acquisition.

6.3 Continuous Split Spoon

The continuous split spoon is a large diameter split spoon that is advanced into the soil column inside a hollow stem auger. Continuous split spoons are typically 3 to 5 inches in diameter and either 5 feet or 10 feet in length, although the 5-foot long samplers are most common. After the auger string has been advanced into the soil column a distance equal to the length of the sampler being used it is returned to the surface. The sampler is removed from inside the hollow stem auger and the threaded collars are removed. The split spoon is then opened for sampling.

6.4 Special Considerations When Using Split Spoon Sampling Methods

- Always discard the top several inches of material in the spoon before removing any portion for sampling. This material normally consists of borehole wall material that has sloughed off of the borehole wall after removal of the drill string prior to and during inserting the split spoon.
- Observe precautions for volatile organic compound sample collection found in Section 3, Method 5035.

7 Shelby Tube/Thin-Walled Sampling Methods

7.1 General

Shelby tubes, also referred to generically as thin-walled push tubes or Acker thin-walled samplers, are used to collect subsurface soil samples in cohesive soils and clays during drilling activities. In addition to samples for chemical analyses, Shelby tubes are also used to collect relatively undisturbed soil samples for geotechnical analyses, such as hydraulic conductivity and permeability, to support hydrogeologic characterizations at hazardous waste and other sites.

If gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials. Turf grass is not typically removed prior to sampling with this device.

7.2 Shelby Tube Sampling Method

A typical Shelby tube is 30 inches in length and has a 3.0-inch OD (2.875-inch ID) and may be constructed of steel, stainless steel, galvanized steel, or brass. They also typically are attached to push heads that are constructed with a ball-check to aid in holding the contained sample during retrieval. If used for collecting samples for chemical analyses, it must be constructed of stainless steel. If used for collecting samples for standard geotechnical parameters, any material is acceptable.

To collect a sample, the tube is attached to a string of drill rod and is lowered into the borehole, where the sampler is then pressed into the undisturbed material by hydraulic force. After retrieval to the surface, the tube containing the sample is then removed from the sampler head. If samples for chemical analyses are needed, the soil contained inside the tube is then removed for sample acquisition. If the sample is collected for geotechnical parameters, the tube is typically capped, maintaining the sample in its relatively undisturbed state, and shipped to the appropriate geotechnical laboratory.

7.3 Special Considerations When Using Split Spoon Sampling Methods

Observe precautions for volatile organic compound sample collection found in Section 3, Method 5035.

8 Backhoe Sampling Method

8.1 General

Backhoes may be used in the collection of surface and shallow subsurface soil samples. The trenches created by excavation with a backhoe offer the capability of collecting samples from very specific intervals and allow visual correlation with vertically and horizontally adjacent material. If possible, the sample should be collected without entering the trench. Samples may be obtained from the trench wall or they may be obtained directly from the bucket at the surface. The following sections describe various techniques for safely collecting representative soil samples with the aid of a backhoe.

The depth measurement for the sample begins at the top of the soil horizon.

8.2 Scoop-and-Bracket Method

If a sample interval is targeted from the surface, it can be sampled using a stainless steel scoop and bracket. First a scoop and bracket are affixed to a length of conduit and is lowered into the backhoe pit. The first step is to take the scoop and scrape away the soil comprising the surface of the excavated wall. This material likely represents soil that has been smeared by the backhoe bucket from adjacent material. After the smeared material has been scraped off, the original stainless steel scoop is removed and a clean stainless steel scoop is placed on the bracket. The clean scoop can then be used to remove sufficient volume of soil from the excavation wall to make up the required sample volume.

8.3 Direct-from-Bucket Method

It is also possible to collect soil samples directly from the backhoe bucket at the surface. Some precision with respect to actual depth or location may be lost with this method but if the soil to be sampled is uniquely distinguishable from the adjacent or nearby soils, it may be possible to characterize the material as to location and depth. In order to ensure representativeness, it is also advisable to dress the surface to be sampled by scraping off any smeared material that may cross-contaminate the sample.

8.4 Special Considerations When Sampling with a Backhoe

- Do not physically enter backhoe excavations to collect a sample. Use either procedure 8.2, Scoop-and-Bracket Method, or procedure 8.3, Direct-from-Bucket Method to obtain soil for sampling.
- Smearing is an important issue when sampling with a backhoe. Measures must be taken, such as dressing the surfaces to be sampled (see Section 2.3), to mitigate problems with smearing.

- Paint, grease and rust must be removed and the bucket decontaminated prior to sample collection.
- Observe precautions for volatile organic compound sample collection found in Section 3, Method 5035.

The Johnson Company (JCO) Standard Operating Procedures and Field Data Collection Forms

Standard Operating Procedure For Slug Tests

INTRODUCTION

The slug test method is one of a number of different methods that are used to evaluate the permeability (or hydraulic conductivity) of an aquifer. The procedure involves either adding or removing a known volume, whether it be air, solid object or liquid, to a well rapidly, followed by a rapid series of water level measurements to assess the rate of water-level recovery (either rising-head or falling-head) to a equilibrium state.

Typically slug tests responses are conducted with a transducer and data recorder that are capable of rapid (i.e. 1 second or less intervals) water level measurements. In some less transmissive formations slug tests can be conducted with manual water level recording instruments. In either situation, more accurate results are generally obtained when using a transducer to collect periodic water level versus time measurements. In addition, the automated monitoring of slug tests simplifies the analysis of the data by providing a data file for entry into an analytical solution(s) of the partial differential equation for groundwater flow to a well for a specific type of condition or aquifer.

The result of this analysis indicates the average value of hydraulic conductivity directly adjacent to the saturated portion of the monitoring well screen interval. Results from several slug tests performed on a monitoring well network within the same hydrologic unit can be used to characterize the hydraulic conductivity of the unit by calculating the geometric mean from all individual test results.

EQUIPMENT CHECKLIST

The following equipment is required prior to commencing the testing:

1) Water level indicator equipped with a graduated interval of at least 0.01 inches.
2) Transducer and data recorder capable of collecting measurements at one second or less intervals.
3) A known volume object that is capable of being inserted or withdrawn from the saturated portion of the well screen or water column.
4) Decontamination equipment (See JCO-SOP-027).
4) Field note book and/or slug test data sheets.
5) Instruction Manual for operation of the transducer and/or data recorder.

PROCEDURE

1) Slug tests are composed of two parts; falling head and/or rising head tests. The test is started by first measuring depth to the static water level in the monitoring well with an electronic water level indicator (SOP-JCO-009).

2) The pressure transducer is then programmed and prepared for deployment by securely

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connecting the transducer to a retrieval cord and programming the specified recording interval. .

- The recording rate on the logger should be set to record at a rapid rate from a known time.
- The field computer time should be synchronized with the watch of the field personnel.
- Set time for test to begin, allowing enough time to secure all components into well allow for equilibration.

3) All information relative to the slug test should be recorded either in a bound field notebook or slug test data sheets including:

- Project name
- Project location/client/number
- Well identification
- Date
- Start/Stop times for falling head tests.
- Start/Stop times for rising head tests.
- Technician(s) identification
- Transducer serial number
- Transducer pressure rating
- Slug identification
- Initial water level
- Depth Transducer installation
- Electronic file name

4) A pressure transducer is lowered into the well to a depth of five feet below the previously measured static water level, but must be at least a foot above the bottom of the well. The transducer should be allowed to equilibrate with the water level within the well. The slug should then be lowered into the well within at least a foot of the water level surface for the falling head test or submerged within at the water column for the rising head test. In the case of the rising head test, the well must again reach equilibration prior to initiating the test. Once the test is ready to begin, the slug is either installed or withdrawn from the water column based on the test being conducted.

5) The transducer and slug, in the case of the falling head test, will be retrieved from the well after a period of time based on the hydrologic unit that is being tested. The data collected should be reviewed to determine the representativness of the test. When possible the water level should recover to at least 80% of the initial static water level. If the data is determined to be anomalous or did not recover sufficiently, repeat the test as necessary

6) Download, save and record the file name of test.

7) The water marker, slug and pressure transducer should be thoroughly decontaminated as described in JCO-SOP-027.

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Author:_____ Date:_____
Scientist, Engineer or Technician

Currently Under Review

Reviewed:_____ Date:_____
Quality Assurance Unit

Approved:_____ Date: _____
Vice President, Engineering or
Officer

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ATTACHMENT

Slug Test Sampling Form

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Slug Test Data Form

0

The Johnson Company
ENVIRONMENTAL SCIENCE AND ENGINEERING SOLUTIONS

100 State Street, Suite 600
Montpelier, Vermont 05602
(802)229-4600 (Voice)
(802)229-5876 (fax)

Project Name: Avery / Dennison
Project Number: 01-0145-5
Project Location: New Windsor, New York
Well ID:
Date :
Recorded By:

Logger Make:
Logger Pressure Rating:
Initial Water Level :
Measuring Point:
Performed By:

Logger Serial Number:
Depth of Installation:
Time:

Test Number	Time		File Name	Rising / Falling	Slug Volume (in^3)	Initial DTW (ft.)	Final DTW (ft.)	Percent Recovery
	Start	Finish						

Comments:

PROJECT:	Log of Well No.	
BORING LOCATION:	ELEVATION AND DATUM:	
DRILLING CONTRACTOR:	DATE STARTED:	DATE FINISHED:
DRILLING METHOD:	TOTAL DEPTH:	SCREEN INTERVAL:
DRILLING EQUIPMENT:	DEPTH TO WATER: FIRST COMPL	CASING:
SAMPLING METHOD:	LOGGED BY:	
HAMMER WEIGHT: DROP:	RESPONSIBLE PROFESSIONAL: REG. NO.	

DEPTH (feet)	SAMPLES			OVM Reading (ppm)	DESCRIPTION NAME (USCS Symbol): color, moist. % by weight, plast., consistency, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
	Sample No.	Sample	Blows/ Foot			
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Project No.		Page ____ of ____

PROJECT:

Log of Well No.

DEPTH (feet)	SAMPLES			OVM Reading (ppm)	DESCRIPTION NAME (USCS Symbol): color, moist. % by weight, plast., consistency, structure, cementation, react. W/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
	Sample No.	Sample	Blows/ Foot			

Project No.

Page ____ of ____

O:\Copy of WellLogForm (2)

THE JOHNSON COMPANY, INC.
100 State Street, Suite 600
Montpelier, VT 05602 USA

Phone: (802) 229-4600
Fax: (802) 229-5876
www.johnsonco.com

Ground Water Monitoring Well Sample Collection Record

Well ID:_____

Project Name: Avery Dennison Project #: 1-0145-16

Site Location: Lenoir, NC Sampler:_____ Date:_____

Weather Conditions:_____ Time on Site:_____

1. WATER LEVEL DATA: (from TOC)

Description of measuring point (MP) Top of PVC casing Depth to water below MP (ft):_____

Total well depth (ft):_____ Well Dia.(in):_____ Length of water column in well (ft):_____

Gallons per foot[1]:_____ Well volume (gal):_____

2. PURGING DATA: Method:_____ Stabilized intake depth:_____

Purge Volume @ 1 well volumes:_____(L) Purge Rate:_____(ml/min)

Parameter equipment: YSI, Turbidimeter

Time	Depth (ft.)	volume removed (liters)	Flow Rate (mL/min)	Temp (EC)	Spec Cond. (uS/cm) @25EC	Dissolved Oxygen (mg/L)	p.H. (Std)	ORP (mV)	Turb. (NTU)

Project Number: 1-0145-16 Well Name:_____ Date:_____ Sampler's Intitials: _____

Purge Water Disposal Method _____ Comments (e.g. color, odor):_____

3. SAMPLE COLLECTION: Method:_____ Sample Time:_____

Sample Matrix	Chain-of-Custody#	Shipper ID#	Container Qty/type	Preservation	Analytical method/Lab
GW			3 x 40mL VOA	HCL	8260B / Prism

[1]well volumes for various diameters in gal./ft.

0.50" = 0.01	0.75" = 0.023	1.00" = 0.041	1.25" = 0.064	1.50" = 0.09
2.00" = 0.16	3.00" = 0.32	3.50" = 0.50	4.00" = 0.65	6.00" = 1.47

Comments:

Time Off Site_____

APPENDIX E

Site-Specific Safety and Health Plan

Site Safety and Health Plan

Environmental Investigation

Revision 1

Avery Dennison Corporation Facility

Former Paxar Facility

950 German Street NW
Lenoir, North Carolina

January 2015

The Johnson Company

ENVIRONMENTAL SCIENCE AND ENGINEERING SOLUTIONS

PARTNERS FOR SMART THINKING AND CREATIVE STRATEGIES

Site Safety and Health Plan

for

Environmental Site Investigation Activities

at the

Avery Dennison Corporation Facility

Former Paxar Facility

950 German Street NW
Lenoir, North Carolina

Adopted by: _____ Date: 1/09/2015
Chris Turner, Project Manager

Adopted by: _____ Date: 1/12/2015
Thomas R. Osborne, Site Safety Officer

Adopted by: _____ Date: 1/12/2015
Joel Behrsing, Corporate Health & Safety Officer

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

I have read, understand and will abide by the procedures set forth in this Health and Safety Plan and any amendments thereto. I have also been briefed of the contents of this plan and been given sufficient opportunity to ask any questions that have arisen, and have received answers which I believe are appropriate and complete which are incorporated in this Health and Safety Plan or its Amendments.

Printed Name	Signature	Representing	Date

By acknowledging the contents of this plan, individuals are recognizing the hazards present at the Site and are indicating that they are willing to accept the jurisdiction of the appropriate Site officials as well as the policies and procedures required to minimize exposure to potentially hazardous substances.

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FIGURES

FIGURE 1-1 SITE LOCATION: 950 GERMAN STREET NW, LENOIR, NORTH CAROLINA 5

1.0 INTRODUCTION

This Site Specific Safety and Health Plan (SSHP) has been developed by The Johnson Company, Inc. (JCO) for use during the environmental site investigation performed at 950 German Street NW, Lenoir, North Carolina. This SSHP describes the health and safety guidelines that will be implemented during this work to protect on-Site personnel, visitors, and the surrounding community from physical harm and exposure to hazardous materials. The specific requirements of this SSHP will be revised if new information is received or conditions change. All revisions will be in writing and attached as amendments in Appendix A.

1.1 SITE INFORMATION

The Site is a former Paxar facility that is now owned by Avery Dennison Corporation and is operated as an apparel labeling manufacturing facility with operations that include: weaving; dyeing, bleaching and finishing fabrics; screen and offset printing; thermal coating; hot stamping; cutting and folding; and packaging labels. The property is comprised of two parcels totaling approximately 34 acres. Background and contaminant information concerning this property is based on two previous reports by ERM and subsurface investigations performed by JCO during the period from 2009 through 2014. Based on those investigations, the chemicals of concern (COCs) include: cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), trichloroethene (TCE) and tetrachloroethene (PCE). A summary of pertinent information and action levels for these contaminants is presented in Table 1. Additional information pertaining to these contaminants is included in Appendix B.

TABLE 1: Chemicals of Concern
Site Safety and Health Plan
Former Paxar Facility
Lenoir, North Carolina

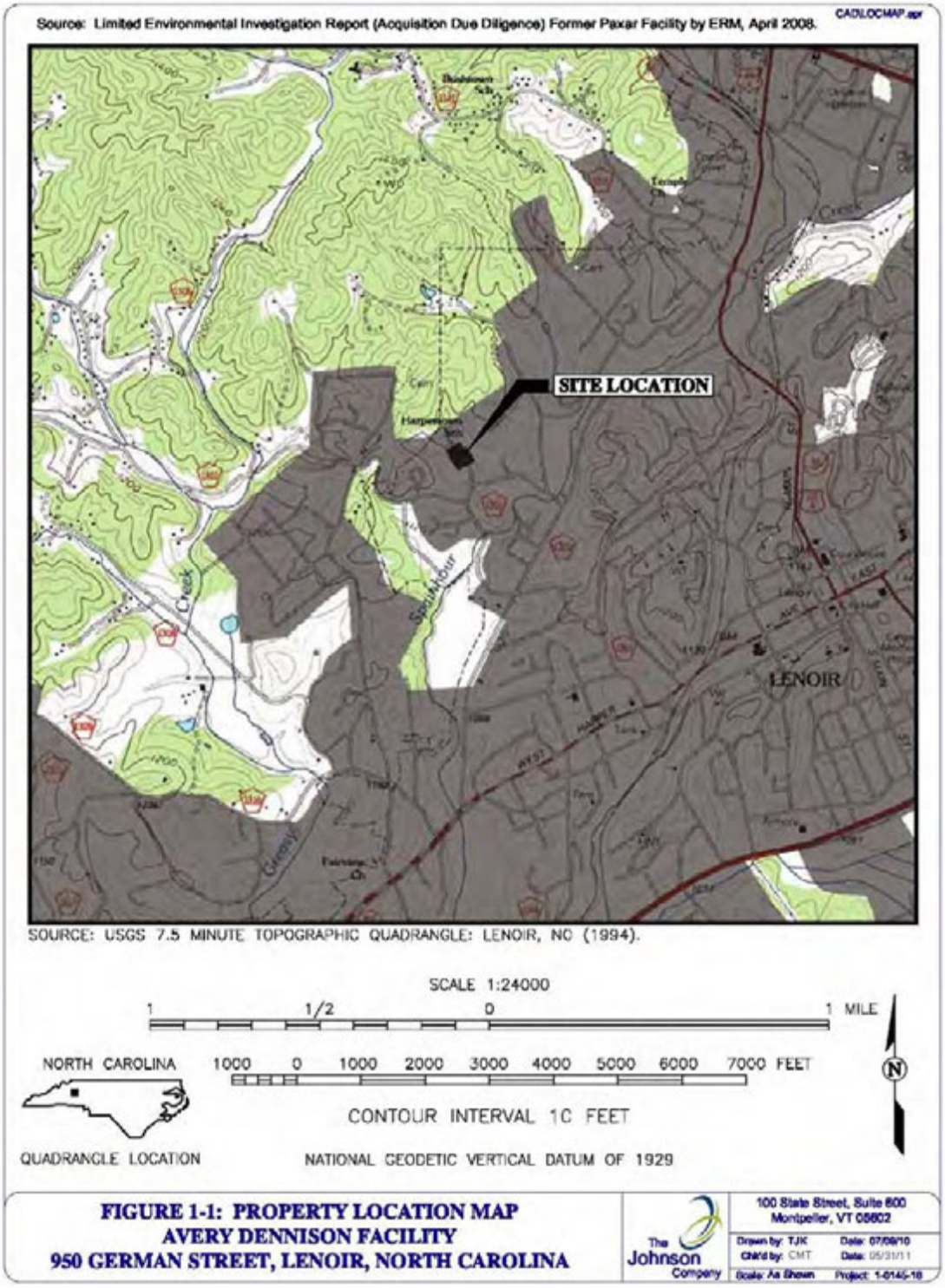
Chemical Name	Synonyms	Ionization Potential (eV)	PID Correction Factor*	Odor Threshold (ppm)	IDLH (ppm)	OSHA PEL (ppm)		PID Reading equivalent to lowest PEL (ppm)*	Action Level
						8-hour TWA	Ceiling		
cis-1,2-Dichloroethene	cis-Acetylene dichloride	9.66	0.80	N/A	1000	200	N/A	250	100 PPM* above background as described in section 8.2
trans-1,2-Dichloroethene	trans-Acetylene dichloride	9.65	0.45	17	1000	200	N/A	444	
Tetrachloroethene	Perchloroethylene; Perchlorethylene	9.32	0.57	1	150	100	200	175	
Trichloroethene	Trichloroethylene; Ethylene trichloride	9.47	0.54	1.4	1000	100	200	185	
Carbon Monoxide	carbonous oxide, carbonyl,	N/A	N/A	odorless	1200	50	100	N/A	25 PPM as described in section 17.6

Notes and Abbreviations:
IDLH - Immediately Dangerous to Life or Health
PEL - Permissible Exposure Limit
TWA - Time Weighted Average
N/A - Indicates data not available
ppm - Parts per million
*for PID equipped with 10.6 eV lamp and span calibrated to 100 ppm isobutylene

Sources:
IDLH and PEL: OSHA Occupational Chemical Database
Odor Threshold: OSHA Occupational Chemical Database, US Dept. of Health and Human Services ATSDR;
New Jersey Dept. of Health Hazardous Substances Fact Sheets
Ionization Potential and PID Correction Factors from RAE Systems Technical Note TN-106 (2014)

1.2 SITE LOCATION MAP

The Site is located at 950 German Street NW in Lenoir, North Carolina. The Site Location is shown on Figure 1-1.



2.0 PROJECT INFORMATION

2.1 SCOPE OF WORK

JCO staff will perform or oversee the following tasks at the Site: concrete/asphalt coring; soil vapor and indoor air sampling; drilling (including direct push; membrane interface probe; and Rota-Sonic methods); soil sampling; surface water gauging and sampling; and groundwater monitoring well installation, development and sampling.

