SITE INVESTIGATION REPORT/REMEDIAL INVESTIGATION REPORT/ AND REMEDIAL ACTION WORKPLAN
FOR
FORMER UNIVERSITY MEDICAL CENTER AT PRINCETON
253 WITHERSPOON STREET; PORTION OF BLOCK 21.02, LOT 1
PRINCETON, MERCER COUNTY, NEW JERSEY
SRP PI # 011700, CASE # 15-09-09-1706-55

Prepared for:

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For Submission to:

New Jersey Department of Environmental Protection
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1. INTRODUCTION

EcolSciences, Inc. was retained by Avalon Princeton, LLC to prepare this *Site Investigation Report/Remedial Investigation Report/Initial Remedial Action Workplan* (SIR/RIR/RAW) to address Reworked Site Material (as defined in Section 1.1 below) that was found to contain low concentrations of certain contaminants at the former University Medical Center at Princeton (SRP PI# 011700, Case # 15-09-09-1706-55), 253 Witherspoon Street, Princeton, Mercer County, New Jersey ("Site"), and referenced as Block 21.02, Lot 1. This SIR/RIR/RAW was prepared in accordance with the New Jersey Department of Environmental Protection (NJDEP) *Technical Requirements for Site Remediation (N.J.A.C. 7:26E)* dated July 1, 2013, and applicable NJDEP guidance for the Reworked Site Material Area of Concern ("AOC").

1.1 Summary

The 5.63-acre Site is located at the intersection of Franklin Avenue and Witherspoon Street. Prior to closure of the facility, the Site was improved with a 308-bed acute care hospital operating as the University Medical Center at Princeton ("Hospital"). This facility included four hospital wings and a power plant, with a detached multi-level parking garage north of the Site. In 2014, EcolSciences oversaw the removal and closure of six regulated underground storage tanks (Incident # 14-05-22-1548-10), and an unrestricted use Response Action Outcome was issued for these tanks (six AOCs) on January 19, 2015.

With the exception of a portion of a parking garage that is present on the Site (the remainder of the parking garage is present on a separate lot), the structures at the Site were decommissioned and then demolished in 2014 and 2015. Masonry material (concrete and brick) generated from the former structures and site improvements was crushed and included with other site materials (sub-base beneath foundations, walkways, and roadways, site soils, a limited amount of pavement) for re-use on site ("Reworked Site Materials"). In addition, surplus Reworked Site Materials were stockpiled for offsite disposal.

1.2 General Reporting Requirements (N.J.A.C. 7:26E-1.6)

Avalon Princeton, LLC retained Peter Hansen of EcolSciences, Inc. as the Licensed Site Remediation Professional (LSRP #575775) on September 21, 2015 to evaluate the Reworked Site Material (AOC-1), to propose a remedy, to document the findings of that remediation, and to issue a regulatory approval (i.e. Response Action Outcome) for this AOC. The Case Inventory Document and original NJDEP forms certified by the Person Responsible for Conducting the Remediation and the LSRP that are applicable to this report are attached to the cover letter accompanying this report, with electronic copies included in Attachment A. Forms submitted in this report include the

Cover/Certification form, Preliminary Assessment/Site Investigation form, Remedial Investigation Report form, Remedial Action Workplan form, Receptor Evaluation form, and Alternate Remedy/Remedial Action Pre-Approval form. The job-specific Quality Assurance Project Plan (QAPP) is presented in Attachment B.

All sampling data (with the exception of waste characterization data) collected by EcolSciences has been submitted electronically in a summary table using the format outlined in the Site Remediation Program's "Electronic Data Interchange Manual." Copies of all sampling data and the Electronic Data Submission Application (EDSA) confirmation emails are provided electronically as Attachment C. The EDSA submissions are cataloged in the NJDEP SRP database as HZ171550.

Horizontal data points are reported in New Jersey state plane coordinates using North American Datum of 1983 (NAD 1983); vertical data points are reported as depth below ground surface, and in mean sea level using the North American Vertical Datum of 1988 (NAVD 1988). Locational data points for all samples collected for the remedial investigation are provided in Table 1. A Geographic Information System (GIS)-compatible site plan, including the site boundaries and the location of all areas of concern as polygons, is provided in Figure 2 and on the disc accompanying this report.

1.3 Regulatory Timeframes

Pursuant to N.J.A.C. 7:26C-1.7(b), the NJDEP hotline was called on September 9, 2015, and Case Tracking Number 15-09-09-1706-55 (SRP PI# 011700) was recorded for the site. September 9, 2015 is the applicable date for initiation of remediation pursuant to N.J.A.C. 7:26C-2.2. This date is used as the NJDEP "trigger date" for regulatory and mandatory timeframes.

Pursuant to N.J.A.C. 7:26C-1.7(d), a Confirmed Discharge Notification form is required within 14 days from the trigger date (i.e. September 22, 2015). The Confirmed Discharge Notification was submitted to NJDEP on September 11, 2015.

N.J.A.C. 7:26C-2.3(a)2, requires that a Licensed Site Remediation Professional (LSRP) shall be retained, and notification provided to NJDEP. Peter Hansen (LSRP # 585775) of EcolSciences, Inc. was retained as the LSRP for this AOC. The LSRP Retention Form was submitted to NJDEP on September 21, 2015.

Pursuant to N.J.A.C. 7:26C-4.3(a)3, the initial Annual Remediation Fee and form are required. The initial Annual Remediation Fee information was submitted to NJDEP on September 21, 2015.

Pursuant to N.J.A.C. 7:26E-1.12, an initial receptor evaluation is required with the submission of a Remedial Investigation Report, or no later than one year after the trigger date (i.e. September 8, 2016), with a mandatory reporting date of September 8, 2017 (N.J.A.C. 7:26C-3.3(a)2). The initial receptor evaluation is presented in Section 3.4.

Pursuant to N.J.A.C. 7:26E-4.10(a)3.ii, the submission of a site investigation and remedial investigation report is required within three years of the trigger date (i.e. September 8, 2018), with a mandatory reporting date of September 8, 2020 (N.J.A.C. 7:26C-3.3(a)5). The Site Investigation/Remedial Investigation Report is presented in Section 3.

The submission of this SIR/RIR/RAW in September 2015 complies with the applicable timeframes.

2. SITE DESCRIPTION

The following sections describe the environmental setting of the Site at the time of building demolition. The USGS regional site location and the proposed Site layout/AOC map are presented in Figures 1 and 2, respectively.

2.1 Regional Location

The location of the Site is as follows:

- **County** – Mercer County, New Jersey
- **Street Address, Block & Lot** – The Site, located at 253 Witherspoon Street, is approximately 5.63 acres in size and consists of a portion of Block 21.02, Lot 1. A portion of a parking garage is located on this parcel (with the remainder of the parking garage located on a separate lot); however, the parking garage is not part of the Site addressed in this report.

2.2 Physical Features

The physical features of the Site, including a brief description of the onsite improvements and exterior grounds, are summarized below:

- **Structures** – The Site is currently under construction with footings, foundations, and the majority of sub-grade utilities installed for the future residential buildings.
- **Grounds** – The Site consists of an active construction site.
- **Current Operations** – The Site is currently under construction for a proposed residential development.
- **Topography** – The Site is characterized by gently sloping topography with elevations ranging between approximately 180 feet above Mean Sea Level (MSL) within the southeast corner of the Site to approximately 155 feet MSL in the northwest corner of the Site.

2.3 Environmental Setting

The following environmental evaluation describes both the regional and site-specific environmental conditions of the site. Site topography is defined, regional and site-specific geology and hydrogeology are presented, and regional and site-specific hydrology is discussed.

2.3.1 Topography

The Site is characterized by gently sloping topography with elevations ranging between approximately 180 feet above Mean Sea Level (MSL) within the southeast corner of the Site to approximately 155 feet MSL in the northwest corner of the Site.

2.3.2 Soils

According to the Soil Survey of Mercer County, prepare by the United States Department of Agriculture (Natural Resource Conservation Service: 1972), soils on the Site and across the local region are classified as Ct-Cut and fill land, stratified substratum. Slopes range from 0 to 6 percent. The permeability ranges from moderate to slow, depending on the density of the rock, the slope of the bedding planes, and the degree to which the rock has been shattered. The Site soils consist of zero to seven feet of Reworked Site Material underlain by native material comprised of brown silty sand and some clay.

Review of the NJDEP Bureau of Land Use Management historic fill mapping (Princeton: HFM 78; 2004), shows that the Site is situated within an area that has not been mapped as a historic fill area.

2.3.3 Geology

The Site lies within the Piedmont Physiographic Province of New Jersey, and is underlain by the Passaic Formation of Late Triassic and early Jurassic age. The Passaic Formation consists of red shale with some inter-bedded sandstone. Surficial soils consist largely of silt and clay derived from decomposed bedrock. Groundwater typically occurs under unconfined water table conditions in unconsolidated deposits overlying the bedrock and in the joints and fractures of the late Triassic and early Jurassic Formation. As documented in EcolSciences' *UST Closure/Site Investigation/Remedial Investigation/Remedial Action Report* previously submitted to NJDEP in January 2015 along with an unrestricted use Response Action Outcome for the USTs, groundwater was not encountered in the Fall of 2014 during three monitor well gauging events. The well was an overburden well that extended to bedrock at a depth of twelve feet below ground surface. The monitor well was abandoned on November 26, 2014.

2.3.4 Hydrology

Surface runoff generated within the Site flows overland toward surface catch basins located within onsite parking areas that discharge to the regional storm water drainage system. The regional storm water drainage system discharges southeastward to the Millstone River. The portion of the

Millstone River that drains the Site has been classified by the NJDEP as FW2-NT (non-trout) waters. By definition, FW-2 waters are suitable for public potable water after required treatment. This category requires the water be acceptable for primary contact recreation, industrial and agricultural use, and the maintenance and migration of established biota. Non-trout waters generally do not have characteristics necessary to support trout such as high dissolved oxygen levels in relatively low summer temperatures; however, more tolerant fish species may flourish.