JCO will subcontract a third party utility locator to identify and mark the location of subsurface utilities within the vicinity of each proposed concrete coring and/or drilling location. The proposed drilling/coring locations will be adjusted, as necessary, based upon the location of identified subsurface utilities before intrusive activities commence.

At each proposed drilling or coring location, JCO's subcontractors will advance drilling tools to the target depth using direct-push, Rota-Sonic, or conventional rotary methods and equipment operated by the subcontractors. During drilling activities, soil and/or groundwater samples will be collected for geological characterization and laboratory analysis. Groundwater monitoring wells or soil vapor sampling probes will be installed at selected drilling locations. JCO will collect soil samples for laboratory analysis from selected soil cores generated during drilling activities. These subsurface investigation activities will be performed both interior to and exterior to the manufacturing facility at the Site.

JCO will measure water levels in monitoring wells and at surface water gauging stations, and collect groundwater and/or surface water samples for laboratory analysis.

2.2 PROJECT MANAGEMENT / TEAM ORGANIZATION

The following Project Team functions have the Safety and Health responsibilities as listed below:

<u>Project Supervisor – Glen A. Kirkpatrick, Vice President</u>

The Project Supervisor has the responsibility to direct all operations, and the authority to suspend or modify work practices for any reason.

Project Manager – Chris Turner

The Project Manager is responsible for:

- Project oversight;
- Implementing the project SSHP;
- Providing an adequate supply of safety equipment; and
- Ensuring that all Site workers have received safety training for this project, and have read, understand, and signed the SSHP.

Site Safety Officer (SSO) – Thomas R. Osborne

The SSO is responsible for:

- Advising the Project Manager of safety and health matters, and implementing this SSHP;
- Providing Material Safety Data Sheets (MSDS) or other chemical information to the Project Manager regarding chemical hazards on Site;
- Supervising any air monitoring, either environmental or personal;
- Establishing safe work zones;
- Preparing SSHP amendments, if needed at the Site; and
- Ensuring that all Site personnel have become familiar with the plan contents through a documented training session.

The SSO has the authority to:

- Request compliance with the SSHP, suspend or modify work practices for safety reasons; and
- Exclude from the Site any individual whose on-Site conduct endangers themselves or others.

Corporate Health and Safety Officer (CHSO) – Joel Behrsing, P.E.

The CHSO is responsible for the overall safety and health of all Site workers, and for overall regulatory compliance. In addition, they are responsible for:

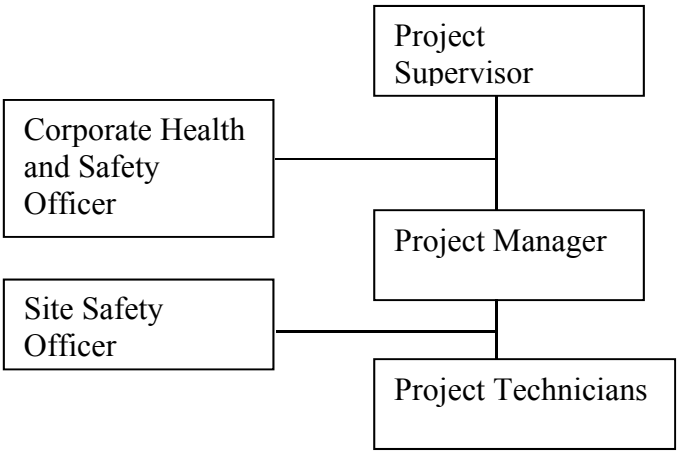
- Reviewing the SSHP to ensure its compliance with all appropriate regulations and ensuring compliance with Company Policies;
- Responding to significant changes in working conditions by issuing a written amendment to this SSHP; and
- Making final decisions with regard to any safety and health dispute or concerns at the project location.

Other Project Professionals:

All employees on-Site are responsible for conduct in compliance with the SSHP and for bringing safety and health concerns to the attention of their supervisor.

2.3 CHAIN OF COMMAND

The following diagram illustrates the Chain of Command with regard to safety and health responsibilities listed above in section 2.2.



3.0 SITE ACTIVITIES

3.1 THE JOHNSON COMPANY TASKS

The Johnson Company will:

- Collect soil samples;
- Supervise installation of groundwater monitoring wells and associated surface completions;
- Develop and sample groundwater monitoring wells;
- Measure surface water and groundwater levels;
- Oversee Membrane Interface Probe investigations;
- Install surface water staff gauges;
- Collect soil samples;
- Collect soil vapor and indoor air samples; and
- Decontaminate equipment.

3.2 SUBCONTRACTOR TASKS

Subcontractors will be utilized for the following tasks:

- Survey locations of soil borings and/or monitoring wells;
- Locate and mark subsurface utilities near each drilling location;
- Penetrate the concrete slab in the facility using a core drill;
- Advance soil borings using Rota-Sonic, direct push, and conventional rotary technology;
- Collect soil samples;
- Install monitoring wells; and
- Perform direct push Membrane Interface Probe work.

Subcontractors will provide their own SSHP for work activities conducted at the Site. JCO will provide Subcontractors with a copy of this SSHP as a reference.

4.0 SITE CONTROL

4.1 RESTRICTED AREAS

The Site is an operational manufacturing facility. Prior to the start of work, JCO will contact a facility representative to exchange safety information, confirm traffic flow and identify any restricted areas.

An exclusion zone will be established by JCO field personnel a minimum of 10 feet away from any drilling operations. JCO field personnel will establish an exclusion zone at non-drilling locations (i.e. soil sampling, groundwater monitoring well sampling, etc.) to prevent unauthorized personnel from entering the work area. The exclusion zone will be clearly marked with boundary tape and/or traffic cones. The exclusion zone will function to protect employees, subcontractors, and the surrounding community from exposure to potentially hazardous materials and to allow for easy egress and decontamination of all personnel and equipment.

The procedures described in this SSHP are protective of safety and health for workers and the community surrounding the Site. Physical hazards are addressed by use of an exclusion zone as described above, and an existing perimeter security fence at the Site to prevent accidental entry into work areas. Chemical hazards will be addressed by perimeter monitoring for VOCs using a PID, and visual monitoring for dust.

5.0 PHYSICAL HAZARDS

5.1 POTENTIAL HAZARDS TO WORKERS

The following are the potential physical hazards to on-Site workers:

___ Confined Space	_X_ Steep, Uneven Terrain	_X_ Hand Tools
_X_ Heavy Equipment	_X_ Heat Stress	_X_ Noise
_X_ Moving Parts	_X_ Extreme Cold	___ Non-Ionizing Radiation
_X_ Heavy Lifting	___ Ionizing Radiation	_X_ Slip, Trip, Falls
_X_ Overhead Hazards	_X_ Traffic	_X_ Biological Hazards
___ Fall over 6 feet	_X_ Surface Water	___ Weather

5.2 PHYSICAL HAZARD MITIGATION OR CONTROLS FOR THIS PROJECT

Heavy Equipment / Moving Parts – Sub-slab coring and drilling will involve the use of large coring and drill rig machinery. Hazards include rotating and moving parts, potential breakage of parts. Controls**:** Awareness of heavy equipment location, maintain body-length distance from machinery, and follow standard operating procedures (SOPs), as described later in this SSHP. Safety glasses will be worn if there is risk of eye impact by foreign materials.
Heavy Lifting / Hand Tools – Movement of machines and equipment could result in back strains / sprains. Controls: Enlist the help of others or use manual assist methods (dollies, carts, etc) to move large objects. Use vehicles for transport heavy items as much as possible.
Overhead Hazards – Operation of heavy equipment may present the potential for a head strike from material dropped from above. Controls: Awareness of overhead tasks and overhead hazards, follow SOPs (as described later in this document), and wear a hard hat.
Traffic – The Site is in an operational industrial facility, with parking lots and nearby roads. The exterior portion of the facility will be frequented by shipping and receiving vehicles, and forklifts will be operating inside the facility. Controls: Information exchange with the on-Site (facility) representative to include identifying areas that are frequented by forklifts and other vehicles. Brightly colored traffic vests are to be worn when working in within 100 feet of vehicular traffic.
Noise – Operation of powered hand drills, impact drills and other equipment may result in sound pressure levels exceeding 85 dBA. Controls: Ear muffs or plugs with NNR rating of 23 or above.
Slip, Trip, Falls (STF) – These may result from uneven terrain, tripping over materials or tools on the ground, or tripping on uneven floor surfaces. Controls: Good housekeeping; maintain orderliness at the Site. Wear good shoes and be aware of uneven surfaces.
Steep, Uneven Terrain – Access to areas of the Site that are not paved, and / or are covered with vegetation is possible. Access to a stream channel / ravine is required. Controls: Identify areas where ground surfaces may be uneven. Wear sturdy boots or shoes with good traction.
Surface Water – Workers may measure surface water levels and/or collect surface water samples from an intermittent stream. Controls: Approach surface water using the least-steep slopes in the area to which access is needed. Stream flow is typically minimal, but may be swift and deep after storm events. Approach with caution and do not enter surface water that is swift-moving or may be deeper than two feet.

Biological Hazards – This work is scheduled to take place during all seasons of the year; the location of the Site lends itself to the following biological hazards:

- Poison plants, such as poison ivy, poison oak, and irritating plants, such as nettles;
- Bees, wasps, mosquitoes, ticks, and other stinging or biting insects; and
- Spiders and snakes.

Poisonous Plants:

Poison ivy and poison oak may be found at the Site. Controls: Long pants, long sleeve shirts. If you believe you have come in contact with either, wash the area thoroughly with tepid water and soap. Report any rashes or skin irritation.

Bees, wasps, mosquito or other stinging or biting insects:

Controls: Be aware that insect contact is possible, and that both overhead and ground level nests are possible for bees and wasps. If you know you are allergic to these insects, let the SSO know and verify that you have a sting kit with you at the Site. Keep lunch and snack foods covered. Wear long sleeve clothing.

Spiders: **It is possible to encounter the black widow** and the **brown recluse spider at the Site**. The bites of these spiders rarely cause death. However, they may cause serious health problems for children, the elderly, and those in poor health.

Controls: Be aware of and avoid places where spiders frequent. Wear long sleeve shirts and long pants.

First Aid:

1. If possible, make a positive identification. If the spider bite is on an arm or a leg, tie a snug bandage above the bite to help slow or halt the venom's spread. Ensure that the bandage is not so tight as to cut off circulation in the arm or the leg.
2. Use a cold cloth at the spider bite location. Apply a cloth dampened with cold water or filled with ice.
3. Seek immediate medical attention. Treatment for the bite of a black widow may require an antivenom medication. Doctors may treat a brown recluse spider bite with corticosteroids.

Ticks: Female deer tick pictured below

Controls: Wear light-colored clothing outdoors to help spot ticks. Wear long sleeves and pants tucked into your socks or boots. Use a hat for added protection. Avoid walking in tall brush and shrubs. Check your clothing often for ticks. After leaving the Site, thoroughly check your body and hair for ticks.

Some ticks transmit bacteria that cause illnesses such as Lyme disease or Rocky Mountain spotted fever. Your risk of contracting one of these diseases depends on how much time you spend in wooded areas and how well you protect yourself. It is possible to contract both RMSF and Lyme disease with a deer tick bite in North Carolina.

If you've received a tick bite:

- Remove the tick promptly and carefully. Use tweezers to grasp the tick near its head or mouth and pull gently to remove the whole tick without crushing it.
- If possible, seal the tick in a jar. Your doctor may want to see the tick if you develop signs or symptoms of illness after a tick bite.
- Use soap and water to wash your hands and the area around the tick bite after handling the tick.
- Call your doctor if you aren't able to completely remove the tick.
- Watch for the following symptoms of Lyme's disease and RMSF:
    - Add list of symptoms

Snakes: North Carolina is home to three types of rattlesnakes, the coral snake, water moccasin and copperhead.

Excepting the coral snake, these poisonous snakes have slit-like eyes. Their heads are triangular, with a depression, or pit, midway between the eyes and nostrils.

Other characteristics are unique to certain poisonous snakes:

- Rattlesnakes make a rattling sound by shaking the rings at the end of their tail.
- Water moccasins have a white, cottony lining in their mouth.
- Coral snakes have red, yellow and black rings along the length of their body.

Controls: To reduce your risk of snakebite, avoid picking up or playing with any snake. Most snakes usually avoid people if possible and bite only when threatened or surprised.

First Aid:

- Remain calm
- Don't try to capture the snake
- Immobilize the bitten arm or leg and try to stay as quiet as possible
- Remove jewelry, because swelling tends to progress rapidly
- Apply a loose splint to reduce movement of the affected area, but make sure it is loose enough that it won't restrict blood flow
- Don't use a tourniquet or apply ice
- Don't cut the wound or attempt to remove the venom

Seek medical attention as soon as possible, especially if the bitten area changes color, begins to swell or is painful.

HEAT STRESS[1]

Hazard: Heat stress and heat exhaustion producing personal injury.

Types of Heat Stress

Heat related problems include heat rash, fainting, heat cramps, heat exhaustion and heat stroke. Heat rash can occur when sweat isn't allowed to evaporate, leaving the skin wet most of the time and making it subject to irritation. Fainting may occur when blood pools to lower parts of the body and as a result, does not return to the heart to be pumped to the brain. Heat related fainting often occurs during activities that require standing erect and immobile in the heat for long periods of time. Heat cramps are painful spasms of the muscles due to excessive salt loss associated with profuse sweating. Heat exhaustion results from the loss of large amounts of fluid and excessive loss of salt from profuse sweating. The skin will be clammy and moist and the affected individual may exhibit giddiness, nausea and headache.

Heat stroke occurs when the body's temperature regulatory system has failed. The skin is hot, dry, red and spotted. The affected person may be mentally confused and delirious. Convulsions could occur. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The

[1] NIOSH/OSHA/USCG/EPA - Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, October, 1985, pp. 8-20 to 8-23.

person should be soaked with water to promote evaporation. Fan the person's body to increase cooling.

Early Symptoms of Heat-Related Health Problems:

- Decline in task performance;
- Excessive fatigue;
- Loss of coordination;
- Reduced vigilance;
- Decline in alertness;
- Muscle cramps;
- Unsteady walk; and
- Dizziness.

Susceptibility to Heat Stress Increases due to:

- Lack of physical fitness;
- Obesity;
- Lack of acclimation;
- Drug or alcohol use;
- Increased age;
- Sunburn;
- Dehydration; and
- Infection.

People unaccustomed to heat are particularly susceptible to heat fatigue. Individuals working in hot conditions while wearing PPE for the first time need to gradually adjust to the heat.

Protective Measures:
Protective measures for multiple heat stress risk levels are described in Table 2.

Table 2: Heat Stress Risk Levels and Protective Measures (see Appendix B for heat index table)

Heat Index	Risk Level	Protective Measures
Less than 91° F	Lower (Caution)	• Establish a cool, shaded area (or areas) for rest breaks. • Provide adequate amounts of cool water in convenient locations close to the work area
91° F to 103° F	Moderate	• Alert workers to the heat index and identify each precaution in place at the work site to reduce the risk of heat-related illness • Establish a cool, shaded area (or areas) for rest breaks. • Provide adequate amounts of cool water in convenient locations close to the work area • Remind workers to drink small amounts of water often – a good rule of thumb is to drink about 4 cups of water every hour • Respond to heat-related illness and medical emergencies without delay. Treating milder symptoms (headache, weakness) early by providing rest in a shaded area and cool water can prevent a more serious medical emergency. Call 911 immediately if a worker shows signs of possible heat stroke. • Review heat-related illness signs and symptoms during daily meetings • Monitor coworkers for signs of heat stress and maintain effective communication

103° F to 115° F	High	• Alert workers to the heat index and identify each precaution in place at the work site to reduce the risk of heat-related illness
		• Establish a cool, shaded area (or areas) for rest breaks.
		• Provide adequate amounts of cool water in convenient locations close to the work area
		• Remind workers to drink small amounts of water often – a good rule of thumb is to drink about 4 cups of water every hour
		• Establish and enforce work/rest schedules to control eat exposure and allow workers to recover – see text below for work/rest schedules.
		• Adjust work activities to reduce risk, including:
		  o Schedule heavy tasks for cooler parts of the work day
		  o Set up shade canopies or move work that can be performed in naturally shaded areas
		  o Decrease the physical demands and pace of tasks.
		  o Rotate workers to job tasks that are less strenuous or in cooler settings
		• Monitor coworkers for signs of heat stress and maintain effective communication

Heat Index	**Risk Level**	**Protective Measures**
Greater than 115° F	Very High to Extreme	• Alert workers to the heat index and identify each precaution in place at the work site to reduce the risk of heat-related illness • Establish a cool, shaded area (or areas) for rest breaks.

		• Provide adequate amounts of cool water in convenient locations close to the work area
		• Remind workers to drink small amounts of water often – a good rule of thumb is to drink about 4 cups of water every hour
		• Establish and enforce work/rest schedules to control eat exposure and allow workers to recover – see text below for work/rest schedules.
		• Reschedule non-essential outdoor work for cooler periods (e.g., morning or evening), or for days with reduced heat index, if possible.
		• Adjust work activities to reduce risk, including:
		  o Schedule heavy tasks for cooler parts of the work day
		  o Set up shade canopies or move work that can be performed in naturally shaded areas
		  o Decrease the physical demands and pace of tasks.
		  o Rotate workers to job tasks that are less strenuous or in cooler settings
		• Monitor coworkers for signs of heat stress and maintain effective communication (e.g., buddy system).
		• Stop work if control methods are inadequate.

Work/Rest Schedules:

Work/Rest schedules for High and Very High heat stress Risk Levels, as defined in Table 2, are described below. "Rest" is defined as sitting quietly or with moderate arm movements, and includes tasks such as attending a meeting, reading instructions, completing paperwork, or recording meter readings.

When working under High heat stress Risk Level conditions, workers will include a minimum **15 minutes of resting activities in each working hour**, and the heat stress monitoring techniques described below will be performed. Shorter work periods and/or longer rest periods may be necessary based on the results of heat stress monitoring, as described below.

When working under Very High heat stress Risk Level conditions, workers will include a minimum **30 minutes of resting activities in each working hour**, and the heat stress monitoring techniques described below will be performed. Shorter work periods and/or longer rest periods may be necessary based on the results of heat stress monitoring, as described below.

Heat Stress Monitoring Techniques

If conditions indicate a high to very high risk level for heat stress as defined in Table 2, Site personnel should regularly monitor their heart rate as an indicator of heat strain by the following method: check radial pulse rates by using fore-and middle fingers and applying light pressure to the pulse in the wrist for one minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beats/minute, shorten the next work cycle by one-third and keep the rest period the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, shorten the work cycle by one-third.

COLD STRESS

Cold stress is caused by lowering the body core temperature to a level that causes lowered mental output, fatigue, unconsciousness, coma and ultimately death. Exposure of flesh to cold may cause physical damage to extremities through the onset of frost bite. Conditions for low temperature injuries can be created by low ambient temperature, chilling winds, and perspiration or emersion, causing heat to be lost from the body by evaporation of the water.

Hazard Reduction

When the ambient temperature or the wind chill temperature produces discomfort in site personnel, precautions shall be taken against cold stress and hypothermia. If deemed appropriate by the SSO, all personnel shall work in 50 minute cycles separated by a minimum of 10 minutes in a warm environment. All work shall stop if the ambient temperature or the wind chill temperature results in serious discomfort, deterioration in function, or other signs of hypothermia in personnel.

Monitoring Protocol

- Mental function: Monitor personnel for decreases in mental function as exhibited by fatigue, forgetfulness, alertness, increase in minor injuries, etc. Any worker showing signs of decreased mental function shall be placed in a warm environment for a minimum period of 10 minutes. If symptoms persist, the worker shall be released of work that further exposes them to cold.
- Physical signs: If any worker complains of serious discomfort or exhibits discoloration of lips or extremities, numbness, excessive shivering, or discoloration with no shivering the worker shall be removed to a warm location until symptoms are abated.

Although not anticipated to be an issue for this project, the above monitoring requirements will be the responsibility of each subcontractor. The Johnson Company will not be responsible for performance monitoring protocols for subcontractors and vice versa.

Prevention

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing cold stress is particularly important because once an individual suffers from severe exposure to cold, that person may be predisposed to additional injuries. To avoid cold stress, the SSO, should ensure that the following steps are taken:

- Dress properly: Wear sufficiently warm clothes that do not cause restriction in blood flow or movement. Dress in layers with loose clothes. Wear a warm hat or hard hat liner. Care should be taken not to spend too long in a warm environment while dressed for cold conditions. This may cause excessive sweating (see below) or even heat stress.

- Keep dry: Evaporation of perspiration or water from emersion can cause rapid cooling of the body, lowering the body temperature further. Care should be taken to avoid short periods of hard labor followed by periods of inactivity.
- Provide shelter (heated, if possible) to protect personnel during rest periods.

5.3 SAFETY EQUIPMENT REQUIRED FOR THIS PROJECT

The following should be available and on-Site:

- Brightly colored traffic vests;
- Barricade tape or safety cones;
- Safety glasses;
- Work boots or shoes with steel toe and shank;
- Hard hat;
- Nitrile gloves;
- Hearing protection; and
- Material handling / lifting mechanical assistance equipment such as a dolly or pallet jack if heavy material handling is required.

6.0 CHEMICAL HAZARD INFORMATION

6.1 EXPOSURE CONTROLS

The main pathways for exposure to COCs at the Site are through physical contact and inhalation. Barriers such as chemical protective gloves and safety glasses will be used to eliminate the possibility of skin or eye contact with contaminated soil and water. If airborne concentrations of COCs exceed 100 ppm above background, as measured by a Photoionization Detector (PID) within the breathing space, then work will stop until the vapors in the air are less than 100 ppm above background.

Special considerations will be made by the SSO with regard to the manufacturing operations at the Site, because solvents are used for manufacturing operations in the facility. JCO personnel will be briefed by on-Site manufacturing representatives and a SSHP amendment to this SSHP may be required to address manufacturing activities in or near JCO work areas.

6.2 HAZARD COMMUNICATION PROGRAM

Material Safety Data Sheets for all suspect chemicals and for chemicals brought on-Site

are located in Appendix B of this document. The SSO will review this information with all field personnel prior to the start of the project.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment will consist of modified level D to include:

Boots/shoes: Heavy duty leather work boots or shoes with steel toe and shank. In wet environments, (or if preferred) these can be substituted with heavy duty rubber boots with steel toe and shank.

Gloves: Nitrile inner gloves whenever the possibility of contact with contaminated water or soils exists. Heavy duty, chemical resistant [Viton] outer gloves are needed if contact with pure-phase chlorinated volatile organic chemicals becomes necessary. General purpose work gloves are needed where hot surface or abrasion hazards exist.

Coveralls: May be used to protect clothes from contamination, if desired. No hood or booties are required.

Hearing Protection: OSHA-approved hearing protection will be worn when working in proximity to noise-generating equipment such as a generator, drill-rig, or air compressor, where noise levels exceed 80 decibels. For reference, the OSHA 8-hour permissible exposure limit (PEL) for noise is 90 decibels. In practical terms, hearing protection should be utilized when persistent noise reaches a level at which normal conversation becomes difficult to hear, or where periodic loud noises, such as metal pipes being dropped into a rack, may occur. Hearing protection will also be worn as required by Avery Dennison Corporation facility health and safety protocols.

Safety Glasses: ANSI standard Z.87. Safety glasses or goggles will be worn when working around equipment or performing tasks where eye hazards exist.

Traffic Vests: High-visibility safety vests must be worn when working in high-traffic areas or near heavy equipment.

Hard Hat: NIOSH-approved, (as necessary) when overhead hazards exist.

8.0 ENVIRONMENTAL MONITORING

During tasks that result in the disturbance of soil or encounter groundwater that is known or is suspected to be contaminated, environmental monitoring using a PID will be performed.

8.1 AIR MONITORING

Air monitoring for volatile COCs will be performed using a PID equipped with a 10.6 eV lamp, as described in Section 8.2. Additional indoor air monitoring will be performed using a multiple gas monitor during indoor internal combustion engine use to monitor for carbon monoxide (CO), as described in Section 17.6.

8.2 ACTION LEVELS AND RESPONSE PROCEDURES

Environmental monitoring for volatile COCs will take place during concrete coring, drilling, soil sampling and groundwater sampling. Action levels are direct readings from a PID equipped with a 10.6 eV lamp and calibrated to 100 ppm isobutylene. The procedure for monitoring is:

- Take the reading in the area of worker's breathing zone. This is an imaginary hemisphere roughly 9 inches in direction from the plane of a person's face, with the nose and mouth at the center of the hemisphere.
- If the readings approach 100 ppm above background over a sustained time period of 3 min or 3 consecutive readings, the activity will cease until natural ventilation has dissipated the vapors.
- If sustained readings are greater than 100 ppm above background with the PID, all JCO and subcontractor work at the work area will cease until permission to continue is received from the CHSO.

Response Procedures – All attempts will be made to control chemical vapors such that sustained readings are below 100 ppm above background. This can be achieved through

natural dilution ventilation, or through positioning workers directly upwind from any vapors. If this is not possible at a specific work location, the source of the chemical vapors will be sealed and work at that location will cease. If ventilation of the work area is unsuccessful in reducing vapor concentrations in the breathing zone, an upgrade to Level C protection [Full Face Mask Respirators with Organic Vapor Cartridges] may be necessary. Under those conditions, modification to this SSHP will be documented to include adoption of Level C PPE.

Perimeter Monitoring –perimeter monitoring will be performed at least once per hour during work activities or more frequently if elevated VOC levels resulting from the work activities are suspected. Perimeter monitoring will be performed by scanning the length of the exclusion zone perimeter with a PID. If working inside the facility, the action level and response procedures described above will be used. If working outside the facility, the size of the exclusion zone will be increased until perimeter monitoring downwind of the work area shows PID readings at or below 10 PPM above background levels.

9.0 PERSONAL MONITORING

Based on review of Site hazards and the use of environmental monitoring, personal industrial hygiene monitoring is not necessary for this project.

10.0 CONFINED SPACE ENTRY PROCEDURES

Confined space entries will not be performed for this project.

11.0 HEALTH AND SAFETY TRAINING / MEDICAL MONITORING

All Site workers, to include subcontractors, will be required to produce evidence of training as a 40 – hour Hazardous Waste Operation Worker and evidence of enrollment in a medical surveillance program.

All JCO employees are enrolled in and have had a baseline Hazardous Materials worker medical exam. Documentation of these exams can be found at JCO's main office in confidential personnel files.

12.0 COMMUNICATION PROCEDURES

When face to face communication is possible, field personnel will communicate verbally.

In areas where verbal communication is not possible, field personnel will communicate with hand signals. Signals will be explained during the pre-start safety meeting.

Cellular phones may be used for communication between field personnel.

13.0 DECONTAMINATION PROCEDURES

13.1 MACHINERY AND EQUIPMENT

All equipment that contacts potentially contaminated media will be decontaminated as appropriate on Site. All hand-held equipment will be decontaminated by removal of disposable wrappings or by washing in soapy water, followed by a clean water rinse on Site.

Any coring and drilling equipment will be decontaminated by cleaning all parts of the equipment that were in contact with the contaminated soil.

Decontamination water will be either collected in 55 gallon drums or other appropriate containers in a fashion that does not pose threat to the environment or human health.

13.2 PERSONNEL DECONTAMINATION

All disposable gloves and Tyvek, if utilized, will be disposed of properly as solid waste. The heavy duty work boots will be washed of contaminants before leaving the Site. The employees' hands and face will be washed as soon as possible after leaving the Site.

All disposable gear will be placed in a double lined garbage bag and securely sealed. The garbage bag will be delivered to a solid waste repository, as soon as practical after the job is completed.

14.0 EMERGENCY PROCEDURES

The SSO is responsible for responding to and correcting an emergency situation. These duties include the protection of employees, evacuating and securing the work area, ensuring the protection of the public and the environment, ensuring that appropriate decontamination procedures are implemented on all personnel, determining the cause of the incident, recommending changes to prevent its reoccurrence, upgrading or downgrading the level of personal protection equipment, and notification of the appropriate Federal, State and local agencies.

14.1 PERSONNEL INJURY

All personnel who are injured or become ill in the Exclusion Zone must be decontaminated to the maximum extent possible. If injuries are minor, a full decontamination procedure will be completed and first-aid administered, as needed, prior to transport. If injuries are severe, a partial decontamination will be completed which will include the removal of all contaminated clothing and redressing in clean coveralls or appropriate materials. First-aid will be administered by trained personnel, as needed, prior to the arrival of medical personnel. Any person transported for further medical attention will be accompanied by information regarding the COCs to which they may have been exposed.

Any vehicle and equipment used to transport contaminated personnel will be cleaned or decontaminated, as necessary.

14.2 EVACUATION ROUTES

In the event of an emergency that requires evacuation of the work area, a verbal command will be sounded to clearly inform all personnel of the emergency situation. At that time, all personnel will proceed to a point within the clean zone, upwind of any smoke, vapors or spills and proceed with decontamination procedures.

Site workers will be briefed with the manufacturer's emergency evacuation notification and procedures before the start of the job.

15.0 SPILL CONTROL PROCEDURES

This section addresses the potential for spillage/accidental release of containerized liquids that may be present on-Site. The materials susceptible to spillage that may be present on-Site are as follows: gasoline, diesel, hydraulic fluid, lubricants, Alconox (or equivalent detergent) and decontamination water.

Preventive Measures

All containerized liquids shall be stored in a designated area, isolated from vehicular traffic and protected from the effects of weather. Measures to prevent spills or leaks include:

- All containers shall be labeled as to their contents and principal hazards, in accordance with 29 CFR 1910.120;
- A file of Material Safety Data Sheets (MSDS) shall be maintained by the SSO for all materials introduced to the Site (see Appendix B);

Spill Response Procedures

Training: During the initial on-Site health and safety briefing, employees will be informed of the potential hazards of the materials with which they work. The following spill procedures will also be presented at that time. Only those employees trained in accordance with 29 CFR 1910.120 will assist in the clean-up procedure.

Initial response: Upon observing a spill or leakage from a container, employees will immediately step back to a safe distance and direct other employees away from the spill. Initial response actions will include the following:

- Sources of ignition within 100 feet of the spill (including vehicle engines) will be de-energized;
- All combustible materials (such as wood, paper, oil, etc.) will be removed from the spill area.
- The Project Manager and SSO will be advised immediately of the location, size, and nature of the spill, including the identity of the spilled material (since all containers brought to the Site should be labeled, the spilling of unidentified liquids is not anticipated to be an issue);
- Employees who have had contact with the spilled material will be decontaminated, as needed.

Planning for Containment/Cleanup: As conditions dictate, the Project Manager or SSO will determine the appropriate follow-up responses.

- These may include any combination of initiating containment/clean-up, requesting outside assistance, and notifying affected authorities.

- The SSO will be notified of the occurrence of any spill in a timely manner.

- The SSO will consult the MSDS for the spilled material to determine the specific approach for containing the spill, including the personal protective equipment to be worn during response activities.

- The SSO will conduct air monitoring appropriate to the nature of the spilled material, to quantify exposure and detect flammable atmospheres and specify the required PPE for containment/cleanup activities.

Containment/Clean-up: The following are examples of specific measures that may be used (in combination when necessary) to respond to a spill.

- Upright or rotate containers to stop the flow of liquids. This step may be accomplished as soon as the spill or leak occurs, providing it is safe to do so;

- Sorbent pads, booms, or adjacent soil may be used to dike or berm materials subject to flow and to solidify liquids;

- Collect used/saturated sorbent pads, soil or booms in drums;

- Collect contaminated tools and equipment for subsequent cleaning or disposal.

Restoration and Salvage of Spill Control Items

The method for disposal of the spill-affected materials will depend on the identity and characteristics of the spilled material. The specific method for disposal, along with any post clean-up verification sampling or restoration procedures, will be determined by the SSO through consultation with the CHSO.

Generally, if spill-affected materials such as PPE, sorbent pads and booms, contaminated soil or collected spillage, are determined or suspected as being hazardous waste, they will be collected and sealed in drums that will be appropriately labeled and characterized to determine if they are RCRA hazardous waste.

16.0 EMERGENCY INFORMATION
EMERGENCY PHONE NUMBERS / HOSPITAL LOCATION / MAP

TELEPHONE

Ambulance: 911

Fire:.....911

Police: 911

Caldwell Memorial Hospital 828–757-5100

Carolinas Poison Center 1-800-222-1222

The Johnson Company, Inc.:

Chris Turner, Project Manager 603-703-4067

Joel Behrsing, Corporate Health & Safety Officer 802-229-4600

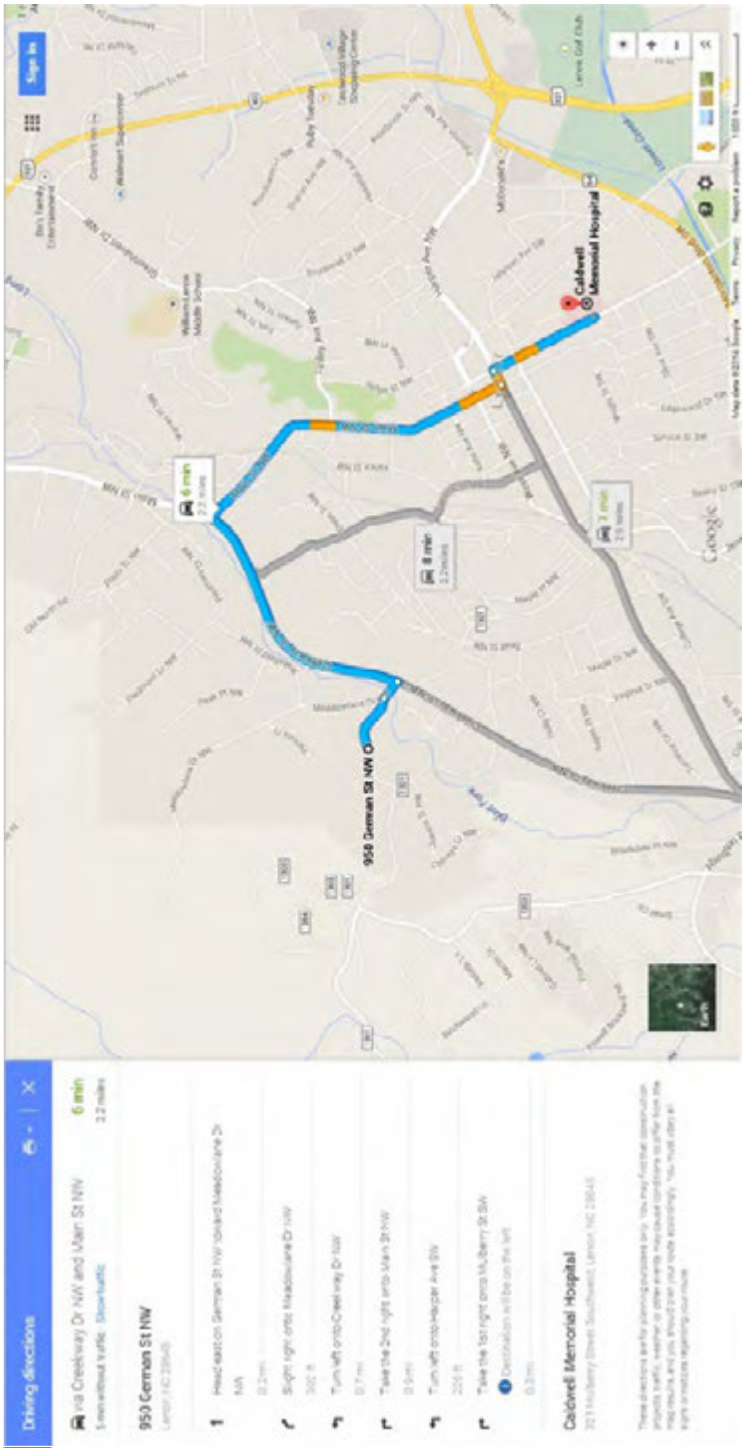
North Carolina Department of Environment and Natural Resources

Asheville Regional Office.....828-296-4500

Client Contact:

Bruce Martin, Corporate Environmental Health and Safety 508-476-5041

DIRECTIONS TO NEAREST HOSPITAL / EMERGENCY SERVICES – CALDWELL MEMORIAL HOSPITAL



17.0 GENERAL SAFE WORK PRACTICES

The following are general safe work practices to be used on-Site:

1. Visual, voice, cellular phone, or radio communications shall be maintained at all times.
2. Contact with contaminated surfaces, water, soil, and equipment shall be avoided whenever possible. Do not walk through discolored surfaces or kneel on the ground, nor lean, sit or place equipment on chemical containment drums or containers.
3. Eating, drinking, and smoking are prohibited in exclusion zone. Alcoholic beverages are prohibited on the Site.
4. Hands must be thoroughly washed after working in the exclusion zone where COCs may be present.
5. Failure to complete a respiratory fit test shall preclude admission to any zone requiring respiratory protection.
6. Personal protective equipment shall be required for all field personnel and may include, but is not limited to respiratory protection, hard hat, chemical resistant coveralls, boots, gloves, safety glasses, and ear protection.
7. Anyone reporting to work under the influence of alcohol and/or illicit drugs will be subject to disciplinary action. Any employee with a physical condition or taking prescription medication that has the potential to affect the employee's performance or susceptibility to hazards must notify the SSO prior to reporting to the Site.
8. All employees shall listen for and yield the right-of-way to heavy equipment.
9. All equipment operators shall provide warning prior to movement and watch for personnel in their path.
10. Employees are responsible to clean and maintain the protective equipment issued to them. Any and all defects or failures of the equipment shall be reported immediately to the SSO.
11. All personnel shall report all injuries and/or illnesses to the SSO regardless of the severity of injuries.
12. Personnel shall avoid any potentially dangerous environmental situations such as entering a confined space without proper supervision, training and equipment.

13. "Dig Safe" number must be at least 48 hours prior to all drilling and excavation operations.
14. All personnel are required to contact the Project Manager or Project Supervisor when conducting a field investigation or Site inspection. They must at a minimum, call prior to, or as soon as possible after leaving the Site.
15. Personnel encountering a potentially hazardous environment (e.g., noticing strong vapor levels of unidentified substances) shall instruct all other on-Site personnel to leave the area and call the on-Site project manager and SSO for instruction. Personnel shall not re-enter the potentially hazardous environment without proper protective clothing, and shall not work in the potentially hazardous area until the unknown substance is further characterized.
18. A hard hat shall be worn when working near overhead hazards, such as drilling rigs with masts extended.
19. A shirt and long pants shall be worn at all times.
20. Skin abrasions must be covered to prevent chemical exposure.
21. Each employee is responsible for his or her health and safety.

17.1 CONCRETE CORING

Hazard: Potential contact with contaminated soil, potential exposure to air-borne contaminants, dust and physical and electrical hazards.

SOPs: Work gloves, safety glasses, and heavy duty steel toe and shank boots shall be worn at all times. Level D gear shall be worn as required by this SSHP and the SSO. A PID will be utilized to quantify the presence of volatile organic materials and indicate the necessity of personal protective gear. A water mist or spray shall be applied to the cutting area to prevent the dust from becoming airborne. All safety precautions outlined in the concrete coring equipment operator's manual will be followed.

17.2 DRILLING

Hazard: Injury from utilities, e.g., buried or overhead electrical lines, generation of dust.

SOPs: Nitrile gloves, safety glasses, hard hat, hearing protection, safety vest, and heavy duty steel toe and shank boots, as specified in Section 7. Personnel are to abide by the SOPs outlined in Section 17.5 when working around operating drilling rigs. Before any drilling begins, the location of underground utilities, such as gas, electricity, and water, in immediate vicinity of the proposed drilling location will be identified and marked. The location of all overhead power lines will be identified, and the drill rig set up at a safe distance from the utility lines. Drilling equipment shall be operated by experienced and skilled operators. Care shall be taken in the movement and placing of equipment to prevent collision with other vehicles or equipment, to stay away from power sources, to avoid poor footing and to avoid injury while operating the equipment. If dust-generating conditions are present (e.g. dry, fine-grained materials in the presence of wind) a potable water mist or spray shall be applied to soil cuttings and/or soil cores exposed to the atmosphere to prevent airborne dust generation, until the dust-generating material is containerized as IDW.

17.3 GROUNDWATER SAMPLING

Hazard: Contact with contaminated water, physical injury and electrical hazards.

SOPs: Nitrile gloves, safety glasses, and traffic vests, as specified in Section 7. A PID will be utilized to quantify the presence of VOCs and indicate the necessity of a PPE upgrade. Ground-fault circuit interrupters (GFCI) shall be used at all times in potentially hazardous conditions such as wet environments or outside. In those instances, if the local power outlets are not equipped with GFCI, GFCI cordsets, shall be used.

17.4 SOIL SAMPLING

Hazard: Contact with unsaturated or saturated contaminated soil.

SOPs: Nitrile gloves and safety glasses, as specified in Section 7. A PID will be utilized to quantify the presence of VOCs and indicate the necessity of a PPE upgrade.

17.5 HEAVY EQUIPMENT OPERATION

Hazard: Injury due to impact from equipment.

SOPs: Safety glasses, hard hat, hearing protection, safety vest, and heavy duty steel toe and shank boots, as specified in Section 7. All heavy equipment shall be operated by experienced and skilled operators. Care shall be taken in the movement and placing of equipment to prevent collision with other vehicles or equipment, to stay away from power sources, to avoid poor footing and to avoid injury while operating the equipment. Heavy equipment shall not be operated outside of the building for a period of 30 minutes after thunder and/or lightning are observed.

17.6 INDOOR INTERNAL COMBUSTION ENGINE OPERATION

Hazard: Carbon Monoxide exposure from equipment use.