According to New Jersey Freshwater Wetland Maps (NJDEP, 1986), no wetlands are mapped on or immediately adjacent to the Site.

3. SITE INVESTIGATION/REMEDIAL INVESTIGATION REPORT

The details regarding the Site Investigation/Remedial Investigation at the former Site are provided in the following sections. The USGS general site location and a scaled area of concern map are provided in Figures 1 and 2, respectively. This Site Investigation/Remedial Investigation (SI/RI) report is prepared in accordance with N.J.A.C. 7:26E. The SI and RI forms are attached to the cover letter accompanying this report, with electronic copies included in Attachment A.

3.1 Site Investigation Sampling

All structures at the Site were decommissioned and then demolished in 2014 and 2015. Decommissioning activities included the evaluation and appropriate removal of lead, asbestos, light fixtures and ballasts, glass, wiring, lighting (including any fluorescent ballasts), batteries, electronic devices, oil-based finishes, thermostats, switches, thermometers, universal wastes, and other non-masonry materials. As noted in Section 1.1, masonry material (concrete and brick) from the structures and sidewalks was crushed and included in the Reworked Site Materials. A portion of the Reworked Site Material has been placed throughout the property and compacted. The remainder is stockpiled for offsite disposal.

In preparation for disposal the stockpiled Reworked Site Materials were sampled by others for disposal characterization by others, including TCL/TAL+30 analysis. This analysis (Attachment D) indicated minor Residential Direct Contact Soil Remediation Standard (RDCSRS) exceedances of polycyclic aromatic hydrocarbons (PAHs), and one polychlorinated biphenyl (PCB) congener. Accordingly, the remaining Reworked Site Material that was placed on the Site was evaluated as discussed below in Section 3.2.

Subsequent to the Remedial Investigation sampling discussed below, additional sampling was conducted from the surplus stockpiled Reworked Site Material for waste characterization purposes. Fourteen (4) four-point composite samples were collected and analyzed for PAHs, PCBs, and metals. Analysis indicated the presence of RDCSRS exceedances for PAHs; however, there were no detectable concentrations of any PCBs and metals were not present in excess of the RDCSRS. A copy of the additional waste characterization sampling data is presented in Attachment D.

3.2 Remedial Investigation Sampling

EcolSciences conducted a remedial investigation on August 20, 2015 to evaluate the Reworked Site Material (AOC-1) present on the Site. Twenty two (22) test pits were installed across the Site to characterize, delineate, and evaluate the Reworked Site Materials. The sample frequency

utilized provides four test pits/samples per acre. All samples were analyzed for Polycyclic Aromatic Hydrocarbons (PAHs), PCBs, and Target Analyte List (TAL) metals. Based on the sampling of the stockpiled surplus Reworked Site Materials by others, these were the constituents that warranted further analysis. All samples were collected, controlled and analyzed in accordance with the project-specific Quality Assurance Project Plan (QAPP) in Attachment B.

As shown in Figure 3 and Table 1, PCBs were not detected in any sample. A combination of one to five different PAHs (i.e. benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and/or indeno(1,2,3-cd)pyrene) were present above the 2012 NJDEP Residential Direct Contact Soil Remediation Standards (RDCSRS) in sixteen (16) of twenty two samples. Arsenic was present exceeding the RDCSRS in four samples, nickel exceeded RDCSRS in one sample, and vanadium exceeded RDCSRS in two samples. Several PAHs and metals exceeded the 2013 Default Impact to Groundwater Soil Screening Levels (DIGWSSL). The majority of these constituents are immobile compounds. As referenced in Section 2.3.3, an attempted groundwater investigation in 2014 did not identify any overburden groundwater. Hence, multiple lines of evidence (i.e. lack of overburden water and the nature of these constituents) support the conclusion, within the professional judgement of the LSRP, that no further evaluation of the impact to groundwater pathway is warranted.

On September 11, 2015, fourteen additional waste characterization samples (four-point composite) were collected from the surplus stockpile of Reworked Site Material for analysis (PAHs, PCBs, TAL Metals). PAH compounds were identified above RDCSRS in these waste characterization samples. There were no metals present above RDCSRS and there were no detectable concentrations of any PCB congeners in any sample. These waste characterization results are presented in Table 3.

All sampling data (with the exception of waste characterization data) has been submitted electronically in a summary table using the format outlined in the Site Remediation Program's "Electronic Data Interchange Manual." Copies of all sampling data and the Electronic Data Submission Application (EDSA) confirmation emails are provided electronically as Attachment C. The EDSA submission is stored in the NJDEP SRP database under catalogue number HZ171550. Horizontal and vertical locational data are provided in New Jersey state plane coordinates and North American Vertical Datum of 1988 (NAVD 1988), respectively in Table 1.