SOPs: A system of heat-resistant piping and inline air fans will be set up to exhaust gases from the engine to the exterior of the facility. Exhaust ventilation piping will be routed away from traffic areas where possible, and marked with brightly colored flagging and/or traffic cones in areas where it must cross foot and vehicle (fork lift) traffic areas. The effectiveness of the ventilation system will be confirmed using a multiple gas meter to monitor indoor CO levels during indoor operation of internal combustion engines. Breathing zone and perimeter monitoring will be performed. Breathing zone monitoring will be performed in the breathing zone for each worker in the vicinity of the operating internal combustion engine or exhaust ventilation system. Perimeter monitoring will be performed along the perimeter of the exclusion zone and the length of the exhaust ventilation system.

If CO concentrations detected in the breathing zone or in perimeter monitoring continuously exceed 25 ppm (half the OSHA PEL value of 50 ppm), JCO or its subcontractor will monitor the length of the exhaust ventilation system for leaks using the multiple gas meter, and reconfigure or reseal portions of the ventilation system, as needed. If CO concentrations reach or exceed the OSHA PEL value of 50 ppm in the breathing zone, use of the internal

combustion engine will be discontinued and the area exceeding the 50 ppm will be temporarily evacuated until the CO concentration has decreased to below 50 ppm. Routine use of internal combustion engines may not resume until the ventilation system is configured to continuously maintain CO levels below 50 ppm in the breathing zone.

APPENDIX A

AMENDMENTS AND AMENDMENT FORMS TO THE HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN AMENDMENT FORM

Site Health and Safety Plan Amendment No.:_____

Site Name:

Date:

Type of Amendment:

Reason for Amendment:

Alternate Safeguard Procedures:

Changes in Personal Protective Equipment:

Accepted by:

_____	_____
Site Health and Safety Officer	Date:
_____	_____
Project Manager	Date:
_____	_____
Corporate Health and Safety Officer	Date:

APPENDIX B

MATERIAL SAFETY DATA SHEETS

Centers for Disease Control and Prevention
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1,2-Dichloroethylene

Synonyms & Trade Names Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene

CAS No. 540-59-0	RTECS No. KV9360000 (/niosh-rtecs/KV8ED280.html)	DOT ID & Guide 1150 130P (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130&poly=1) (http://www.cdc.gov/Other/disclaimer.html)
Formula ClCH=CHCl	Conversion 1 ppm = 3.97 mg/m3	IDLH 1000 ppm See: 540590 (/niosh/idlh/540590.html)
Exposure Limits NIOSH REL : TWA 200 ppm (790 mg/m3) OSHA PEL : TWA 200 ppm (790 mg/m3)		Measurement Methods NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ; OSHA 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.

MW: 97.0	BP: 118-140°F	FRZ: -57 to -115°F	Sol: 0.4%	VP: 180-265 mmHg	IP: 9.65 eV
Sp.Gr(77°F): 1.27	Fl.P: 36-39°F	UEL: 12.8%	LEL: 5.6%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, respiratory system; central nervous system depression

Target Organs Eyes, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html)) Skin: Prevent skin contact Eyes: Prevent eye contact	First Aid (See procedures (firstaid.html)) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support

Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation	Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 1000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)£
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0436 (/niosh/ipcsneng/neng0436.html)

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Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

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Tetrachloroethylene

Synonyms & Trade Names Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

CAS No. 127-18-4	RTECS No. KX3850000 (/niosh-rtecs/KX3ABF10.html)	DOT ID & Guide 1897 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160) (http://www.cdc.gov/Other/disclaimer.html)
Formula $Cl_2C=CCl_2$	Conversion 1 ppm = 6.78 mg/m3	IDLH Ca [150 ppm] See: 127184 (/niosh/idlh/127184.html)

Exposure Limits

NIOSH REL : Ca Minimize workplace exposure concentrations. See Appendix A (nengapdxa.html)

OSHA PEL † (nengapdxg.html) : TWA 100 ppm
C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm

Measurement Methods

NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ;
OSHA 1001 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a mild, chloroform-like odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
165.8	250°F	-2°F	0.02%	14 mmHg	9.32 eV
Sp.Gr: 1.62	Fl.P: NA	UEL: NA	LEL: NA		

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Incompatibilities & Reactivities Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system

Cancer Site [in animals: liver tumors]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0076 (/niosh/ipcsneng/neng0076.html) See MEDICAL TESTS: 0179 (/niosh/docs/2005-110/nmed0179.html)

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Carbon monoxide

Synonyms & Trade Names Carbon oxide, Flue gas, Monoxide

CAS No.	RTECS No.	DOT ID & Guide
630-08-0	FG3500000 (/niosh-rtecs/FG3567E0.html)	1016 119 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=119) (http://www.cdc.gov/Other/disclaimer.html) 9202 168 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=168) (http://www.cdc.gov/Other/disclaimer.html) (cryogenic liquid)

Formula	Conversion	IDLH
CO	1 ppm = 1.15 mg/m3	1200 ppm See: 630080 (/niosh/idlh/630080.html)

Exposure Limits	Measurement Methods
NIOSH REL : TWA 35 ppm (40 mg/m3) C 200 ppm (229 mg/m3) **OSHA PEL** † (nengapdxg.html) : TWA 50 ppm (55 mg/m3)	**NIOSH** 6604 (/niosh/docs/2003-154/pdfs/6604.pdf) ; **OSHA** ID209 (http://www.osha.gov/dts/sltc/methods/inorganic/id209/id209.html) (http://www.cdc.gov/Other/disclaimer.html) , ID210 (http://www.osha.gov/dts/sltc/methods/inorganic/id210/id210.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless, odorless gas. [Note: Shipped as a nonliquefied or liquefied compressed gas.]

MW:	BP:	MLT:	Sol:	VP:	IP:
28.0	-313° F	-337°F	2%	>35 atm	14.01 eV
	Fl.P: NA (Gas)	UEL: 74%	LEL: 12.5%	RGasD: 0.97	

Flammable Gas

Incompatibilities & Reactivities Strong oxidizers, bromine trifluoride, chlorine trifluoride, lithium

Exposure Routes inhalation, skin and/or eye contact (liquid)

Symptoms headache, tachypnea, nausea, lassitude (weakness, exhaustion), dizziness, confusion, hallucinations; cyanosis; depressed S-T segment of electrocardiogram, angina, syncope

Target Organs cardiovascular system, lungs, blood, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Frostbite
Eyes: Frostbite
Wash skin: No recommendation
Remove: When wet (flammable)
Change: No recommendation
Provide: Frostbite wash

First Aid (See procedures (firstaid.html))
Eye: Frostbite
Skin: Frostbite
Breathing: Respiratory support

Respirator Recommendations

NIOSH

Up to 350 ppm:
(APF = 10) Any supplied-air respirator

Up to 875 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

Up to 1200 ppm:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0023 (/niosh/ipcsneng/neng0023.html) See MEDICAL TESTS: 0040 (/niosh/docs/2005-110/nmed0040.html)

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Trichloroethylene

Synonyms & Trade Names Ethylene trichloride, TCE, Trichloroethene, Trilene

CAS No. 79-01-6	**RTECS No.** KX4550000 (/niosh-rtecs/KX456D70.html)	**DOT ID & Guide** 1710 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160) (http://www.cdc.gov/Other/disclaimer.html)
Formula $ClCH=CCl_2$	**Conversion** 1 ppm = 5.37 mg/m3	**IDLH** Ca [1000 ppm] See: 79016 (/niosh/idlh/79016.html)

Exposure Limits

NIOSH REL : Ca See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html)

OSHA PEL † (nengapdxg.html) : TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)

Measurement Methods

NIOSH 1022 (/niosh/docs/2003-154/pdfs/1022.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf); **OSHA** 1001 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.html) (http://www.cdc.gov/Other/disclaimer.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid (unless dyed blue) with a chloroform-like odor.

MW: 131.4	**BP:** 189°F	**FRZ:** -99° F	**Sol:** 0.1%	**VP:** 58 mmHg	**IP:** 9.45 eV
Sp.Gr: 1.46	**Fl.P:** ?	UEL(77° F): 10.5%	LEL(77° F): 8%		

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system

Cancer Site [in animals: liver & kidney cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly

Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0081 (/niosh/ipcsneng/neng0081.html) See MEDICAL TESTS: 0236 (/niosh/docs/2005-110/nmed0236.html)

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Oakton 00653-00
Zero Oxygen Solution
Material Safety Data Sheet

I. PRODUCT AND COMPANY IDENTIFICATION:

CATALOG NUMBER: 00653-00

PRODUCT NAME:Zero Oxygen Solution

PRODUCT USE: Reagent

NFPA RATINGS: HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

MANUFACTURER'S NAME: Thermo Fisher Scientific, Inc

ADDRESS: 22 Alpha Road, Chelmsford MA 01824, USA

PHONE NUMBER FOR INFORMATION: 978-232-6000

CHEMTREC® 24 hr Emergency: US 800-424-9300; International 703-527-3887

II. COMPOSITION/INFORMATION ON INGREDIENTS

		%	LD_{50} mg/kg
COMPONENT	Sodium Sulfite (Na_2SO_3)		
CAS NO.	7757-83-7	5	820 (ORL-MUS)
COMPONENT	Cobalt Chloride Hexahydrate ($CoCl_2.6H_2O$)		
CAS NO.	7791-13-1	<0.001	766 (ORL-RAT)
COMPONENT	Deionized Water (H_2O)		
CAS NO.	7732-18-5	>94	190,000 (IPR-MUS)

III. HAZARDS IDENTIFICATION

May cause irritation to eyes and skin. May be harmful if swallowed. May cause allergic respiratory and skin reaction.
TARGET ORGANS: Eyes, skin, respiratory tract.
ACUTE TOXICITY: May cause gastric irritation by the liberation of sulfurous acid. Ingestion of large amount of sodium sulfite may cause circulatory disturbances, diarrhea, and central nervous system depression.
CHRONIC TOXICITY: Cobalt compounds may cause cancer and adverse reproductive effects based upon animal studies.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Some people are said to be dangerously sensitive to minute amounts of sulfites in foods and some bronchodilator medicines preserved with sulfites.

IV. FIRST AID MEASURES

EYE AND SKIN CONTACT: Wash off contact area with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
INHALATION: Remove to fresh air. Get medical attention for any breathing difficulty.
INGESTION: Induce vomiting as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician immediately.

V. FIRE FIGHTING MEASURES

FLASH POINT: NA AUTOIGNITION POINT: NA
FLAMMABILITY LIMITS: UPPER: NA LOWER: NA
EXTINGUISHING MEDIA: Water, CO_2, dry chemical or foam.

VI. ACCIDENTAL RELEASE MEASURES

Take up with absorbent materials. Place in small containers for disposal. Wash spill site after material pick up is complete.

VII. HANDLING AND STORAGE

Wear eye protection and gloves when working with this product.
This product absorbs oxygen from the air. Avoid direct solution contact with air as much as possible.
Avoid contact with eyes and skin. Do not ingest.
Store at room temperature. Keep away from heat and keep container closed.

VIII. EXPOSURE CONTROLS/ PERSONAL PROTECTION

OSHA THRESHOLD LIMIT: None listed.
ACGIH THRESHOLD LIMIT: 5 mg/m^3 (TWA) as $NaHSO_3$; 0.02 mg/m^3 (TWA) as Co.
PROTECTIVE EQUIPMENT: Safety glasses, lab coat and gloves.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE: Clear colorless liquid ODOR THRESHOLD: Odorless
SENSITIVITY TO MECHANICAL IMPACT: None
SENSITIVITY TO STATIC DISCHARGE: None
COEFFICIENT OF OIL/WATER DISTRIBUTION: None
SOLUBILITY IN WATER: Soluble pH: 9.7
SPECIFIC GRAVITY: 1.06
BOILING POINT: Not determined MELTING POINT: Not determined
VAPOR DENSITY: Not determined

X. STABILITY AND REACTIVITY

Sulfite reacts with oxygen to form sulfate. Hazardous polymerization will not occur.
Incompatibles: Strong oxidizers, acids, high temperatures.
Hazardous decomposition product: May emit oxides of sulfur, cobalt and chloride when heated to decomposition.

XI. TOXICOLOGICAL INFORMATION

Route of Exposure: Eyes, skin, respiratory tract.
Teratogen Status: None
Mutagen Status: Effects have occurred in experimental animals with Co compound.
Reproductive Toxicity: Adverse effects have occurred in experimental animals with Co compound.
Carcinogen Status: 'Cobalt, inorganic compounds' are listed as a group 2B carcinogen by IARC.

XII. ECOLOGICAL INFORMATION

Cobalt is toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with Federal, State and Local Regulations.

XIV. TRANSPORT INFORMATION

Product is not hazardous for transport.

XV. REGULATORY INFORMATION

EUROPEAN INFORMATION:

RISK PHRASES: R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
SAFETY PHRASES: S23 Do not breathe vapor. S24/25 Avoid contact with skin and eyes. S37/39 Wear suitable gloves and eye/face protection.

US/ CANADA INFORMATION:

SARA/Title III: $CoCl_2$ is listed under CERCLA.
Cal. Proposition 65: Ingredients not listed.
US TSCA Inventory: Ingredients are listed.
CPR Class: None.
TDG Class: None.
MSDS discloses elements required by the CPR.

XVI. OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. ALL PRODUCTS ARE OFFERED IN ACCORDANCE WITH THE MANUFACTURER'S CURRENT PRODUCTION SPECIFICATIONS AND ARE INTENDED SOLELY FOR USE IN ANALYTICAL TESTING. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE RESULTING FROM THE HANDLING, USE OR MISUSE OF THESE PRODUCTS.

MSDS prepared by Environmental, Health and Safety.

Document Number 265053-001 Rev. B Effective Date: 2013-03-11

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Oakton 00606-10, 00653-15, 00653-16, 00653-18, 00653-20, 00653-23, 00653-27, 00653-47, 00653-50, 00653-89, 35653-09, 35653-10, 35653-11, 35653-12, 35653-13, 35653-15

Conductivity Standard
Material Safety Data Sheet

I. PRODUCT AND COMPANY IDENTIFICATION:

CATALOG NUMBERS: 00606-10, 00653-15, 00653-16, 00653-18, 00653-20, 00653-23, 00653-27, 00653-47, 00653-50, 00653-89, 35653-09, 35653-10, 35653-11, 35653-12, 35653-13, 35653-15

PRODUCT NAME: Conductivity Standard

PRODUCT USE: Standard

NFPA RATINGS: HEALTH: 0 FLAMMABILITY: 0 REACTIVITY: 0

MANUFACTURER'S NAME: Thermo Fisher Scientific, Inc

ADDRESS: 22 Alpha Road, Chelmsford MA 01824, USA

PHONE NUMBER FOR INFORMATION: 978-232-6000

CHEMTREC® 24 hr Emergency: US 800-424-9300; International 703-527-3887

II. COMPOSITION/INFORMATION ON INGREDIENTS

		%	LD_{50} mg/kg
COMPONENT	Potassium Chloride (KCl)		
CAS NO.	7447-40-7	< 1	2,600 (ORL-RAT)
COMPONENT	Deionized Water (H_2O)		
CAS NO.	7732-18-5	> 99	190,000 (IPR-MUS)

III. HAZARDS IDENTIFICATION

Low hazard for normal use.
TARGET ORGANS: Eyes, skin.
ACUTE TOXICITY: May cause irritation to eyes and skin.
CHRONIC TOXICITY: No information found.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: May cause stinging or irritation in an open cut.

IV. FIRST AID MEASURES

EYE AND SKIN CONTACT: Wash off with large amounts of water.
INGESTION: Drink large amounts of water. Consult physician.
INHALATION: Not hazardous.

V. FIRE FIGHTING MEASURES

FLASH POINT: NA AUTOIGNITION POINT: NA
FLAMMABILITY LIMITS: UPPER: NA LOWER: NA
EXTINGUISHING MEDIA: Water, dry chemical, foam or CO_2.

VI. ACCIDENTAL RELEASE MEASURES

Take up with absorbent material. Place in small container for disposal. Wash spill site with water after material pick up is complete.

VII. HANDLING AND STORAGE

Wear eye protection and gloves when working with this product.
Avoid contact with eyes and skin.
Store at room temperature. Keep away from heat and keep container closed.

VIII. EXPOSURE CONTROLS/ PERSONAL PROTECTION

OSHA & ACGIH THRESHOLD LIMIT: None listed.
PROTECTIVE EQUIPMENT: Safety glasses, lab coat and gloves.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE: Clear colorless liquid ODOR THRESHOLD: None
SENSITIVITY TO MECHANICAL IMPACT: None
SENSITIVITY TO STATIC DISCHARGE: None
COEFFICIENT OF OIL/WATER DISTRIBUTION: None
SOLUBILITY IN WATER: Soluble pH: Approx. 7
SPECIFIC GRAVITY: 1.0
BOILING POINT: Approx. 100ºC MELTING POINT: Not determined
VAPOR DENSITY: Not determined

X. STABILITY AND REACTIVITY

Product is stable. Hazardous polymerization will not occur.
Incompatibles: Bromine trifluoride, potassium permanganate plus sulfuric acid.
Hazardous decomposition product: None.

XI. TOXICOLOGICAL INFORMATION

Route of Exposure: Eyes, skin.
Teratogen Status: None
Mutagen Status: None
Reproductive Toxicity: None
Carcinogen Status: None

XII. ECOLOGICAL INFORMATION

None available.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with Federal, State and Local regulations.

XIV. TRANSPORT INFORMATION

Product is not hazardous for transport.

XV. REGULATORY INFORMATION

EUROPEAN INFORMATION:

RISK PHRASES: None
SAFETY PHRASES: S24/25 Avoid contact with skin and eyes.

US/ CANADA INFORMATION:

SARA/Title III: Ingredients not listed.
Cal. Proposition 65: Ingredients not listed.
US TSCA Inventory: Ingredients are listed.
CPR Class: None.
TDG Class: None.
MSDS discloses elements required by the CPR.

XVI. OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. ALL PRODUCTS ARE OFFERED IN ACCORDANCE WITH THE MANUFACTURER'S CURRENT PRODUCTION SPECIFICATIONS AND ARE INTENDED SOLELY FOR USE IN ANALYTICAL TESTING. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE RESULTING FROM THE HANDLING, USE OR MISUSE OF THESE PRODUCTS.

MSDS prepared by Environmental, Health and Safety.

Document Number 264886-001 Rev. B Effective Date: 2013-03-11

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Oakton 00654-08, 05942-61, 05942-62, 05942-64, 05942-65, 35653-03
pH 10.01 Buffer
Material Safety Data Sheet

I. PRODUCT AND COMPANY IDENTIFICATION:

CATALOG NUMBERS: 00654-08, 05942-61, 05942-62, 05942-64, 05942-65, 35653-03

PRODUCT NAME: pH 10.01 Buffer

PRODUCT USE: Buffer

NFPA RATINGS: HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

MANUFACTURER'S NAME: Thermo Fisher Scientific, Inc

ADDRESS: 22 Alpha Road, Chelmsford MA 01824, USA

PHONE NUMBER FOR INFORMATION: 978-232-6000

CHEMTREC® 24 hr Emergency: US 800-424-9300; International 703-527-3887

II. COMPOSITION/INFORMATION ON INGREDIENTS

		%	LD_{50} mg/kg
COMPONENT	Sodium Bicarbonate ($NaHCO_3$)		
CAS NO.	144-55-8	<1	4220 (ORL-RAT)
COMPONENT	Sodium Carbonate (Na_2CO_3)		
CAS NO.	497-19-8	<1	117 (IPR-MUS)
COMPONENT	Methyl Paraben ($C_8H_8O_3$)		
CAS NO.	99-76-3	<0.1	3000 (ORL-DOG)
COMPONENT	FD&C Blue #1 ($C_{37}H_{34}N_2O_9S_3Na_2$)		
CAS NO.	3844-45-9	<0.01	Not available
COMPONENT	Deionized Water (H_2O)		
CAS NO.	7732-18-5	99	190,000 (IPR-MUS)

III. HAZARDS IDENTIFICATION

Low hazard for normal use.
May be harmful if swallowed. May cause irritation to eyes and skin.
TARGET ORGANS: Eye, skin.
ACUTE TOXICITY: Low hazard.
CHRONIC TOXICITY: May cause irritation to skin after prolonged exposure.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Disease of the skin.

IV. FIRST AID MEASURES

EYE AND SKIN CONTACT: Wash off with large amounts of water.
INGESTION: Give large amounts of water. Consult physician.
INHALATION: Not hazardous.

V. FIRE FIGHTING MEASURES

FLASH POINT: NA AUTOIGNITION POINT: NA
FLAMMABILITY LIMITS: UPPER: NA LOWER: NA
EXTINGUISHING MEDIA: Water, CO_2, dry chemical or foam.

VI. ACCIDENTAL RELEASE MEASURES

Take up with absorbent materials. Place in small containers for disposal. Wash spill site after material pick up is complete.