As shown in the soil test pit logs (Attachment E), the Reworked Site Materials were documented to be found throughout the Site, extending to depths of up to seven feet below ground

surface; native material was observed to underlie the reworked onsite materials at all 22 test pit locations. The Person Responsible to Conduct the Remediation confirmed the visual observation that the Reworked Site Materials have been confined to the fenced limits of the Site (an active construction site). Hence, no further delineation is warranted.

Reworked onsite materials were the only area of concern investigated during this Site/Remedial Investigation—no other media or areas of concern were identified as part of investigating this AOC. There were no seasonal variations noted that may have influenced sampling procedures, analytical results, or field measurements during the Site/Remedial Investigation sampling.

3.3 Reliability of Analytical Data

A Data Quality Assurance review and Data Usability Evaluation was conducted for all Remedial Investigation data packages pursuant to the project-specific QAPP (Attachment B) and in accordance with the NJDEP *Data of Known Quality Protocols Technical Guidance* (April 2014). The Data Quality Assurance review revealed that the laboratory quality control data, reports, and narrative contained no significant non-conformances that would cause qualification or rejection of analytical data. The Data Usability Evaluation determined that the quality of analytical data was sufficient to satisfy the Data Quality Objectives as defined in the QAPP. That is, the laboratory data was found to be representative and of adequate quality to support the decision that the site investigation met the objective of determining the presence/absence of contaminants in the Reworked Site Material. Table 2 provides a summary of the Data Quality Assurance review and the Data Usability Evaluation, and is presented in lieu of the worksheets suggested in the DKQP Guidance.

3.4 Receptor Evaluation and Ecological Evaluation

An Ecological Evaluation was submitted to NJDEP as part of EcolSciences' *UST Closure/Site Investigation/Remedial Investigation/Remedial Action Report* dated January 15, 2015. (A receptor evaluation was not required pursuant to N.J.A.C. 7:26E-1.12(b) since an unrestricted use Response Action Outcome was issued within one year of the earliest applicable trigger to remediate.) A Receptor Evaluation and updated Ecological Evaluation prepared in accordance with N.J.A.C. 7:26E-1.12 and 1.16, respectively, are provided in the following sections. The Receptor Evaluation form is attached to the cover letter accompanying this report, with electronic copies included in Attachment A.

3.4.1 Receptor Evaluation: Land Use

As shown on the figure and table attached to the Receptor Evaluation form (Attachment A), thirty five (35) potential land use receptors were identified within 200 feet of Site. Based on the chemical properties of the contaminants found in the reworked onsite material in the Site (i.e. PAHs, Metals), the fact that the Site is a controlled construction site with proper dust controls and is not open to the public, the presence of perimeter silt fencing and other erosional controls, and the lack of overland erosion observed at the Site, no open contaminant-migration pathways are present at the Site. Therefore, no additional investigation of land use receptors is warranted.

3.4.2 Receptor Evaluation: Groundwater

Contaminants within the reworked onsite materials were demonstrated via EcolSciences' test pit study to be limited to surficial soils, generally not extending more than seven feet below grade. As demonstrated in EcolSciences' *UST Closure/Site Investigation/Remedial Investigation/Remedial Action Report* dated January 15, 2015, overburden groundwater was not encountered in a monitoring well gauged on three separate occasions. The monitoring well was installed onsite to the top of bedrock, which was encountered at an approximate depth of twelve feet below ground. Considering the absence of overburden groundwater onsite, the immobile characteristics of the majority of Site constituents, there is no pathway for contaminant migration to groundwater. Therefore, no further receptor evaluation of groundwater is warranted.

3.4.3 Receptor Evaluation: Ecological

As discussed in EcolSciences' *UST Closure/Site Investigation/Remedial Investigation/Remedial Action Report*, the Site is located in an urban area of Princeton, Mercer County. The properties surrounding the Site are completely developed, and no environmentally sensitive natural resources were observed. Further, according to NJDEP mapping, no freshwater wetlands have been mapped in the immediate vicinity of the Site. As such, no further investigation regarding ecological receptors is warranted.

3.5 Variances from Technical Requirements – Site Investigation

No variances from the Technical Requirements were necessary for Site Remediation as part of this investigation.

3.6 Site Investigation/Remedial Investigation Findings and Conclusions

A Remedial Investigation of Reworked Site Materials throughout the Site identified the presence of PAHs and certain metals at concentrations in excess of the RDCSRS. Constituents above RDCSRS were also identified in the stockpile of surplus crushed masonry material.

Remediation (i.e. removal of the surplus stockpiled material and engineering and institutional controls for the material that was reused on the Site) is warranted. The proposed remedial activities are described in the Remedial Action Workplan presented in Section 4.