VII. HANDLING AND STORAGE

Always wear eye protection and gloves when working with this product.
Avoid contact with eyes, skin or clothing. Do not ingest.
Store at room temperature. Keep away from heat and keep container closed.

VIII. EXPOSURE CONTROLS/ PERSONAL PROTECTION

OSHA & ACGIH THRESHOLD LIMIT: None listed.
PROTECTIVE EQUIPMENT: Safety glasses, lab coat and gloves.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE: Light blue liquid ODOR THRESHOLD: None
SENSITIVITY TO MECHANICAL IMPACT: None
SENSITIVITY TO STATIC DISCHARGE: None
COEFFICIENT OF OIL/WATER DISTRIBUTION: None
SOLUBILITY IN WATER: Soluble pH: 10.01
SPECIFIC GRAVITY: 1.0
BOILING POINT: 100ºC MELTING POINT: Not determined
VAPOR DENSITY: Not determined

X. STABILITY AND REACTIVITY

Product is stable. Hazardous polymerization will not occur.
Incompatibles: Na-K alloy, $NH_4H_2PO_4$, Al, P_2O_5, H_2SO_4.
Hazardous decomposition product: May emit fumes of carbon dioxides when heated to decomposition.

XI. TOXICOLOGICAL INFORMATION

Route of Exposure: Eyes, skin.
Teratogen Status: None
Mutagen Status: None
Reproductive Toxicity: None
Carcinogen Status: None

XII. ECOLOGICAL INFORMATION

None available.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with Federal, State and Local Regulations.

XIV. TRANSPORT INFORMATION

Product is not hazardous for transport.

XV. REGULATORY INFORMATION

EUROPEAN INFORMATION:

RISK PHRASES: None
SAFETY PHRASES: S24/25 Avoid contact with skin and eyes.

US/ CANADA INFORMATION:

SARA/Title III: Ingredients not listed.
Cal. Proposition 65: Ingredients not listed.
US TSCA Inventory: Ingredients are listed.
CPR Class: None.
TDG Class: None.
MSDS discloses elements required by the CPR.

XVI. OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. ALL PRODUCTS ARE OFFERED IN ACCORDANCE WITH THE MANUFACTURER'S CURRENT PRODUCTION SPECIFICATIONS AND ARE INTENDED SOLELY FOR USE IN ANALYTICAL TESTING. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE RESULTING FROM THE HANDLING, USE OR MISUSE OF THESE PRODUCTS.

MSDS prepared by Environmental, Health and Safety.

Document Number 264594-001 Rev. B Effective Date: 2013-03-11

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Oakton 00654-00, 05942-21, 05942-22, 05942-24, 05942-25, 35653-01

pH 4.01 Buffer
Material Safety Data Sheet

I. PRODUCT AND COMPANY IDENTIFICATION:

CATALOG NUMBERS: 00654-00, 05942-21, 05942-22, 05942-24, 05942-25, 35653-01

PRODUCT NAME: pH 4.01 Buffer

PRODUCT USE: Buffer

NFPA RATINGS: HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

MANUFACTURER'S NAME: Thermo Fisher Scientific, Inc

ADDRESS: 22 Alpha Road, Chelmsford MA 01824, USA

PHONE NUMBER FOR INFORMATION: 978-232-6000

CHEMTREC® 24 hr Emergency: US 800-424-9300; International 703-527-3887

II. COMPOSITION/INFORMATION ON INGREDIENTS

		%	LD_{50} mg/kg
COMPONENT	Potassium Hydrogen Phthalate ($C_8H_5O_4K$)		
CAS NO.	877-24-7	1	> 3,200 (ORL-RAT)
COMPONENT	Amaranth Red Dye ($C_{20}H_{11}N_2O_{10}S_3Na_3$)		
CAS NO.	915-67-3	<0.01	1000 (IRP-MUS)
COMPONENT	Deionized Water (H_2O)		
CAS NO.	7732-18-5	99	190,000 (IPR-MUS)

III. HAZARDS IDENTIFICATION

Low hazard for normal use.
Maybe harmful if swallowed. May cause irritation to eyes and skin.
TARGET ORGANS: Eyes, skin.
ACUTE TOXICITY: Low hazards.
CHRONIC TOXICITY: May cause irritation to skin after prolonged exposure.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Disease of the skin.

IV. FIRST AID MEASURES

EYE AND SKIN CONTACT: Wash off with large amounts of water.
INGESTION: Give large amounts of water. Consult physician.
INHALATION: Not hazardous.

V. FIRE FIGHTING MEASURES

FLASH POINT: NA AUTOIGNITION POINT: NA
FLAMMABILITY LIMITS: UPPER: NA LOWER: NA
EXTINGUISHING MEDIA: Water, CO_2, dry chemical or foam.

VI. ACCIDENTAL RELEASE MEASURES

Take up with absorbent materials. Place in small containers for disposal. Wash spill site after material pick up is complete.

VII. HANDLING AND STORAGE

Always wear eye protection and gloves when working with this product.
Avoid contact with eyes, skin or clothing. Do not ingest.
Store at room temperature. Keep away from heat and keep container closed.

VIII. EXPOSURE CONTROLS/ PERSONAL PROTECTION

OSHA & ACGIH THRESHOLD LIMIT: None listed.
PROTECTIVE EQUIPMENT: Safety glasses, lab coat and gloves.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE: Light red liquid ODOR THRESHOLD: None
SENSITIVITY TO MECHANICAL IMPACT: None
SENSITIVITY TO STATIC DISCHARGE: None
COEFFICIENT OF OIL/WATER DISTRIBUTION: None
SOLUBILITY IN WATER: Soluble pH: 4.01
SPECIFIC GRAVITY: 1.0
BOILING POINT: 100ºC MELTING POINT: Not determined
VAPOR DENSITY: Not determined

X. STABILITY AND REACTIVITY

Product is stable. Hazardous polymerization will not occur.
Incompatibles: Strong oxidizing agents, nitric acid.
Hazardous decomposition product: None known.

XI. TOXICOLOGICAL INFORMATION

Route of Exposure: Eyes, skin.
Teratogen Status: None
Mutagen Status: None
Reproductive Toxicity: None.
Carcinogen Status: None.

XII. ECOLOGICAL INFORMATION

None available.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with Federal, State and Local Regulations.

XIV. TRANSPORT INFORMATION

Product is not hazardous for transport.

XV. REGULATORY INFORMATION

EUROPEAN INFORMATION:

RISK PHRASES: None
SAFETY PHRASES: S24/25 Avoid contact with skin and eyes.

US/CANADA INFORMATION:

SARA/Title III: Ingredients not listed.
Cal. Proposition 65: Ingredients not listed.
US TSCA Inventory: Ingredients are listed
CPR Class: None.
TDG Class: None.
MSDS discloses elements required by the CPR.

XVI. OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. ALL PRODUCTS ARE OFFERED IN ACCORDANCE WITH THE MANUFACTURER'S CURRENT PRODUCTION SPECIFICATIONS AND ARE INTENDED SOLELY FOR USE IN ANALYTICAL TESTING. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE RESULTING FROM THE HANDLING, USE OR MISUSE OF THESE PRODUCTS.

MSDS prepared by Environmental, Health and Safety.

Document Number 264586-001 Rev. B Effective Date: 2013-03-11

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Oakton 00654-04, 05942-41, 05942-42, 05942-44, 05942-45, 35653-02
pH 7.00 Buffer
Material Safety Data Sheet

I. PRODUCT AND COMPANY IDENTIFICATION:

CATALOG NUMBERS: 00654-04, 05942-41, 05942-42, 05942-44, 05942-45, 35653-02

PRODUCT NAME: pH 7.00 Buffer

PRODUCT USE: Buffer

NFPA RATINGS: HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

MANUFACTURER'S NAME: Thermo Fisher Scientific, Inc

ADDRESS: 22 Alpha Road, Chelmsford MA 01824, USA

PHONE NUMBER FOR INFORMATION: 978-232-6000

CHEMTREC® 24 hr Emergency: US 800-424-9300; International 703-527-3887

II. COMPOSITION/INFORMATION ON INGREDIENTS

		%	LD_{50} mg/kg
COMPONENT	Potassium Dihydrogen Phosphate (KH_2PO_4)		
CAS NO.	7778-77-0	<1	>4,640 (SKN-RBT)
COMPONENT	Disodium Hydrogen Phosphate (Na_2HPO_4)		
CAS NO.	7558-79-4	<1	17 gm/kg (ORL-RAT)
COMPONENT	5-Bromo-5-Nitro-1,3-Dioxane ($C_4H_6BrNO_4$)		
CAS NO.	30007-47-7	<1	455 (ORL-RAT)
COMPONENT	Naphthol Green ($C_{30}H_{15}FeN_3O_{15}S_3 3Na$)		
CAS NO.	19381-50-1	<0.02	Not found
COMPONENT	Deionized Water (H_2O)		
CAS NO.	7732-18-5	99	190,000 (IPR-MUS)

III. HAZARDS IDENTIFICATION

Low hazard for normal use.
May be harmful if swallowed. May cause irritation to eyes and skin.
TARGET ORGANS: Eyes, skin.
ACUTE TOXICITY: Low hazard.
CHRONIC TOXICITY: May irritate skin after prolonged exposure.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Disease of the skin.

IV. FIRST AID MEASURES

EYE AND SKIN CONTACT: Wash off with large amounts of water.
INGESTION: Give large amounts of water. Consult physician.
INHALATION: Not hazardous.

V. FIRE FIGHTING MEASURES

FLASH POINT: NA AUTOIGNITION POINT: NA
FLAMMABILITY LIMITS: UPPER: NA LOWER: NA
EXTINGUISHING MEDIA: Water, CO_2, dry chemical or foam.

VI. ACCIDENTAL RELEASE MEASURES

Take up with absorbent materials. Place in small containers for disposal. Wash spill site after material pick up is complete.

VII. HANDLING AND STORAGE

Wear eye protection and gloves when working with this product.
Avoid contact with eyes, skin or clothing. Do not ingest.
Store at room temperature. Keep away from heat and keep container closed.

VIII. EXPOSURE CONTROLS/ PERSONAL PROTECTION

OSHA THRESHOLD LIMIT: None listed.
ACGIH THRESHOLD LIMIT: None listed.
PROTECTIVE EQUIPMENT: Safety glasses, lab coat and gloves.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE: Light green liquid ODOR THRESHOLD:
SENSITIVITY TO MECHANICAL IMPACT: None
SENSITIVITY TO STATIC DISCHARGE: None
COEFFICIENT OF OIL/WATER DISTRIBUTION: None
SOLUBILITY IN WATER: Soluble pH: 7.00
SPECIFIC GRAVITY: 1.0
BOILING POINT: 100ºC MELTING POINT: Not determined
VAPOR DENSITY: Not determined

X. STABILITY AND REACTIVITY

Product is stable. Hazardous polymerization will not occur.
Incompatibles: Oxidizers, strong acids and bases.
Hazardous decomposition product: May emit toxic fumes of sodium, potassium, and phosphorus oxides when heated to decomposition.

XI. TOXICOLOGICAL INFORMATION

Route of Exposure: Eyes, skin.
Teratogen Status: None
Mutagen Status: None
Reproductive Toxicity: None
Carcinogen Status: None

XII. ECOLOGICAL INFORMATION

None available.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with Federal, State and Local Regulations.

XIV. TRANSPORT INFORMATION

Product is not hazardous for transport.

XV. REGULATORY INFORMATION

EUROPEAN INFORMATION:

RISK PHRASES: None
SAFETY PHRASES: S24/25 Avoid contact with skin and eyes.

US/ CANADA INFORMATION

SARA/Title III: Regulated under Section 302. Na_2HPO_4 is a CERCLA hazard and regulated under Section 304.
Cal. Proposition 65: Ingredients not listed.
US TSCA Inventory: Ingredients are listed.
CPR Class: None.
TDG Class: None.
MSDS discloses elements required by the CPR.

XVI. OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. ALL PRODUCTS ARE OFFERED IN ACCORDANCE WITH THE MANUFACTURER'S CURRENT PRODUCTION SPECIFICATIONS AND ARE INTENDED SOLELY FOR USE IN ANALYTICAL TESTING. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE RESULTING FROM THE HANDLING, USE OR MISUSE OF THESE PRODUCTS.

MSDS prepared by Environmental, Health and Safety.

Document Number 264878-001 Rev. C Effective Date: 2013-3-8

A GUIDELINE FOR PID INSTRUMENT RESPONSE

CORRECTION FACTORS AND IONIZATION ENERGIES*

RAE Systems PIDs can be used for the detection of a wide variety of gases that exhibit different responses. In general, any compound with ionization energy (IE) lower than that of the lamp photons can be measured.* The best way to calibrate a PID to different compounds is to use a standard of the gas of interest. However, correction factors have been determined that enable the user to quantify a large number of chemicals using only a single calibration gas, typically isobutylene. In our PIDs, correction factors can be used in one of three ways:

1. Calibrate the monitor with isobutylene in the usual fashion to read in isobutylene equivalents. Manually multiply the reading by the correction factor (CF) to obtain the concentration of the gas being measured.
2. Calibrate the unit with isobutylene in the usual fashion to read in isobutylene equivalents. Call up the correction factor from the instrument memory or download it from a personal computer and then call it up. The monitor will then read directly in units of the gas of interest.
3. Calibrate the unit with isobutylene, but input an equivalent, "corrected" span gas concentration when prompted for this value. The unit will then read directly in units of the gas of interest.

** The term "ionization energy" is more scientifically correct and replaces the old term "ionization potential." High-boiling ("heavy") compounds may not vaporize enough to give a response even when their ionization energies are below the lamp photon energy. Some inorganic compounds like H_2O_2 and NO_2 give weak response even when their ionization energies are well below the lamp photon energy.*

Example 1:

With the unit calibrated to read isobutylene equivalents, the reading is 10 ppm with a 10.6 eV lamp. The gas being measured is butyl acetate, which has a correction factor of 2.6. Multiplying 10 by 2.6 gives an adjusted butyl acetate value of 26 ppm. Similarly, if the gas being measured were trichloroethylene (CF = 0.54), the adjusted value with a 10 ppm reading would be 5.4 ppm.

Example 2:

With the unit calibrated to read isobutylene equivalents, the reading is 100 ppm with a 10.6 eV lamp. The gas measured is m-xylene (CF = 0.43). After downloading this factor, the unit should read about 43 ppm when exposed to the same gas, and thus read directly in m-xylene values.

Example 3:

The desired gas to measure is ethylene dichloride (EDC). The CF is 0.6 with an 11.7 eV lamp. During calibration with 100 ppm isobutylene, insert 0.6 times 100, or 60 at the prompt for the calibration gas concentration. The unit then reads directly in EDC values.

Conversion to mg/m^3

To convert from ppm to mg/m^3, use the following formula:

$$\text{Conc. (mg/m}^3) = \frac{[\text{Conc.(ppmv) x mol. wt. (g/mole)}]}{\text{molar gas volume (L)}}$$

For air at 25°C (77°F), the molar gas volume is 24.4 L/mole and the formula reduces to:

$$\text{Conc.(mg/m}^3) = \text{Conc.(ppmv) x mol. wt. (g/mole) x 0.041}$$

For example, if the instrument is calibrated with a gas standard in ppmv, such as 100 ppm isobutylene, and the user wants the display to read in mg/m^3 of hexane, whose m.w. is 86 and CF is 4.3, the overall correction factor would be 4.3 x 86 x 0.041 equals 15.2.

Correction Factors for Mixtures

The correction factor for a mixture is calculated from the sum of the mole fractions Xi of each component divided by their respective correction factors CFi:

$$CFmix = 1 / (X_1/CF_1 + X_2/CF_2 + X_3/CF_3 + \ldots X_i/CF_i)$$

Thus, for example, a vapor phase mixture of 5% benzene and 95% n-hexane would have a CFmix of CFmix = 1 / (0.05/0.53 + 0.95/4.3) = 3.2. A reading of 100 would then correspond to 320 ppm of the total mixture, comprised of 16 ppm benzene and 304 ppm hexane.

For a spreadsheet to compute the correction factor and TLV of a mixture see the appendix at the end of the CF table.

TLVs and Alarm Limits for Mixtures

The correction factor for mixtures can be used to set alarm limits for mixtures. To do this one first needs to calculate the exposure limit for the mixture. The Threshold Limit Value (TLV) often defines exposure limits. The TLV for the mixture is calculated in a manner similar to the CF calculation:

$$TLV\ mix = 1 / (X_1/TLV_1 + X_2/TLV_2 + X_3/TLV_3 + \ldots X_i/TLV_i)$$

In the above example, the 8-h TLV for benzene is 0.5 ppm and for n-hexane 50 ppm. Therefore the TLV of the mixture is TLVmix = 1 / (0.05/0.5 + 0.95/50) = 8.4 ppm, corresponding to 8.0 ppm hexane and 0.4 ppm benzene. For an instrument calibrated on isobutylene, the reading corrsponding to the TLV is:

$$\text{Alarm Reading} = TLVmix / CFmix = 8.4 / 3.2 = 2.6\ ppm$$

A common practice is to set the lower alarm limit to half the TLV, and the higher limit to the TLV. Thus, one would set the alarms to 1.3 and 2.6 ppm, respectively.

CALIBRATION CHARACTERISTICS

A. Flow Configuration. PID response is essentially independent of gas flow rate as long as it is sufficient to satisfy the pump demand. Four main flow configurations are used for calibrating a PID:

1. Pressurized gas cylinder (Fixed-flow regulator): The flow rate of the regulator should match the flow demand of the instrument pump or be slightly higher.
2. Pressurized gas cylinder (Demand-flow regulator): A demand-flow regulator better matches pump speed differences, but results in a slight vacuum during calibration and thus slightly high readings.
3. Collapsible gas bag: The instrument will draw the calibration gas from the bag at its normal flow rate, as long as the bag valve is large enough. The bag should be filled with enough gas to allow at least one minute of flow (~ 0.6 L for a MiniRAE, ~0.3 L for MultiRAE).
4. T (or open tube) method: The T method uses a T-junction with gas flow higher than the pump draw. The gas supply is connected to one end of the T, the instrument inlet is connected to a second end of the T, and excess gas flow escapes through the third, open end of the T. To prevent ambient air mixing, a long tube should be connected to the open end, or a high excess rate should be used. Alternatively, the instrument probe can be inserted into an open tube slightly wider than the probe. Excess gas flows out around the probe.

The first two cylinder methods are the most efficient in terms of gas usage, while the bag and T methods give slightly more accurate results because they match the pump flow better.

B. Pressure. Pressures deviating from atmospheric pressure affect the readings by altering gas concentration and pump characteristics. It is best to calibrate with the instrument and calibration gas at the same pressure as each other and the sample gas. (Note that the cylinder pressure is not relevant because the regulator reduces the pressure to ambient.) If the instrument is calibrated at atmospheric pressure in one of the flow configurations described above, then 1) pressures slightly above ambient are acceptable but high pressures can damage the pump and 2) samples under vacuum may give low readings if air leaks into the sample train.

C. Temperature. Because temperature effects gas density and concentration, the temperature of the calibration gas and instrument should be as close as possible to the ambient temperature where the unit will be used. We recommend that the temperature of the calibration gas be within the instrument's temperature specification (typically 14° to 113° F or -10° to 45° C). Also, during actual measurements, the instrument should be kept at the same or higher temperature than the sample temperature to avoid condensation in the unit.

D. Matrix. The matrix gas of the calibration compound and VOC sample is significant. Some common matrix components, such as methane and water vapor can affect the VOC signal.

PIDs are most commonly used for monitoring VOCs in air, in which case the preferred calibration gas matrix is air. For a MiniRAE, methane, methanol, and water vapor reduce the response by about 20% when their concentration is 15,000 ppm and by about 40% at 30,000 ppm. Despite earlier reports of oxygen effects, RAE PID responses with 10.6 eV lamps are independent of oxygen concentration, and calibration gases in a pure nitrogen matrix can be used. H_2 and CO_2 up to 5 volume % also have no effect.

E. Concentration. Although RAE Systems PIDs have electronically linearized output, it is best to calibrate in a concentration range close to the actual measurement range. For example, 100 ppm standard gas for anticipated vapors of 0 to 250 ppm, and 500 ppm standard for expected concentrations of 250 to 1000 ppm. The correction factors in this table were typically measured at 50 to 100 ppm and apply from the ppb range up to about 1000 ppm. Above 1000 ppm the CF may vary and it is best to calibrate with the gas of interest near the concentration of interest.

F. Filters. Filters affect flow and pressure conditions and therefore all filters to be used during sampling should also be in place during calibration. Using a water trap (hydrophobic filter) greatly reduces the chances of drawing water aerosols or dirt particles into the instrument. Regular filter replacements are recommended because dirty filters can adsorb VOCs and cause slower response time and shifts in calibration.