4. REMEDIAL ACTION WORKPLAN

The following sections of this *Remedial Action Workplan* (RAW) were prepared following the guidelines set forth in New Jersey Department of Environmental Protection (NJDEP) *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E-5.5) applicable NJDEP guidance and present the procedures for remediating the Reworked Site Material (AOC-1). The requisite NJDEP remedial action workplan form is attached to the cover letter accompanying this report, with an electronic copy included in Attachment A. The following presents a summary of the overall remedial strategy, the proposed engineering control details, the proposed institutional controls, and the remedial procedures that will be followed for the Site.

4.1 Overall Remedial Strategy

As discussed above, a Remedial Investigation (RI) of Reworked Site Materials throughout the Site identified the presence of PAHs and certain metals at concentrations in excess of the RDCSRS. The RI demonstrated that the Reworked Site Material is present on the Site at depths ranging to seven feet below ground. Surplus stockpiled Reworked Site Material will be removed for offsite disposal. The remedial action consists of the installation of engineering controls and the establishment of institutional controls in accordance with the NJDEP Presumptive and Alternative Remedy Technical Guidance (August 2013) for the existing Reworked Site Material. The Site is an active construction site with the majority of the subgrade Site utilities within the Reworked Site Materials already installed. Accordingly, this RAW includes an Alternative Remedy Approval request for the Clean Utility Corridor presumptive remedy specifications. As discussed in Section 4.4.2 below, the proposed Alternative Remedy for the utility corridor included herein is equally protective over time as the Presumptive Remedy. All other components of the proposed engineering controls conform to the respective Presumptive Remedy specifications.

4.2 Disposal of Surplus Reworked Site Material

Surplus onsite reworked material will be characterized and removed for offsite disposal at a permitted disposal facility. Fully executed manifests or bills of lading documenting off-site transport of surplus material will be maintained and included in the Remedial Action Report.

4.3 Proposed Engineering Controls (conforming to Presumptive Remedy Specifications)

Engineering controls will be implemented as the remedial action at the Site in the form of various site improvements: Building Slab, Concrete Walkway, Asphalt Paving, Vegetative Cover, Landscaping, Playground, and Dog Walk. These capping elements will be constructed as per N.J.A.C. 7:26E-5.3 and the NJDEP Site Remediation Program Presumptive and Alternate Remedy

Guidance (August 2013). A description of the elements of these engineering controls is provided below.

- **Building Slab (New Construction)** – The buildings being constructed will form a portion of the engineering controls. The Building Slab cap will consist of four inches (minimum) of concrete atop a four inch (minimum) layer of sub base (washed crushed stone or DGA from a certified quarry), atop the Reworked Site Material. The transition from the stone layer to the Reworked Site Material will constitute the visual contamination boundary. The monitoring requirement (to be prescribed in the Deed Notice and Remedial Action Permit for the Site) will include annual inspections to support the long term effectiveness of the Building Slab capping element. The proposed Building Slab specification is consistent with the NJDEP's Presumptive Remedy requirements and guidance. The proposed location and cross-sectional detail of the Building Slab capping element is provided in Figures 4 and 5, respectively.

- **Concrete Walkway Areas** – Site amenities will include concrete sidewalks, walkways, patios, terraces, and other surfaces. The Concrete Walkway Areas capping element will consist of a minimum of four inches of concrete material atop a four-inch (minimum) layer of sub base (washed crushed stone or DGA from a certified quarry), atop the Reworked Site Material. The transition from the stone layer to the Reworked Site Material will constitute the visual contamination boundary. The Concrete Walkway Areas will included a variety of surficial materials including but not limited to stamped concrete, concrete pavers and/or bricks. The manufactured thickness of certain pavers may not be four inches thick; however, the pavers will be underlain by poured concrete, and crushed stone or DGA. In all areas, there will be a total barrier and buffer thickness of at least eight inches. The monitoring requirement (to be prescribed in the Deed Notice and Remedial Action Permit for the Site) will include annual inspections to support the long term effectiveness of the Concrete Walkway Areas capping element. The proposed Building Slab specification is consistent with the NJDEP's Presumptive Remedy requirements and guidance. The proposed location and cross-sectional detail of the Concrete Walkways capping element is provided in Figures 4 and 5, respectively.

- **Asphalt-Paved Areas** – Onsite roadways will comprise the Asphalt-Paved Areas capping element, which will consist of four inches (minimum) of asphalt atop a four-inch (minimum) layer of sub base (washed crushed stone or DGA from a certified quarry), atop the Reworked Site Material. The transition from the crushed stone layer to the Reworked Site Material will constitute the visual contamination boundary. The monitoring requirement (to be prescribed in the Deed Notice and Remedial Action Permit for the

Site) will include annual inspections to support the long term effectiveness of the Asphalt-Paved Areas capping element. The proposed Asphalt-Paved Areas specification is consistent with the NJDEP's Presumptive Remedy requirements and guidance. The proposed location and cross-sectional detail of the Asphalt-Paved Areas capping element is provided in Figures 4 and 5, respectively.