G. Instrument Design. High-boiling ("heavy") or very reactive compounds can be lost by reaction or adsorption onto materials in the gas sample train, such as filters, pumps and other sensors. Multi-gas meters, including EntryRAE, MultiRAE and AreaRAE have the pump and other sensors upstream of the PID and are prone to these losses. Compounds possibly affected by such losses are shown in green in the table, and may give slow response, or in extreme cases, no response at all. In many cases the multi-gas meters can still give a rough indication of the relative concentration, without giving an accurate, quantitative reading. The ppbRAE and MiniRAE series instruments have inert sample trains and therefore do not exhibit significant loss; nevertheless, response may be slow for the very heavy compounds and additional sampling time up to a minute or more should be allowed to get a stable reading.

TABLE ABBREVIATIONS

CF = Correction Factor (multiply by reading to get corrected value for the compound when calibrated to isobutylene)

NR = No Response

IE = Ionization Energy (values in parentheses are not well established)

C = Confirmed Value indicated by "+" in this column; all others are preliminary or estimated values and are subject to change

ne = Not Established ACGIH 8-hr. TWA

C## = Ceiling value, given where 8-hr.TWA is not available

DISCLAIMER

TN-106 is a general guideline for Correction Factors (CF) for use with PID instruments manufactured by RAE Systems. The CF may vary depending on instrument and operation conditions. For the best accuracy, RAE Systems recommends calibrating the instrument to target gas. Actual readings may vary with age and cleanliness of lamp, relative humidity, and other factors as well. For accurate work, the instrument should be calibrated regularly under the operating conditions used. The factors in this table on the following pages were measured in dry air (40 to 50% RH) at room temperature, typically at 50 to 100 ppm. CF values may vary above about 1000 ppm.

Updates

The values in this table on the following pages are subject to change as more or better data become available. Watch for updates of this table on the Internet at **http://www.raesystems.com**.

IE data are taken from the CRC Handbook of Chemistry and Physics, 73rd Edition, D.R. Lide (Ed.), CRC Press (1993) and NIST Standard Ref. Database 19A, NIST Positive Ion Energetics, Vers. 2.0, Lias, et.al., U.S. Dept. Commerce (1993). Exposure limits (8-h TWA and Ceiling Values) are from the 2005 ACGIH Guide to Occupational Exposure Values, ACGIH, Cincinnati, OH 2005. Equations for exposure limits for mixtures of chemicals were taken from the 1997 TLVs and BEIs handbook published by the ACGIH (1997).

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Acetaldehyde		75-07-0	C_2H_4O	NR	+	6	+	3.3	+	10.23	C25
Acetic acid	Ethanoic Acid	64-19-7	$C_2H_4O_2$	NR	+	22	+	2.6	+	10.66	10
Acetic anhydride	Ethanoic Acid Anhydride	108-24-7	$C_4H_6O_3$	NR	+	6.1	+	2.0	+	10.14	5
Acetone	2-Propanone	67-64-1	C_3H_6O	1.2	+	0.9	+	1.4	+	9.71	500
Acetone cyanohydrin	2-Hydroxyisobutyronitrile	75-86-5	C_4H_7NO					4	+	11.1	C5
Acetonitrile	Methyl cyanide, Cyanomethane	75-05-8	C_2H_3N					100		12.19	40
Acetylene	Ethyne	74-86-2	C_2H_2					2.1	+	11.40	ne
Acrolein	Propenal	107-02-8	C_3H_4O	42	+	3.9	+	1.4	+	10.10	0.1
Acrylic acid	Propenoic Acid	79-10-7	$C_3H_4O_2$			12	+	2.0	+	10.60	2
Acrylonitrile	Propenenitrile	107-13-1	C_3H_3N			NR	+	1.2	+	10.91	2
Allyl alcohol		107-18-6	C_3H_6O	4.5	+	2.4	+	1.6	+	9.67	2
Allyl chloride	3-Chloropropene	107-05-1	C_3H_5Cl			4.3		0.7		9.9	1
Ammonia		7664-41-7	NH_3	NR	+	10.9	+	5.7	+	10.16	25
Amyl acetate	mix of n-Pentyl acetate & 2-Methylbutyl acetate	628-63-7	$C_7H_{14}O_2$	11	+	2.3	+	0.95	+	<9.9	100
Amyl alcohol	1-Pentanol	75-85-4	$C_5H_{12}O$			5				10.00	ne
Aniline	Aminobenzene	62-53-3	C_6H_7N	0.50	+	0.48	+	0.47	+	7.72	2
Anisole	Methoxybenzene	100-66-3	C_7H_8O	0.89	+	0.58	+	0.56	+	8.21	ne
Arsine	Arsenic trihydride	7784-42-1	AsH_3			1.9	+			9.89	0.05
Benzaldehyde		100-52-7	C_7H_6O					1		9.49	ne
Benzene		71-43-2	C_6H_6	0.55	+	0.47	+	0.6	+	9.25	0.5
Benzonitrile	Cyanobenzene	100-47-0	C_7H_5N			1.6				9.62	ne
Benzyl alcohol	α-Hydroxytoluene, Hydroxymethylbenzene, Benzenemethanol	100-51-6	C_7H_8O	1.4	+	1.1	+	0.9	+	8.26	ne
Benzyl chloride	α-Chlorotoluene, Chloromethylbenzene	100-44-7	C_7H_7Cl	0.7	+	0.6	+	0.5	+	9.14	1
Benzyl formate	Formic acid benzyl ester	104-57-4	$C_8H_8O_2$	0.9	+	0.73	+	0.66	+		ne
Boron trifluoride		7637-07-2	BF_3	NR		NR		NR		15.5	C1
Bromine		7726-95-6	Br_2	NR	+	1.30	+	0.74	+	10.51	0.1
Bromobenzene		108-86-1	C_6H_5Br			0.6		0.5		8.98	ne
2-Bromoethyl methyl ether		6482-24-2	C_3H_7OBr			0.84	+			~10	ne
Bromoform	Tribromomethane	75-25-2	$CHBr_3$	NR	+	2.7	+	0.5	+	10.48	0.5
Bromopropane,1-	n-Propyl bromide	106-94-5	C_3H_7Br	150	+	1.5	+	0.6	+	10.18	ne
Butadiene	1,3-Butadiene, Vinyl ethylene	106-99-0	C_4H_6	0.8		0.6	+	1.1		9.07	2
Butadiene diepoxide, 1,3-	1,2,3,4-Diepoxybutane	298-18-0	$C_4H_6O_2$	25	+	3.5	+	1.2		~10	ne
Butane		106-97-8	C_4H_{10}			67	+	1.2		10.53	800
Butanol, 1-	Butyl alcohol, n-Butanol	71-36-3	$C_4H_{10}O$	70	+	4.7	+	1.4	+	9.99	20
Butanol, t-	tert-Butanol, t-Butyl alcohol	75-65-0	$C_4H_{10}O$	6.9	+	2.9	+			9.90	100
Butene, 1-	1-Butylene	106-98-9	C_4H_8			0.9				9.58	ne
Butoxyethanol, 2-	Butyl Cellosolve, Ethylene glycol monobutyl ether	111-76-2	$C_6H_{14}O_2$	1.8	+	1.2	+	0.6	+	<10	25
Butoxyethyl Acetate, 2-	2-Butoxyethyl acetate; 2-Butoxy-ethanol acetate; Butyl Cellosolve acetate; Butyl glycol acetate; EGBEA; Ektasolve EB acetate	112-07-2	$C_8H_{16}O_3$			1.27	+				20
Butyl acetate, n-		123-86-4	$C_6H_{12}O_2$			2.6	+			10	150
Butyl acrylate, n-	Butyl 2-propenoate, Acrylic acid butyl ester	141-32-2	$C_7H_{12}O_2$			1.6	+	0.6	+		10
Butylamine, n-		109-73-9	$C_4H_{11}N$	1.1	+	1.1	+	0.7	+	8.71	C5
Butyl cellosolve see 2-Butoxyethanol		111-76-2									
Butyl hydroperoxide, t-		75-91-2	$C_4H_{10}O_2$	2.0	+	1.6	+			<10	1

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Butyl mercaptan	1-Butanethiol	109-79-5	$C_4H_{10}S$	0.55	+	0.52	+			9.14	0.5
Butyraldehyde	Butanal	123-72-8	C_4H_8O			1.87	+			9.82	20
Camelinal HRJ						1.1	+	0.32	+		
Camelinal HRJ/JP-8 50/50						0.89	+	0.41	+		
CamelinalHRJ						1.15	+				
CamelinalHRJ/JP-8						1.07	+				
Carbon disulfide		75-15-0	CS_2	4	+	1.2	+	0.44		10.07	10
Carbon tetrachloride	Tetrachloromethane	56-23-5	CCl_4	NR	+	NR	+	1.7	+	11.47	5
Carbonyl sulfide	Carbon oxysulfide	463-58-1	COS							11.18	
Cellosolve see 2-Ethoxyethanol											
CFC-14 see Tetrafluoromethane											
CFC-113 see 1,1,2-Trichloro-1,2,2-trifluoroethane											
Chlorine		7782-50-5	Cl_2					1.0	+	11.48	0.5
Chlorine dioxide		10049-04-4	ClO_2	NR	+	NR	+	NR	+	10.57	0.1
Chlorobenzene	Monochlorobenzene	108-90-7	C_6H_5Cl	0.44	+	0.55	+	0.39	+	9.06	10
Chlorobenzotrifluoride, 4-	PCBTF, OXSOL 100 p-Chlorobenzotrifluoride	98-56-6	$C_7H_4ClF_3$	0.74	+	0.63	+	0.55	+	<9.6	
Chloro-1,3-butadiene, 2-	Chloroprene	126-99-8	C_4H_5Cl			3					10
Chloro-1,1-difluoroethane, 1-	HCFC-142B, R-142B	75-68-3	$C_2H_3ClF_2$	NR		NR		NR		12.0	ne
Chlorodifluoromethane	HCFC-22, R-22	75-45-6	$CHClF_2$	NR		NR		NR		12.2	1000
Chloroethane	Ethyl chloride	75-00-3	C_2H_5Cl	NR	+	NR	+	1.1	+	10.97	100
Chloroethanol	Ethylene chlrohydrin	107-07-3	C_2H_5ClO							10.52	C1
Chloroethanol, 2-	2-Chloroethanol; 2-Chloroethyl alcohol; Ethylene chlorhydrin	107-07-3	C_2H_5ClO			2.88	+			10.5	5
Chloroethyl ether, 2-	bis (2-chloroethyl) ether	111-44-4	$C_4H_8Cl_2O$	8.6	+	3.0	+				5
Chloroethyl methyl ether, 2-	Methyl 2-chloroethyl ether	627-42-9	C_3H_7ClO			3					ne
Chloroform	Trichloromethane	67-66-3	$CHCl_3$	NR	+	NR	+	3.5	+	11.37	10
Chloro-2-methylpropene, 3-	Methallyl chloride, Isobutenyl chloride	563-47-3	C_4H_7Cl	1.4	+	1.2	+	0.63	+	9.76	ne
Chloropicrin		76-06-2	CCl_3NO_2	NR	+	~400	+	7	+		0.1
Chlorotoluene, o-	o-Chloromethylbenzene	95-49-8	C_7H_7Cl			0.5		0.6		8.83	50
Chlorotoluene, p-	p-Chloromethylbenzene	106-43-4	C_7H_7Cl					0.6		8.69	ne
Chlorotrifluoroethene	CTFE, Chlorotrifluoroethylene Genetron 1113	79-38-9	C_2ClF_3	6.7	+	3.9	+	1.2	+	9.76	5
Chlorotrimethylsilane		75-77-4	C_3H_9ClSi	NR		NR		0.82	+	10.83	ne
Cresol, m-	m-Hydroxytoluene, 3-Methylphenol	108-39-4	C_7H_8O	0.57	+	0.50	+	0.57	+	8.29	5
Cresol, o-	ortho-Cresol; 2-Cresol; o-Cresylic acid; 1-Hydroxy-2-methylbenzene; 2-Hydroxytoluene; 2-Methyl phenol	95-48-7	C_7H_8O			1	+			8.14	5
Cresol, p-	para-Cresol; 4-Cresol; p-Cresylic acid; 1-Hydroxy-4-methylbenzene; 4-Hydroxytoluene; 4-Methyl phenol	106-44-5	C_7H_8O			1.4	+			8.34	5
Crotonaldehyde	trans-2-Butenal	123-73-9 4170-30-3	C_4H_6O	1.5	+	1.1	+	1.0	+	9.73	2
Cumene	Isopropylbenzene	98-82-8	C_9H_{12}	0.58	+	0.54	+	0.4	+	8.73	50
Cyanogen bromide		506-68-3	CNBr	NR		NR		NR		11.84	ne
Cyanogen chloride		506-77-4	CNCl	NR		NR		NR		12.34	C0.3
Cyclohexane		110-82-7	C_6H_{12}	3.3	+	1.4	+	0.64	+	9.86	300
Cyclohexanol	Cyclohexyl alcohol	108-93-0	$C_6H_{12}O$	1.5	+	0.9	+	1.1	+	9.75	50
Cyclohexanone		108-94-1	$C_6H_{10}O$	1.0	+	0.9	+	0.7	+	9.14	25

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Cyclohexene		110-83-8	C_6H_{10}			0.8	+			8.95	300
Cyclohexylamine		108-91-8	$C_6H_{13}N$			1.2				8.62	10
Cyclopentane 85% 2,2-dimethylbutane 15%		287-92-3	C_5H_{10}	NR	+	15	+	1.1		10.33	600
Cyclopropylamine	Aminocyclpropane	765-30-0	C_3H_7N	1.1	+	0.9	+	0.9	+		ne
Decamethylcyclopentasiloxane		541-02-6	$C_{10}H_{30}O_5Si_5$	0.16	+	0.13	+	0.12	+		ne
Decamethyltetrasiloxane		141-62-8	$C_{10}H_{30}O_3Si_4$	0.17	+	0.13	+	0.12	+	<10.2	ne
Decane		124-18-5	$C_{10}H_{22}$	4.0	+	1.4	+	0.35	+	9.65	ne
Diacetone alcohol	4-Methyl-4-hydroxy-2-pentanone	123-42-2	$C_6H_{12}O_2$			0.7					50
Dibromochloromethane	Chlorodibromomethane	124-48-1	$CHBr_2Cl$	NR	+	5.2	+	0.7	+	10.59	ne
Dibromo-3-chloropropane, 1,2-	DBCP	96-12-8	$C_3H_5Br_2Cl$	NR	+	1.7	+	0.43	+		0.001
Dibromoethane, 1,2-	EDB, Ethylene dibromide, Ethylene bromide	106-93-4	$C_2H_4Br_2$	NR	+	1.7	+	0.6	+	10.37	ne
Dichlorobenzene, o-	1,2-Dichlorobenzene	95-50-1	$C_6H_4Cl_2$	0.54	+	0.64	+	0.38	+	9.08	25
Dichlorodifluoromethane	CFC-12	75-71-8	CCl_2F_2			NR	+	NR	+	11.75	1000
Dichlorodimethylsilane		75-78-5	$C_2H_6Cl_2Si$	NR		NR		1.1	+	>10.7	ne
Dichloroethane, 1,2-	EDC, 1,2-DCA, Ethylene dichloride	107-06-2	$C_2H_4Cl_2$			NR	+	0.6	+	11.04	10
Dichloroethene, 1,1-	1,1-DCE, Vinylidene chloride	75-35-4	$C_2H_2Cl_2$			0.82	+	0.8	+	9.79	5
Dichloroethene, c-1,2-	c-1,2-DCE, *cis*-Dichloroethylene	156-59-2	$C_2H_2Cl_2$			0.8				9.66	200
Dichloroethene, t-1,2-	t-1,2-DCE, *trans*-Dichloroethylene	156-60-5	$C_2H_2Cl_2$			0.45	+	0.34	+	9.65	200
Dichloro-1-fluoroethane, 1,1-	R-141B	1717-00-6	$C_2H_3Cl_2F$	NR	+	NR	+	2.0	+		ne
Dichloromethane see Methylene chloride											
Dichloropentafluoropropane	AK-225, mix of ~45% 3,3-dichloro-1,1,1,2,2-pentafluoro-propane (HCFC-225ca) & ~55% 1,3-Dichloro-1,1,2,2,3-penta-fluoropropane (HCFC-225cb)	442-56-0 507-55-1	$C_3HCl_2F_5$	NR	+	NR	+	25	+		ne
Dichloropropane, 1,2-		78-87-5	$C_3H_6Cl_2$					0.7		10.87	75
Dichloro-1-propene, 1,3-		542-75-6	$C_3H_4Cl_2$	1.3	+	0.96	+			<10	1
Dichloro-1-propene, 2,3-		78-88-6	$C_3H_4Cl_2$	1.9	+	1.3	+	0.7	+	<10	ne
Dichloro-1,1,1- trifluoroethane, 2,2-	R-123	306-83-2	$C_2HCl_2F_3$	NR	+	NR	+	10.1	+	11.5	ne
Dichloro-2,4,6- trifluoropyridine, 3,5-	DCTFP	1737-93-5	$C_5Cl_2F_3N$	1.1	+	0.9	+	0.8	+		ne
Dichlorvos**	Vapona; O,O-dimethyl O-dichlorovinyl phosphate	62-73-7	$C_4H_7Cl_2O_4P$			0.9	+			<9.4	0.1
Dicyclopentadiene	DCPD, Cyclopentadiene dimer	77-73-6	$C_{10}H_{12}$	0.57	+	0.48	+	0.43	+	8.8	5
Diesel Fuel**		68334-30-5	m.w. 226			0.9	+				11
Diesel Fuel #2 (Automotive)**		68334-30-5	m.w. 216	1.3		0.7	+	0.4	+		11
Diethylamine		109-89-7	$C_4H_{11}N$			1	+			8.01	5
Diethylaminopropylamine, 3-		104-78-9	$C_7H_{18}N_2$			1.3					ne
Diethylbenzene see Dowtherm J											
Diethyl ether	Diethyl ether; Diethyl oxide; Ethyl oxide; Ether; Solvent ether	60-29-7	$C_4H_{10}O$			1.74	+			9.51	400
Diethylene glycol butyl ether	2-(2-Butoxyethoxy)ethanol, BDG, Butyldiglycol, DB Solvent	112-34-5	$C_8H_{18}O_3$			4.6	+				5
Diethylene glycol monobutyl ether acetate	Butyldiglycol acetate, DB Acetate, Diethylene glycol monobutyl ether acetate	124-17-4	$C_{10}H_{20}O_4$			5.62	+				ne
Diethylmaleate		141-05-9	$C_8H_{12}O_4$			4					ne
Diethyl sulfide see Ethyl sulfide											
Diglyme see Methoxyethyl ether		111-96-6	$C_6H_{14}O_3$								

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Diisobutyl ketone	DIBK, 2,2-dimethyl-4-heptanone	108-83-8	$C_9H_{18}O$	0.71	+	0.61	+	0.35	+	9.04	25
Diisopropylamine		108-18-9	$C_6H_{15}N$	0.84	+	0.74	+	0.5	+	7.73	5
Diisopropylcarbodiimide,N,N'-	DIPC	693-13-0	$C_7H_{14}N_2$			0.42	+				ne
Diisopropylethylamine	'Hünig's base', *N*-Ethyldiisopropylamine, DIPEA, Ethyldiisopropylamine	7087-68-5	$C_8H_{19}N$			0.7	+				ne
Diketene	Ketene dimer	674-82-8	$C_4H_4O_2$	2.6	+	2.0	+	1.4	+	9.6	0.5
Dimethylacetamide, N,N-	DMA	127-19-5	C_4H_9NO	0.87	+	0.8	+	0.8	+	8.81	10
Dimethylamine		124-40-3	C_2H_7N			1.5				8.23	5
Dimethyl carbonate	Carbonic acid dimethyl ester	616-38-6	$C_3H_6O_3$	NR	+	~70	+	1.7	+	~10.5	ne
Dimethyl disulfide	DMDS	624-92-0	$C_2H_6S_2$	0.2	+	0.20	+	0.21	+	7.4	ne
Dimethyl ether see Methyl ether											
Dimethylethylamine	DMEA	598-56-1	$C_4H_{11}N$	1.1	+	1.0	+	0.9	+	7.74	~3
Dimethylformamide, N,N-	DMF	68-12-2	C_3H_7NO	0.7	+	0.7	+	0.8	+	9.13	10
Dimethylhydrazine, 1,1-	UDMH	57-14-7	$C_2H_8N_2$			0.8	+	0.8	+	7.28	0.01
Dimethyl methylphosphonate	DMMP, methyl phosphonic acid dimethyl ester	756-79-6	$C_3H_9O_3P$	NR	+	4.3	+	0.74	+	10.0	ne
Dimethyl sulfate		77-78-1	$C_2H_6O_4S$	~23		~20	+	2.3	+		0.1
Dimethyl sulfide see Methyl sulfide											
Dimethyl sulfoxide	DMSO, Methyl sulfoxide	67-68-5	C_2H_6OS			1.4	+			9.10	ne
Dioxane, 1,4-		123-91-1	$C_4H_8O_2$			1.3				9.19	25
Dioxolane, 1,3-	Ethylene glycol formal	646-06-0	$C_3H_6O_2$	4.0	+	2.3	+	1.6	+	9.9	20
Dowtherm A see Therminol®**											
Dowtherm J (97% Diethylbenzene)**		25340-17-4	$C_{10}H_{14}$			0.5					
DS-108F Wipe Solvent	Ethyl lactate/Isopar H/ Propoxypropanol ~7:2:1	97-64-3 64742-48-9 1569-01-3	m.w. 118	3.3	+	1.6	+	0.7	+		ne
Epichlorohydrin	ECH Chloromethyloxirane, 1-chloro2,3-epoxypropane	106-89-8	C_2H_5ClO	~200	+	8.5	+	1.4	+	10.2	0.5
Ethane		74-84-0	C_2H_6			NR	+	15	+	11.52	ne
Ethanol	Ethyl alcohol	64-17-5	C_2H_6O			9.6	+	3.1	+	10.47	1000
Ethanolamine**	MEA, Monoethanolamine	141-43-5	C_2H_7NO	5.6	+	1.6	+			8.96	3
Ethene	Ethylene	74-85-1	C_2H_4			9	+	4.5	+	10.51	ne
Ethoxyethanol, 2-	Ethyl cellosolve, Ethylene glycol monoethyl ether	110-80-5	$C_4H_{10}O_2$			1.3				9.6	5
Ethyl acetate	Acetic ester; Acetic ether; Ethyl ester of acetic acid; Ethyl ethanoate	141-78-6	$C_4H_8O_2$			3.8	+			10.01	400
Ethyl acetoacetate		141-97-9	$C_6H_{10}O_3$	1.4	+	1.2	+	1.0	+	<10	ne
Ethyl acrylate		140-88-5	$C_5H_8O_2$			2.4	+	1.0	+	<10.3	5
Ethylactate	Acetic ester; Acetic ether; Ethyl ester of acetic acid; Ethyl ethanoate	141-78-6	$C_4H_8O_2$					2.18	+	10.01	400
Ethylamine		75-04-7	C_2H_7N			0.8				8.86	5
Ethylbenzene		100-41-4	C_8H_{10}	0.52	+	0.65	+	0.51	+	8.77	100
Ethyl caprylate	Ethyl octanoate	106-32-1	$C_{10}H_{20}O_2$		+	0.52	+	0.51	+		
Ethylenediamine	1,2-Ethanediamine; 1,2-Diaminoethane	107-15-3	$C_2H_8N_2$	0.9	+	0.8	+	1.0	+	8.6	10
(Ethylenedioxy)diethanethiol, 2,2'-	1,2-Bis(2-mercaptoethoxy)ethane, 3,6-Dioxa-1,8-octane-dithiol	14970-87-7	$C_6H_{14}O_2S_2$			1.3	+				ne
Ethylene glycol**	1,2-Ethanediol	107-21-1	$C_2H_6O_2$			16	+	6	+	10.16	C100
Ethylene glycol, Acrylate**	2-hydroxyethyl Acrylate	818-61-1	$C_5H_8O_3$			8.2				≤10.6	
Ethylene glycol dimethyl ether	1,2-Dimethoxyethane, Monoglyme	110-71-4	$C_4H_{10}O_2$	1.1		1.1		0.7		9.2	ne

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Ethylene glycol monobutyl ether acetate	1,2-Dimethoxyethane, Monoglyme	110-71-4	$C_4H_{10}O_2$	1.1		1.1		0.7		9.2	ne
Ethylene glycol, monothio		60-24-2	C_2H_6OS			1.5				9.65	
Ethylene oxide	Oxirane, Epoxyethane	75-21-8	C_2H_4O			13	+	3.5	+	10.57	1
Ethyl ether	Diethyl ether	60-29-7	$C_4H_{10}O$			1.1	+			9.51	400
Ethyl 3-ethoxypropionate	EEP	763-69-9	$C_7H_{14}O_3$	1.2	+	0.75	+				ne
Ethyl formate		109-94-4	$C_3H_6O_2$					1.9		10.61	100
Ethyl-1-hexanol, 2-	Isooctyl alcohol	104-76-7	$C_8H_{18}O$			1.9	+				ne
Ethyl hexyl acrylate, 2-	Acrylic acid 2-ethylhexyl ester	103-11-7	$C_{11}H_{20}O_2$			1.1	+	0.5	+		ne
Ethylidenenorbornene	5-Ethylidene bicyclo(2,2,1) hept-2-ene	16219-75-3	C_9H_{12}	0.4	+	0.39	+	0.34	+	≤8.8	ne
Ethyl (S)-(-)-lactate see also DS-108F	Ethyl lactate, Ethyl (S)-(-)-hydroxypropionate	687-47-8 97-64-3	$C_5H_{10}O_3$	13	+	3.2	+	1.6	+	~10	ne
Ethyl mercaptan	Ethanethiol	75-08-1	C_2H_6S	0.60	+	0.56	+			9.29	0.5
Ethyl sulfide	Diethyl sulfide	352-93-2	$C_4H_{10}S$			0.5	+			8.43	ne
Formaldehyde	Formalin	50-00-0	CH_2O	NR	+	NR	+	1.6	+	10.87	C0.3
Formamide		75-12-7	CH_3NO			6.9	+	4		10.16	10
Formic acid		64-18-6	CH_2O_2	NR	+	NR	+	9	+	11.33	5
Furfural	2-Furaldehyde	98-01-1	$C_5H_4O_2$			0.92	+	0.8	+	9.21	2
Furfuryl alcohol		98-00-0	$C_5H_6O_2$			0.80	+			<9.5	10
Gasoline #1		8006-61-9	m.w. 72			0.9	+				300
Gasoline #2, 92 octane		8006-61-9	m.w. 93	1.3	+	1.0	+	0.5	+		300
Glutaraldehyde	1,5-Pentanedial, Glutaric dialdehyde	111-30-8	$C_5H_8O_2$	1.1	+	0.8	+	0.6	+		C0.05
Glycidyl methacrylate	2,3-Epoxypropyl methacrylate	106-91-2	$C_7H_{10}O_3$	2.6	+	1.2	+	0.9	+		0.5
Halothane	2-Bromo-2-chloro-1,1,1-trifluoroethane	151-67-7	$C_2HBrClF_3$					0.6		11.0	50
HCFC-22 see Chlorodifluoromethane											
HCFC-123 see 2,2-Dichloro-1,1,1-trifluoroethane											
HCFC-141B see 1,1-Dichloro-1-fluoroethane											
HCFC-142B see 1-Chloro-1,1-difluoroethane											
HCFC-134A see 1,1,1,2-Tetrafluoroethane											
HCFC-225 see Dichloropentafluoropropane											
Heptane, n-		142-82-5	C_7H_{16}	45	+	2.8	+	0.60	+	9.92	400
Heptanol, 4-	Dipropylcarbinol	589-55-9	$C_7H_{16}O$	1.8	+	1.3	+	0.5	+	9.61	ne
Hexamethyldisilazane, 1,1,1,3,3,3-**	HMDS	999-97-3	$C_6H_{19}NSi_2$			0.2	+	0.2	+	~8.6	ne
Hexamethyldisiloxane	HMDSx	107-46-0	$C_6H_{18}OSi_2$	0.33	+	0.27	+	0.25	+	9.64	ne
Hexane, n-		110-54-3	C_6H_{14}	350	+	4.3	+	0.54	+	10.13	50
Hexanol, 1-	Hexyl alcohol	111-27-3	$C_6H_{14}O$	9	+	2.5	+	0.55	+	9.89	ne
Hexene, 1-		592-41-6	C_6H_{12}			0.8				9.44	30
HFE-7100 see Methyl nonafluorobutyl ether											
Histoclear (Histo-Clear)	Limonene/corn oil reagent		m.w. ~136	0.5	+	0.4	+	0.3	+		ne
Hydrazine**		302-01-2	H_4N_2	>8	+	2.6	+	2.1	+	8.1	0.01
Hydrazoic acid	Hydrogen azide		HN_3							10.7	
Hydrogen	Synthesis gas	1333-74-0	H_2	NR	+	NR	+	NR	+	15.43	ne
Hydrogen cyanide	Hydrocyanic acid	74-90-8	HCN	NR	+	NR	+	NR	+	13.6	C4.7
Hydrogen iodide**	Hydriodic acid	10034-85-2	HI			~0.6				10.39	
Hydrogen peroxide		7722-84-1	H_2O_2	NR	+	NR	+	NR	+	10.54	1
Hydrogen sulfide		7783-06-4	H_2S	NR	+	3.3	+	1.5	+	10.45	10
Hydroxyethyl acrylate, 2-	Ethylene glycol monoacrylate	818-61-1	$C_5H_8O_3$			8.2	+				ne

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Hydroxypropyl methacrylate		27813-02-1 923-26-2	$C_7H_{12}O_3$	9.9	+	2.3	+	1.1	+		ne
Iodine**		7553-56-2	I_2	0.1	+	0.1	+	0.1	+	9.40	C0.1
Iodomethane	Methyl iodide	74-88-4	CH_3I	0.21	+	0.22	+	0.26	+	9.54	2
Isoamyl acetate	Isopentyl acetate	123-92-2	$C_7H_{14}O_2$	10.1		2.1		1.0		<10	100
Isobutane	2-Methylpropane	75-28-5	C_4H_{10}			100	+	1.2	+	10.57	ne
Isobutanol	2-Methyl-1-propanol	78-83-1	$C_4H_{10}O$	19	+	3.8	+	1.5		10.02	50
Isobutene	Isobutylene, Methyl butene	115-11-7	C_4H_8	1.00	+	1.00	+	1.00	+	9.24	ne
Isobutyl acetate	2-methylpropyl ethanoate, β-methylpropyl acetate	110-19-0	$C_6H_{12}O_2$			2.1	+			9.97	150
Isobutyl acrylate	Isobutyl 2-propenoate, Acrylic acid Isobutyl ester	106-63-8	$C_7H_{12}O_2$			1.5	+	0.60	+		ne
Isoflurane	1-Chloro-2,2,2-trifluoroethyl difluoromethyl ether, forane	26675-46-7	$C_3H_2ClF_5O$	NR	+	NR	+	48	+	~11.7	ne
Isooctane	2,2,4-Trimethylpentane	540-84-1	C_8H_{18}			1.2				9.86	ne
Isopar E Solvent	Isoparaffinic hydrocarbons	64741-66-8	m.w. 121	1.7	+	0.8	+				ne
Isopar G Solvent	Photocopier diluent	64742-48-9	m.w. 148			0.8	+				ne
Isopar K Solvent	Isoparaffinic hydrocarbons	64742-48-9	m.w. 156	0.9	+	0.5	+	0.27	+		ne
Isopar L Solvent	Isoparaffinic hydrocarbons	64742-48-9	m.w. 163	0.9	+	0.5	+	0.28	+		ne
Isopar M Solvent	Isoparaffinic hydrocarbons	64742-47-8	m.w. 191			0.7	+	0.4	+		ne
Isopentane	2-Methylbutane	78-78-4	C_5H_{12}			8.2					ne
Isophorone		78-59-1	$C_9H_{14}O$					3		9.07	C5
Isoprene	2-Methyl-1,3-butadiene	78-79-5	C_5H_8	0.69	+	0.63	+	0.60	+	8.85	ne
Isopropanol	Isopropyl alcohol, 2-propanol, IPA	67-63-0	C_3H_8O	500	+	4.6	+	2.7		10.12	200
Isopropyl acetate		108-21-4	$C_5H_{10}O_2$			2.6				9.99	100
Isopropyl ether	Diisopropyl ether	108-20-3	$C_6H_{14}O$			0.8				9.20	250
Jet fuel JP-4	Jet B, Turbo B, F-40 Wide cut type aviation fuel	8008-20-6 + 64741-42-0	m.w. 115			1.0	+	0.4	+		ne
Jet fuel JP-5	Jet 5, F-44, Kerosene type aviation fuel	8008-20-6 + 64747-77-1	m.w. 167			0.6	+	0.5	+		29
Jet fuel JP-8	F-34, Kerosene type aviation fuel	8008-20-6 + 64741-77-1	m.w. 165			0.94	+	0.3	+		30
Jet fuel A-1	F-34, Kerosene type aviation fuel	8008-20-6 + 64741-77-1	m.w. 145			0.67					34
Jet Fuel TS	Thermally Stable Jet Fuel, Hydrotreated kerosene fuel	8008-20-6 + 64742-47-8	m.w. 165	0.9	+	0.6	+	0.3	+		30
JP-10						0.7	+	0.5	+		
JP5, Petroleum/camelinal						1.05	+				
JP5/Petroleum						0.98	+				
Limonene, D-	(R)-(+)-Limonene	5989-27-5	$C_{10}H_{16}$			0.33	+			~8.2	ne
Kerosene C10-C16 petro.distillate see Jet Fuels		8008-20-6									
MDI see 4,4′-Methylenebis (phenylisocyanate)											
Maleic anhydride	2,5-Furandione	108-31-6	$C_4H_2O_3$							~10.8	0.1
Mercapto-2-ethanol	β-Mercaptoethanol, 2-Hydroxyethylmercaptan, BME, Thioethylene glycol	60-24-2	C_2H_6OS			1.5	+			9.65	0.2
Mesitylene	1,3,5-Trimethylbenzene	108-67-8	C_9H_{12}	0.36	+	0.35	+	0.3	+	8.41	25
Methallyl chloride see 3-Chloro-2-methylpropene											
Methane	Natural gas	74-82-8	CH_4	NR	+	NR	+	NR	+	12.61	ne
Methanol	Methyl alcohol, carbinol	67-56-1	CH_4O	NR	+	NR	+	2.5	+	10.85	200
Methoxyethanol, 2-	Methyl cellosolve, Ethylene glycol monomethyl ether	109-86-4	$C_3H_8O_2$	4.8	+	2.4	+	1.4	+	10.1	5

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Methoxyethoxyethanol, 2-	2-(2-Methoxyethoxy)ethanol Diethylene glycol monomethyl ether	111-77-3	$C_7H_{16}O$	2.3	+	1.2	+	0.9	+	<10	ne
Methoxyethyl ether, 2-	bis(2-Methoxyethyl) ether, Diethylene glycol dimethyl ether, Diglyme	111-96-6	$C_6H_{14}O_3$	0.64	+	0.54	+	0.44	+	<9.8	ne
Methyl acetate		79-20-9	$C_3H_6O_2$	NR	+	6.6	+	1.4	+	10.27	200
Methyl acrylate	Methyl 2-propenoate, Acrylic acid methyl ester	96-33-3	$C_4H_6O_2$			3.7	+	1.2	+	(9.9)	2
Methylamine	Aminomethane	74-89-5	CH_5N			1.2				8.97	5
Methyl amyl ketone	MAK, 2-Heptanone, Methyl pentyl ketone	110-43-0	$C_7H_{14}O$	0.9	+	0.85	+	0.5	+	9.30	50
Methylaniline, N-	MA; (Methylamino) benzene; N-Methyl aniline; Methylphenylamine; N-Phenylmethylamin	100-61-8	C_7H_9N			0.68	+			7.32	2
Methyl bromide	Bromomethane	74-83-9	CH_3Br	110	+	1.7	+	1.3	+	10.54	1
Methyl-2-butanol, 2-	*tert*-Amyl alcohol, *tert*-Pentyl alcohol	75-85-4	$C_5H_{12}O$			1.62	+			10.16	100
Methyl t-butyl ether	MTBE, tert-Butyl methyl ether	1634-04-4	$C_5H_{12}O$			0.9	+			9.24	40
Methyl cellosolve see 2-Methoxyethanol											
Methyl chloride	Chloromethane	74-87-3	CH_3Cl	NR	+	NR	+	0.74	+	11.22	50
Methylcyclohexane		107-87-2	C_7H_{14}	1.6	+	0.97	+	0.53	+	9.64	400
Methylene bis (phenyl-isocyanate), 4,4'-**	MDI, Mondur M		$C_{15}H_{10}N_2O_2$	Very slow ppb level response							0.005
Methylene chloride	Dichloromethane	75-09-2	CH_2Cl_2	NR	+	NR	+	0.89	+	11.32	25
Methyl ether	Dimethyl ether	115-10-6	C_2H_6O	4.8	+	3.1	+	2.5	+	10.03	ne
Methyl ethyl ketone	MEK, 2-Butanone	78-93-3	C_4H_8O	0.86	+	1.0	+	1.1	+	9.51	200
Methylhydrazine	Monomethylhydrazine, Hydrazomethane	60-34-4	$C_2H_6N_2$	1.4	+	1.2	+	1.3	+	7.7	0.01
Methyl isoamyl ketone	MIAK, 5-Methyl-2-hexanone	110-12-3	$C_7H_{14}O$	0.8	+	0.76	+	0.5	+	9.28	50
Methyl isobutyl ketone	MIBK, 4-Methyl-2-pentanone	108-10-1	$C_6H_{12}O$	0.9	+	0.8	+	0.6	+	9.30	50
Methyl isocyanate		624-83-9	C_2H_3NO	NR	+	4.6	+	1.5		10.67	0.02
Methyl isothiocyanate		551-61-6	C_2H_3NS	0.5	+	0.45	+	0.4	+	9.25	ne
Methyl mercaptan	Methanethiol	74-93-1	CH_4S	0.65		0.54		0.66		9.44	0.5
Methyl methacrylate		80-62-6	$C_5H_8O_2$	2.7	+	1.5	+	1.2	+	9.7	100
Methyl nonafluorobutyl ether	HFE-7100DL	163702-08-7, 163702-07-6	$C_5H_3F_9O$			NR	+	~35	+		ne
Methyl-1,5-pentanediamine, 2- (coats lamp)**	Dytek-A amine, 2-Methyl pentamethylenediamine	15520-10-2	$C_6H_{16}N_2$			~0.6	+			<9.0	ne
Methyl propyl ketone	MPK, 2-Pentanone	107-87-9	$C_5H_{12}O$			0.93	+	0.79	+	9.38	200
Methyl-2-pyrrolidinone, N-	NMP, N-Methylpyrrolidone, 1-Methyl-2-pyrrolidinone, 1-Methyl-2-pyrrolidone	872-50-4	C_5H_9NO	1.0	+	0.8	+	0.9	+	9.17	ne
Methyl salicylate**	Methyl 2-hydroxybenzoate	119-36-8	$C_8H_8O_3$	1.3	+	0.9	+	0.9	+	~9	ne
Methylstyrene, α-	2-Propenylbenzene	98-83-9	C_9H_{10}			0.5				8.18	50
Methyl sulfide	DMS, Dimethyl sulfide	75-18-3	C_2H_6S	0.49	+	0.44	+	0.46	+	8.69	ne
Methyl tertiary-butyl ether	MTBE, Methyl *tert*-butyl ether	1634-04-4	$C_5H_{12}O$			1.43	+			9.24	50
Methyl vinyl ketone	MVK, 3-Buten-2-one	78-94-4	C_4H_6O			0.93	+			9.65	ne
Methyltetrahydrofuran	2-MeTHF, Tetrahydro-2-methylfuran, Tetrahydrosilvan	96-47-9	$C_5H_{10}O$			2.44	+			9.22	ne
Mineral spirits	Stoddard Solvent, Varsol 1, White Spirits	8020-83-5 8052-41-3 68551-17-7	m.w. 144	1.0		0.69	+	0.38	+		100
Mineral Spirits	Viscor 120B Calibration Fluid, b.p. 156-207°C	8052-41-3	m.w. 142	1.0	+	0.7	+	0.3	+		100