- **Vegetative Cover Areas** – The onsite lawn areas will comprise the Vegetative Cover Areas capping element, which will consist of the following elements beneath the a vegetative cover (e.g. grass): twelve inches (minimum) of clean fill (e.g. topsoil and certified clean fill) atop a geotextile fabric (Mirafi 140N or equivalent), atop the Reworked Site Material. The clean fill will be evaluated in accordance with the NJDEP Fill Material Guidance for SRP Sites. The geotextile fabric will constitute the visual contamination boundary. The monitoring requirement (to be prescribed in the Deed Notice and Remedial Action Permit for the Site) will include semi-annual inspections to support the long term effectiveness of the Vegetative Cover Areas capping element. The proposed Vegetative Cover Areas specification is consistent with the NJDEP's Presumptive Remedy requirements and guidance. The proposed location and cross-sectional detail of the Vegetative Cover Areas capping element is provided in Figures 4 and 5, respectively.

- **Landscaped Areas** – Onsite areas that are landscaped with plantings or mulch will comprise the Landscaped Areas capping element, which will consist of twenty four inches (minimum) of clean fill (e.g. topsoil, clean fill), atop a geotextile fabric (Mirafi 140N or equivalent), atop the Reworked Site Material. The clean fill will be evaluated in accordance with the NJDEP Fill Material Guidance for SRP Sites. The geotextile fabric will constitute the visual contamination boundary. If trees or shrubs are to be planted within this capping element, a minimum 12-inch buffer of clean fill must be maintained on all lateral sides and below the extent of the planted root ball. The monitoring requirement (to be prescribed in the Deed Notice and Remedial Action Permit for the Site) will include semi-annual inspections to support the long term effectiveness of the Landscaped Areas capping element. The proposed Landscaped Areas specification is consistent with the NJDEP's Presumptive Remedy requirements and guidance. The proposed location and cross-sectional detail of the Landscaped Areas capping element is provided in Figures 4 and 5, respectively.

- **Playground Area** – A playground area will be constructed in the southwest portion of the site. The Playground Area capping element will consist of a surface of unitary surface material (e.g. a 0.5-inch thick poured-in-place EPDM granular wearing material or similar material) atop a 3.5-inch shredded rubber base course, atop a filter fabric, underlain by a twelve-inch

(minimum) layer of sub base (washed crushed stone or DGA from a certified quarry). The sub base will be underlain by a geotextile fabric (Mirafi 140N or equivalent). The geotextile fabric will constitute the visual contamination boundary between the engineering control and the underlying Reworked Site Material. The monitoring requirement (to be prescribed in the Deed Notice and Remedial Action Permit for the Site) will include annual inspections to support the long term effectiveness of the Playground Area capping element. The proposed Playground Area specification is consistent with the NJDEP's Presumptive Remedy requirements and guidance. The proposed location and cross-sectional detail of the Playground Area capping element is provided in Figures 4 and 5, respectively.

- **Dog Walk Area** – A dog walk area will be constructed in the southeastern portion of the site. The Dog Walk Area capping element will consist of a synthetic turf designed for dog parks (e.g. K9 Grass Classic, or equivalent) underlain by a twelve-inch (minimum) layer of sub base (washed crushed stone from a certified quarry), and a geotextile fabric (Mirafi 140N or equivalent). The geotextile fabric will constitute the visual contamination boundary between the engineering control and the underlying Reworked Site Material. The monitoring requirement (to be prescribed in the Deed Notice and Remedial Action Permit for the Site) will include annual inspections to support the long term effectiveness of the Dog Walk Area capping element. The proposed Dog Walk Area specification is consistent with the NJDEP's Presumptive Remedy requirements and guidance. The proposed location and cross-sectional detail of the Dog Walk Area capping element is provided in Figures 4 and 5, respectively.

4.4 Proposed Alternate Remedy (Engineering Controls)

The engineering control in only the underground utility corridors is proposed to be different from the NJDEP Site Remediation Program Presumptive and Alternate Remedy Guidance (August 2013). Pursuant to NJAC 7:26e-5.3(c)2, NJDEP written approval is required prior to the implementation of an alternate remedy. Accordingly, an Alternate Remedy/Remedial Action Pre-Approval form has been included in this submission and timely NJDEP approval of the following specification is requested. Upon issuance of the Alternate Remedy Approval by the NJDEP, the RAW will be updated to reflect this Approval, and a revised RAW will be submitted to NJDEP. A description of the alternate remedy is as follows:

- **Underground Utility Corridors** – All onsite underground utility corridors are assumed to have been constructed using Reworked Site Materials which may contain PAHs and metals above RDCSRS. The surficial engineering controls described in Section 4.3 above will be present above all utility corridors. Because the Site will be a rental community (i.e. Type II

Residential) under the oversight and control of the property owner (i.e. Avalon Princeton, LLC), no disruption of any underground utilities can occur without the property owner's knowledge and approval. In addition, prior to any future disruption of an underground utility for repairs, the repair contractor will also need to obtain pre-approval of the disruption from the LSRP or his designee. The disruption will occur under the oversight of the LSRP (or designee) in accordance with all applicable regulations. Any material removed from the utility corridor during a repair will be replaced within the corridor after a disruption or properly disposed of offsite, with the surficial engineering control(s) repaired to pre-existing conditions. In addition, the areas of the Site where underground utilities are located will be inspected on a semi-annual basis.

It is the professional judgment of the LSRP that the alternative presumptive remedy for the utility corridors is equally protective over time as the presumptive remedy.

4.4.1 Impractical Due to Conditions at the Site

The Presumptive Remedy for Utility Corridors is impractical because the majority of underground utilities have already been installed within the Reworked Site Material prior to the discovery of contaminants above the RDCSRS. Use of the default Presumptive Remedy for Utility Corridors would require excavation of all areas where utilities have been installed. Undermining and/or disrupting the existing utilities may cause negative effects on the integrity of these subsurface utilities resulting in future maintenance issues. In addition, it may not be possible to remove all Reworked Site Materials from around the installed utilities particularly given the depth of some of the installed utilities. Further, since the utility corridors will all be beneath the engineering controls described in Section 4.3, the presence of Reworked Site Materials in the sub-surface utility corridors remains protective of human health and the environment.

The NJDEP Presumptive and Alternative Remedy Guidance includes a list of potential site-specific factors that may be considered in determining if a Presumptive Remedy is impractical. Among these potential site-specific conditions is the following circumstance that applies to the Site.

- The remedy will require excavation near or beneath structures (either onsite or on adjacent sites) that would jeopardize the stability or integrity of such structures.

As discussed herein, the majority of Site utilities are already installed onsite. In addition, a series of footings and portions of the proposed building foundations are already in place. Providing clean utility corridors may jeopardize these site improvements.

4.4.2 Equally Protective Over Time

It is the LSRP's professional judgement that implementation of the Alternate Remedy will be equally protective of human health and the environment over time when compared to a Presumptive Remedy. The proposed development is Type II residential housing (i.e. rental) under full control of the property owner/Person Responsible for Conducting the Remediation. The property owner/Person Responsible for Conducting the Remediation will ensure that, prior to any disruption of any underground utility corridor, the LSRP or his designee is notified of the proposed disruption so that the disruption is conducted in a manner that is protective of human health and safety and the environment. Furthermore, these procedures will be memorialized in the Deed Notice for the Site.

As a means to document and ensure that the alternate remedy (i.e. engineering control) will remain equally protective over time, areas of the site where subsurface utilities are located will be inspected on a semi-annual basis. This inspection frequency is more rigorous than the frequency prescribed for presumptive remedies for underground utility corridors (i.e. annual).

4.5 Installation of Engineering Controls

Installation of the engineering controls described above will be conducted to ensure: 1) the control of the sub-grade preparation prior to installation of the elements of the engineering control; 2) installation of the geotextile fabric to allow for overlapping/sealing of the fabric seams; and 3) placement and compaction of capping buffers and barriers (e.g. clean fill, crushed stone, asphalt, concrete, etc.) in a manner consistent with N.J.A.C. 7:26E Table 5.1. A brief description of each step is as follows:

- **Sub-grade Preparation** – Prior to capping, the surface layer of the contaminated fill material will be re-graded if necessary and areas requiring removal of soil per site engineering constraints will be excavated and the soils transferred to areas where excess soil can be used onsite below the engineering control. In the event excess reworked onsite material is generated, this material will be disposed of along with the already stockpiled Reworked Site Material (Section 4.2). The area to be capped will be cleared of any standing vegetation, frozen materials (if applicable), and debris which might negatively impact the integrity of the engineering control.

- **Filter Fabric Installation** – A permeable geotextile fabric (Mirafi 140N or an equivalent) will be used as a visual contamination boundary marker in the Landscaped Areas, Vegetative Cover Areas, Playground Area and Dog Walk Area. The fabric will be placed in accordance with manufacturer's specifications. After a roll or panel of the filter fabric is initially positioned,

the fabric will be shifted for optimal positioning as per design specifications. Quality control of the filter fabric seams will be monitored to ensure that the fabric is sufficiently overlapped. Once in place, the filter fabric liner will be secured to prevent movement during the installation of the soil.

- **Soil Cap Installation** – Once the geotextile fabric is positioned, the buffer and barrier layers will be installed in accordance with the specifications set forth in N.J.A.C. 7:26E-Table 5.1 and as described in Section 4.3. A sufficient volume of certified clean soil will be incorporated into the capping such that upon settling, the final depth of the barrier and buffer layers will be in accordance with N.J.A.C. 7:26E-Table 5.1.

- **Certification of the Installed Cap** – The final cap will be surveyed by a licensed surveyor and the as-built site plan will become a component of the Deed Notice for the Site.

- **Source Materials for Capping** – The Vegetative Cover and Landscaped Area capping elements will consist of certified clean soil materials evaluated in accordance with the NJDEP Fill Material Guidance for SRP Sites. Capping elements requiring clean stone or quarry product will receive written certification that the material originated from a licensed quarry/mine, and that the material has not been subject to discharged hazardous substances. Material not originating from a licensed quarry/mine will be evaluated in accordance with Section 6 of the Fill Material Guidance.

4.6 Fill Use Plan

Clean fill to be imported as final cover to the Site will comply with the NJDEP Fill Material Guidance for SRP Sites to document that the material is clean in accordance with NJDEP regulations and guidance. At the time of this submission, a clean fill source has not been identified, and the volume of clean fill required to complete the remediation has not been determined. Bills of lading for the clean fill will be maintained and included in the remedial action report.

Surplus onsite reworked material will be removed from the Site in accordance with the procedures described in Section 4.2

4.7 Soil/Sediment Erosion Control and Monitoring

All grading, site disturbances, and capping activities will comply with the Soil Erosion and Sediment Control Plan approved by the local Soil Conservation District.

4.8 Dust Control and Monitoring

During the implementation of this Remedial Action Workplan, the exposed Reworked Site Material will be kept wet (as needed) to minimize the potential for fugitive dust. If street sweeping is needed, wet street-sweeping techniques will be used. Stockpiled surplus Reworked Site Material will be kept wet (as needed) to minimize fugitive dust within acceptable limits, and covered and secured with 6-mil plastic.

Fugitive dust emissions will be monitored pursuant to NJAC 7:26E-5.5(b)7 during earthwork activities using Real-Time Aerosol Monitors. The applicable Permissible Exposure Limits (PELs) or Threshold Limit Values (TLVs) for the contaminants is 150 $\mu g/m^3$ time-weighted average (TWA) in ambient air. If monitoring indicates exceedances of this TWA level, construction activities will be temporarily suspended until dust emissions are reduced to within acceptable limits. Dust control measures will consist of either covering or wetting the Reworked Site Material with water to reduce fugitive dust.

4.9 Deed Notice

The Deed Notice will include a summary of the constituents present above the NJDEP RDCSRS at the Site. The Deed Notice will also memorialize the engineering controls "as-built" on the Site, and identify procedures to be followed in the event future maintenance or construction would penetrate the cap. Upon completion of remedial activities at the Site, the Deed Notice will be filed in the Mercer County Clerk's office and a Remedial Action Permit for Soil (RAP) obtained from the NJDEP.

4.9.1 Long Term Monitoring and Maintenance

Long-term monitoring and maintenance requirements will be set forth in the Deed Notice and RAP and will be conducted under LSRP oversight. As part of the routine monitoring procedures, Semi-Annual Monitoring Reports will be prepared by the LSRP or his designee.

4.9.2 Inspection Schedule

Periodic monitoring and maintenance will be implemented to ensure the integrity of the capped areas. As discussed in Section 4.3 for the presumptive remedy and Section 4.4 for the Alternative Remedy, annual inspections and semi-annual inspections are proposed to ensure the continued protectiveness of the engineering controls as detailed above. Any breaches in the integrity of the cap identified during routine inspections will be repaired accordingly.

4.9.3 Biennial Certification

Biennial certifications will be completed under LSRP oversight and submitted to the NJDEP in accordance with the terms of the RAP. The purpose of the biennial certification is to document to the NJDEP that the engineering and institutional controls are being properly maintained and continue to be protective of public health and safety and of the environment. The Biennial certifications will include the Monitoring Reports (Section 4.9.1) and the Remedial Action Protectiveness/Biennial Certification Form-Soil. The Biennial Certification will be submitted to the NJDEP with copies to all entities required pursuant to NJAC 7:26C-7. The NJDEP shall also be provided with the name and address of each person that was sent a copy of the certification.

4.10 Permits

Pursuant to NJAC 7:26E-5.5(b)8, the following permits are required to complete the remediation:

- **Remedial Action Permit-Soil**: A Remedial Action Permit Application-Soil (RAP) will be included in the Remedial Action Report. Issuance of the Response Action Outcome (RAO) will not occur until the RAP has been issued, any required financial assurance posted and all appropriate Annual Remediation Fees have been paid.

4.11 Submission of Remedial Action Report

Upon completion of remediation at the Site, a *Remedial Action Report* (RAR) will be prepared including the filed Deed Notice and a Remedial Action Permit-Soil application. The RAR and RAP application will be certified by the LSRP and submitted to the NJDEP.

Upon receipt of the RAP from the NJDEP, an area of concern restricted use Response Action Outcome will be issue by EcolSciences' LSRP.

4.12 Schedule

The installation of the engineering controls will occur simultaneous to construction. Construction is scheduled to be complete by the end of 2016. Final reporting will occur within six months of completing the capping activities.

SIR/RIR/RAW FIGURES

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