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Monoethanolamine see Ethanolamine											
Mustard	HD, Bis (2-chloroethyl) sulfide	505-60-2 39472-40-7 68157-62-0	$C_4H_8Cl_2S$			0.6					0.0005
Naphtha see VM & P Naphtha											
Naphthalene	Mothballs	91-20-3	$C_{10}H_8$	0.45	+	0.42	+	0.40	+	8.13	10
Nickel carbonyl (in CO)	Nickel tetracarbonyl	13463-39-3	C_4NiO_4			0.18				<8.8	0.001
Nicotine	3-(1-Methyl-2-pyrrolidyl)pyridine	54-11-5	$C_{10}H_{14}N_2$			1.98	+				ne
Nitric oxide		10102-43-9	NO	~6		5.2	+	2.8	+	9.26	25
Nitrobenzene		98-95-3	$C_6H_5NO_2$	2.6	+	1.9	+	1.6	+	9.81	1
Nitroethane		79-24-3	$C_2H_5NO_2$					3		10.88	100
Nitrogen dioxide		10102-44-0	NO_2	23	+	16	+	6	+	9.75	3
Nitrogen trifluoride		7783-54-2	NF_3	NR		NR		NR		13.0	10
Nitromethane		75-52-5	CH_3NO_2					4		11.02	20
Nitropropane, 2-		79-46-9	$C_3H_7NO_2$					2.6		10.71	10
Nonane		111-84-2	C_9H_{20}			1.4				9.72	200
Norpar 12	n-Paraffins, mostly C_{10}-C_{13}	64771-72-8	m.w. 161	3.2	+	1.1	+	0.28	+		ne
Norpar 13	n-Paraffins, mostly C_{13}-C_{14}	64771-72-8	m.w. 189	2.7	+	1.0	+	0.3	+		ne
Octamethylcyclotetrasiloxane		556-67-2	$C_8H_{24}O_4Si_4$	0.21	+	0.17	+	0.14	+		ne
Octamethyltrisiloxane		107-51-7	$C_8H_{24}O_2Si_3$	0.23	+	0.18	+	0.17	+	<10.0	ne
Octane, n-		111-65-9	C_8H_{18}	13	+	1.8	+			9.82	300
Octene, 1-		111-66-0	C_8H_{16}	0.9	+	0.75	+	0.4	+	9.43	75
Pentachloropropane	1,1,1,3,3-pentachloropropane	23153-23-3	$C_3H_3Cl_5$					1.25	+		0.1
Pentane		109-66-0	C_5H_{12}	80	+	8.4	+	0.7	+	10.35	600
Peracetic acid**	Peroxyacetic acid, Acetyl hydroperoxide	79-21-0	$C_2H_4O_3$	NR	+	NR	+	2.3	+		ne
Peracetic/Acetic acid mix**	Peroxyacetic acid, Acetyl hydroperoxide	79-21-0	$C_2H_4O_3$			50	+	2.5	+		ne
Perchloroethene	PCE, Perchloroethylene, Tetrachloroethylene	127-18-4	C_2Cl_4	0.69	+	0.57	+	0.31	+	9.32	25
Propylene glycol methyl ether, 1-Methoxy-2-propanol	PGME	107-98-2	$C_6H_{12}O_3$	2.4	+	1.5	+	1.1	+		100
Propylene glycol methyl ether acetate, 1-Methoxy-2-acetoxypropane, 1-Methoxy-2-propanol acetate	PGMEA	108-65-6	$C_6H_{12}O_3$	1.65	+	1.0	+	0.8	+		ne
Phenol	Hydroxybenzene	108-95-2	C_6H_6O	1.0	+	1.0	+	0.9	+	8.51	5
Phosgene	Dichlorocarbonyl	75-44-5	CCl_2O	NR	+	NR	+	8.5	+	11.2	0.1
Phosgene in Nitrogen	Dichlorocarbonyl	75-44-5	CCl_2O	NR	+	NR	+	6.8	+	11.2	0.1
Phosphine (coats lamp)		7803-51-2	PH_3	28		3.9	+	1.1	+	9.87	0.3
Photocopier Toner	Isoparaffin mix					0.5	+	0.3	+		ne
Picoline, 3-	3-Methylpyridine	108-99-6	C_6H_7N			0.9				9.04	ne
Pinene, α-		2437-95-8	$C_{10}H_{16}$			0.31	+	0.47		8.07	ne
Pinene, β-		18172-67-3	$C_{10}H_{16}$	0.38	+	0.37	+	0.37	+	~8	100
Piperylene, isomer mix	1,3-Pentadiene	504-60-9	C_5H_8	0.76	+	0.69	+	0.64	+	8.6	100
Propane		74-98-6	C_3H_8			NR	+	1.8	+	10.95	2500
Propanol, n-	Propyl alcohol	71-23-8	C_3H_8O			5.5		1.7		10.22	200
Propene	Propylene	115-07-1	C_3H_6	1.5	+	1.4	+	1.6	+	9.73	ne
Propionaldehyde	Propanal	123-38-6	C_3H_6O			1.9				9.95	ne
Propyl acetate, n-		109-60-4	$C_5H_{10}O_2$			3.5				10.04	200
Propyl acetate	Propylacetate; n-Propyl ester of acetic acid	109-60-4	$C_5H_{10}O_2$			2.27	+			10.04	200

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Propylamine, n-	1-Propylamine, 1-Aminopropane	107-10-8	C_3H_9N	1.1	+	1.1	+	0.9	+	8.78	ne
Propylene carbonate**		108-32-7	$C_4H_6O_3$			62	+	1	+	10.5	ne
Propylene glycol	1,2-Propanediol	57-55-6	$C_3H_8O_2$	18		4.2	+	1.6	+	<10.2	ne
Propylene glycol propyl ether	1-Propoxy-2-propanol	1569-01-3	$C_6H_{14}O_2$	1.3	+	1.0	+	1.6	+		ne
Propylene oxide	Methyloxirane	75-56-9 16088-62-3 15448-47-2	C_3H_6O	~240		6.6	+	2.9	+	10.22	20
Propyleneimine	2-Methylaziridine	75-55-8	C_3H_7N	1.5	+	1.3	+	1.0	+	9.0	2
Propyl mercaptan, 2-	2-Propanethiol, Isopropyl mercaptan	75-33-2	C_3H_8S	0.64	+	0.66	+			9.15	ne
Pyridine		110-86-1	C_5H_5N	0.78	+	0.7	+	0.7	+	9.25	5
Pyrrolidine (coats lamp)	Azacyclohexane	123-75-1	C_4H_9N	2.1	+	1.3	+	1.6	+	~8.0	ne
RR7300 (PGME/PGMEA)	70:30 PGME:PGMEA (1-Methoxy-2-propanol: 1-Methoxy-2-acetoxypropane)	107-98-2	$C_4H_{10}O_2$/ $C_6H_{12}O_3$			1.4	+	1.0	+		ne
Sarin	GB, Isopropyl methylphosphonofluoridate	107-44-8 50642-23-4	$C_4H_{10}FO_2P$			~3					
Shell SPK						1.26	+				
Shell SPK						1.29	+	0.4	+		
Shell SPK 50/50						1.02	+	0.41	+		
Shell SPK/JP-8						1.11	+				
Stoddard Solvent see Mineral Spirits		8020-83-5									
Styrene		100-42-5	C_8H_8	0.45	+	0.43	+	0.4	+	8.43	20
Sulfur dioxide		7446-09-5	SO_2	NR		NR	+	NR	+	12.32	2
Sulfur hexafluoride		2551-62-4	SF_6	NR		NR		NR		15.3	1000
Sulfuryl fluoride	Vikane	2699-79-8	SO_2F_2	NR		NR		NR		13.0	5
Tabun**	Ethyl N, N-dimethylphosphoramidocyanidate	77-81-6	$C_5H_{11}N_2O_2P$			0.8					15ppt
Tallow HRJ						1.09	+				
Tallow HRJ						0.95	+	0.36	+		
Tallow HRJ/JP-8						1.14	+				
Tallow HRJ/JP-8 50/50						0.9	+	0.39	+		
Tetrachloroethane, 1,1,1,2-		630-20-6	$C_2H_2Cl_4$					1.3		~11.1	ne
Tetrachloroethane, 1,1,2,2-		79-34-5	$C_2H_2Cl_4$	NR	+	NR	+	0.60	+	~11.1	1
Tetrachlorosilane		10023-04-7	$SiCl_4$	NR		NR		15	+	11.79	ne
Tetraethyllead	TEL	78-00-2	$C_8H_{20}Pb$	0.4		0.3		0.2		~11.1	0.008
Tetraethyl orthosilicate	Ethyl silicate, TEOS	78-10-4	$C_8H_{20}O_4Si$			0.7	+	0.2	+	~9.8	10
Tetrafluoroethane, 1,1,1,2-	HFC-134A	811-97-2	$C_2H_2F_4$			NR		NR			ne
Tetrafluoroethene	TFE, Tetrafluoroethylene, Perfluoroethylene	116-14-3	C_2F_4			~15				10.12	ne
Tetrafluoromethane	CFC-14, Carbon tetrafluoride	75-73-0	CF_4			NR	+	NR	+	>15.3	ne
Tetrahydrofuran	THF	109-99-9	C_4H_8O	1.9	+	1.7	+	1.0	+	9.41	200
Tetramethyl orthosilicate	Methyl silicate, TMOS	681-84-5	$C_4H_{12}O_4Si$	10	+	1.9	+			~10	1
Therminol® D-12**	Hydrotreated heavy naphtha	64742-48-9	m.w. 160	0.8	+	0.51	+	0.33	+		ne
Therminol® VP-1**	Dowtherm A, 3:1 Diphenyl oxide: Biphenyl	101-84-8 92-52-4	$C_{12}H_{10}O$ $C_{12}H_{10}$			0.4	+				1
Toluene	Methylbenzene	108-88-3	C_7H_8	0.54	+	0.45	+	0.51	+	8.82	50
Tolylene-2,4-diisocyanate	TDI, 4-Methyl-1,3-phenylene-2,4-diisocyanate	584-84-9	$C_9H_6N_2O_2$	1.4	+	1.4	+	2.0	+		0.002
Trichlorobenzene, 1,2,4-	1,2,4-TCB	120-82-1	$C_6H_3Cl_3$	0.7	+	0.9	+			9.04	C5
Trichloroethane, 1,1,1-	1,1,1-TCA, Methyl chloroform	71-55-6	$C_2H_3Cl_3$			NR	+	1	+	11	350

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Trichloroethane, 1,1,2-	1,1,2-TCA	79-00-5	$C_2H_3Cl_3$	NR	+	NR	+	0.9	+	11.0	10
Trichloroethene	TCE, Trichoroethylene	79-01-6	C_2HCl_3	0.62	+	0.54	+	0.43	+	9.47	50
Trichloromethylsilane	Methyltrichlorosilane	75-79-6	CH_3Cl_3Si	NR		NR		1.8	+	11.36	ne
Trichlorotrifluoroethane, 1,1,2-	CFC-113	76-13-1	$C_2Cl_3F_3$			NR		NR		11.99	1000
Triethylamine	TEA	121-44-8	$C_6H_{15}N$	0.95	+	0.9	+	0.65	+	7.3	1
Triethyl borate	TEB; Boric acid triethyl ester, Boron ethoxide	150-46-9	$C_6H_{15}O_3B$			2.2	+	1.1	+	~10	ne
Triethyl phosphate	Ethyl phosphate	78-40-0	$C_6H_{15}O_4P$	~50	+	3.1	+	0.60	+	9.79	ne
Trifluoroethane, 1,1,2-		430-66-0	$C_2H_3F_3$					34		12.9	ne
Trimethylamine		75-50-3	C_3H_9N			0.9				7.82	5
Trimethylbenzene, 1,3,5- see Mesitylene		108-67-8									25
Trimethyl borate	TMB; Boric acid trimethyl ester, Boron methoxide	121-43-7	$C_3H_9O_3B$			5.1	+	1.2	+	10.1	ne
Trimethyl phosphate	Methyl phosphate	512-56-1	$C_3H_9O_4P$			8.0	+	1.3	+	9.99	ne
Trimethyl phosphite	Methyl phosphite	121-45-9	$C_3H_9O_3P$			1.1	+		+	8.5	2
Turpentine	Pinenes (85%) + other diisoprenes	8006-64-2	$C_{10}H_{16}$	0.37	+	0.4	+	0.29	+	~8	20
Undecane		1120-21-4	$C_{11}H_{24}$			2				9.56	ne
Varsol see Mineral Spirits											
Vinyl actetate		108-05-4	$C_4H_6O_2$	1.5	+	1.2	+	1.0	+	9.19	10
Vinyl bromide	Bromoethylene	593-60-2	C_2H_3Br			0.4				9.80	5
Vinyl chloride	Chloroethylene, VCM	75-01-4	C_2H_3Cl			2.0	+	0.6	+	9.99	5
Vinyl-1-cyclohexene, 4-	Butadiene dimer, 4-Ethenylcyclohexene	100-40-3	C_8H_{12}	0.6	+	0.56	+			9.83	0.1
Vinylidene chloride see 1,1-Dicholorethene											
Vinyl-2-pyrrolidinone, 1-	NVP, N-vinylpyrrolidone, 1-ethenyl-2-pyrrolidinone	88-12-0	C_6H_9NO	1.0	+	0.8	+	0.9	+		ne
Viscor 120B see Mineral Spirits—Viscor 120B Calibration Fluid											
V. M. & P. Naphtha	Ligroin; Solvent naphtha; Varnish maker's & painter's naphtha	64742-89-8	m.w. 111 (C_8-C_9)	1.7	+	0.97	+				300
Xylene, m-	1,3-Dimethylbenzene	108-38-3	C_8H_{10}	0.50	+	0.44	+	0.40	+	8.56	100
Xylene, o-	1,2-Dimethylbenzene	95-47-6	C_8H_{10}	0.56	+	0.45	+	0.43		8.56	100
Xylene, p-	1,4-Dimethylbenzene	106-42-3	C_8H_{10}	0.48	+	0.39	+	0.38	+	8.44	100

* The term "ionization energy" is more scientifically correct and replaces the old term "ionization potential." High-boiling ("heavy") compounds may not vaporize enough to give a response even when their ionization energies are below the lamp photon energy. Some inorganic compounds like H_2O_2 and NO_2 give weak response even when their ionization energies are well below the lamp photon energy.

** Compounds indicated in green can be detected using a MiniRAE 3000, UltraRAE 3000 or ppbRAE 3000 with slow response, but may be lost by adsorption on a MultiRAE, EntryRAE and AreaRAE. Response on multi-gas meters can give an indication of relative concentrations, but may not be quantitative and for some chemicals no response is observed.

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MATERIAL SAFETY DATA SHEET

Revision Number A96008F
03/04/11

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND THE COMPANY / UNDERTAKING

Product name	YSI 3682 Zobell Solution
Synonyms	None
Chemical characterization	White powder
Manufacturer, importer, supplier	YSI Inc. 1725 Brannum Lane Yellow Springs, OH 45387 USA
EMERGENCY TELEPHONE NUMBER	(937) 767-7241

2. COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Chemical Name	% Weight	ACGIH TWA	Acute Toxicity	IARC*	NTP*	OSHA*
7447-40-7	Potassium chloride	72-78	None	N/A	N/A	N/A	N/A
14459-95-1	Potassium ferrocyanide	10-15			N/A	N/A	N/A
13746-66-2	Potassium ferrocyanide	10-15			N/A	N/A	N/A

* IARC - Group 1 (Carcinogenic to humans)
* NTP - Report on Carcinogens - Known Carcinogens
* OSHA - Regulated Carcinogens

3. HAZARDS IDENTIFICATION

Emergency Overview

- Use all necessary personal protection when handling this material.

Eye Contact	• Contact with eyes may cause irritation • Wear safety glasses with side shields, • In the event of exposure, flush eyes with water for at least 15 minutes. • Remove contacts and continue to flush eyes, including under the eye lids.
Skin Contact	• Exposure can cause skin irritation. • Wash exposed areas with soap and water for at least 15 minutes. • Remove contaminated clothing, laundry before re-using.
Inhalation	• Dust from this product may cause respiratory irritation • Use with adequate ventilation.
Ingestion	• No effects expected from normal use of this product. Ingestion may cause digestive system upset.
General Advice	• Users with skin conditions (eczema, psoriasis, etc) respiratory conditions (asthma, bronchitis, emphysema, etc) or with chemical sensitivities should take protective precautions
Principle Routes of Exposure	Eyes, absorption, ingestion

4. FIRST AID MEASURES

General Advice	• If exposure symptoms persist, seek medical attention.
Skin Contact	• Wash exposed area with soap and plenty of water. • If skin irritation develops, seek medical attention.
Eye Contact	• Immediately flush with plenty of water after initial flushing, remove any contact lenses and continue flushing for at least 15 minutes • Keep eyes wide open while rinsing

	• If eye irritation persists, seek medical attention
Inhalation	• Move to fresh air in case of accidental inhalation • If a person feels unwell or symptoms of respiratory irritation persist, consult a physician
Ingestion	• Do not swallow. Rinse mouth with water and afterwards drink plenty of water. • For ingestion of large amounts induce vomiting if person is conscious. If conditions persist, seek medical attention.
Notes to Physician	• Treat symptomatically
Protection of First-Aiders	• Use necessary personal protective equipment
Aggravated Medical Conditions	• Users with skin conditions, respiratory conditions, or with chemical sensitivities should take protective precautions.

5. FIRE-FIGHTING MEASURES

Flash Point	NA
Suitable Extinguishing Media	• Not applicable to this product
Extinguishing media which must not be used for safety reasons	• Not applicable to this product

Specific Hazards

Special exposure hazards rising from the substance or preparation itself, its combustion products, or released gases	• Material is not combustible. It may emit toxic fumes when heated, such as hydrogen cyanide, and hydrochloric acid.
Special protective equipment for firefighters	• As in any fire, wear self contained breathing apparatus and full protective gear

NFPA (National Fire Protection Association)	Health=3	Reactivity=2	Fire=0	Special=0 (none)
HMIS (Hazardous Material Information System)	Health=3	Reactivity=2	Fire=0	Special=0 (none)

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	• Use necessary personal protective equipment
Environmental precautions	• No information available
Methods for cleaning up	• Sweep up and collect in suitable container for disposal • Avoid formation of dust

7. HANDLING AND STORAGE

Handling

Technical Measures / Precautions	• Use only in areas provided with adequate ventilation
Safe Handling Advice	• Wear personal protective equipment • Avoid contact with skin and eyes. Take necessary personal protective precautions before using this product.

Storage

Technical Measures / Precautions	• Store in a tightly closed container. Store in a cool, dry, well ventilated area away from incompatible substances. • Store in properly labeled container
Incompatible Products	• Avoid strong acids, oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures	• Ensure adequate ventilation, especially in confined areas • Ensure eyewash station is readily available

Personal protective equipment

Hand Protection	• Wear appropriate protective gloves
Eye protection	• Avoid contact with eyes • Wear safety glasses with side-shields or full face shield.
Respiratory Protection	• Ensure adequate ventilation is available before handling any chemical
Skin and Body Protection	• Lightweight protective clothing • Boots • Apron
Hygiene measures	• Handle in accordance with good industrial hygiene and safety practice • Keep away from food, drink and animal feeding material
Environmental exposure controls	• No information available

9. PHYSICAL AND CHEMICAL PROPERTIES

General Information

Form	Powder
Appearance	White
Odor	unknown

Important Health Safety and Environmental Information

pH	No information
Boiling Point / Range	No information
Flash Point	None
Water Solubility	Infinitely soluble
Specific Gravity	No information

10. STABILITY AND REACTIVITY

Stability	• Stable under normal conditions
Materials to Avoid	• Acids, oxidizing agents
Hazardous Decomposition Products	• When heated, possibly nitrogen oxides and hydrogen cyanide
Polymerization	• Polymerization does not occur

11. TOXICOLOGICAL INFORMATION

Local Effects

Skin Irritation	• May cause skin irritation
Eye Irritation	• Dust may cause eye irritation
Inhalation	• Inhalation of dust may cause irritation of respiratory tissue
Ingestion	• Ingestion of large amounts may cause digestive system upset

Specific Effects

Carcinogenic Effects	• No information available
Mutagenic Effects	• No information available
Reproductive Toxicity	• No information available
Target Organ Effects	• No information available

12. ECOLOGICAL INFORMATION

Component information

CAS	Chemical Name	% Weight	ACGIH*
7447-40-7	Potassium chloride	72-78	N/A
14459-95-1	Potassium ferrocyanide	10-15	N/A
13746-66-2	Potassium ferrocyanide	10-15	N/A

* ACGIH - Occupational Exposure Limits - TWA's
* OSHA - PELs

Product Information

Aquatic Toxicity	No information available.

Other Information

Ozone Depletion Potential; ODP; (R-11=1)	No information available.
Global Warming Potential (GWP)	No information available.
Additional Ecological Information	No information available
Mobility	No information available.
Bioaccumulative Potential	No information available.
Ecotoxicity Effects	No information available
Aquatic Toxicity	No information available.

13. DISPOSAL CONSIDERATIONS

Waste From Residues / Unused Products	Dispose of in accordance with local and state regulations
Contaminated Packaging	Empty containers should be rinsed and disposed of as appropriate for glass and plastic containers.

14. TRANSPORT INFORMATION

DOT Not regulated
UN-No
Proper shipping name
Packing group
Subsidiary Risk
Description

15. REGULATORY INFORMATION

U.S. Inventories

CAS	Chemical Name	% Weight	ACGIH*
7447-40-7	Potassium chloride	72-78	N/A
14459-95-1	Potassium ferrocyanide	10-15	N/A
13746-66-2	Potassium ferrocyanide	10-15	N/A

* ACGIH - Occupational Exposure Limits - TWA's

International Inventories

CAS	Chemical Name	% Weight	EUOED*
7447-40-7	Potassium chloride	72-78	N/A
14459-95-1	Potassium ferrocyanide	10-15	N/A
13746-66-2	Potassium ferrocyanide	10-15	N/A

* EUOED - EU Occupational Exposure Directive (98/24/EC) Indicative Occupational Exposure Limit Values (IOELV)

16. OTHER INFORMATION

Literary Reference	None.
Prepared By	YSI, Inc.

End of Safety Data Sheet.

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger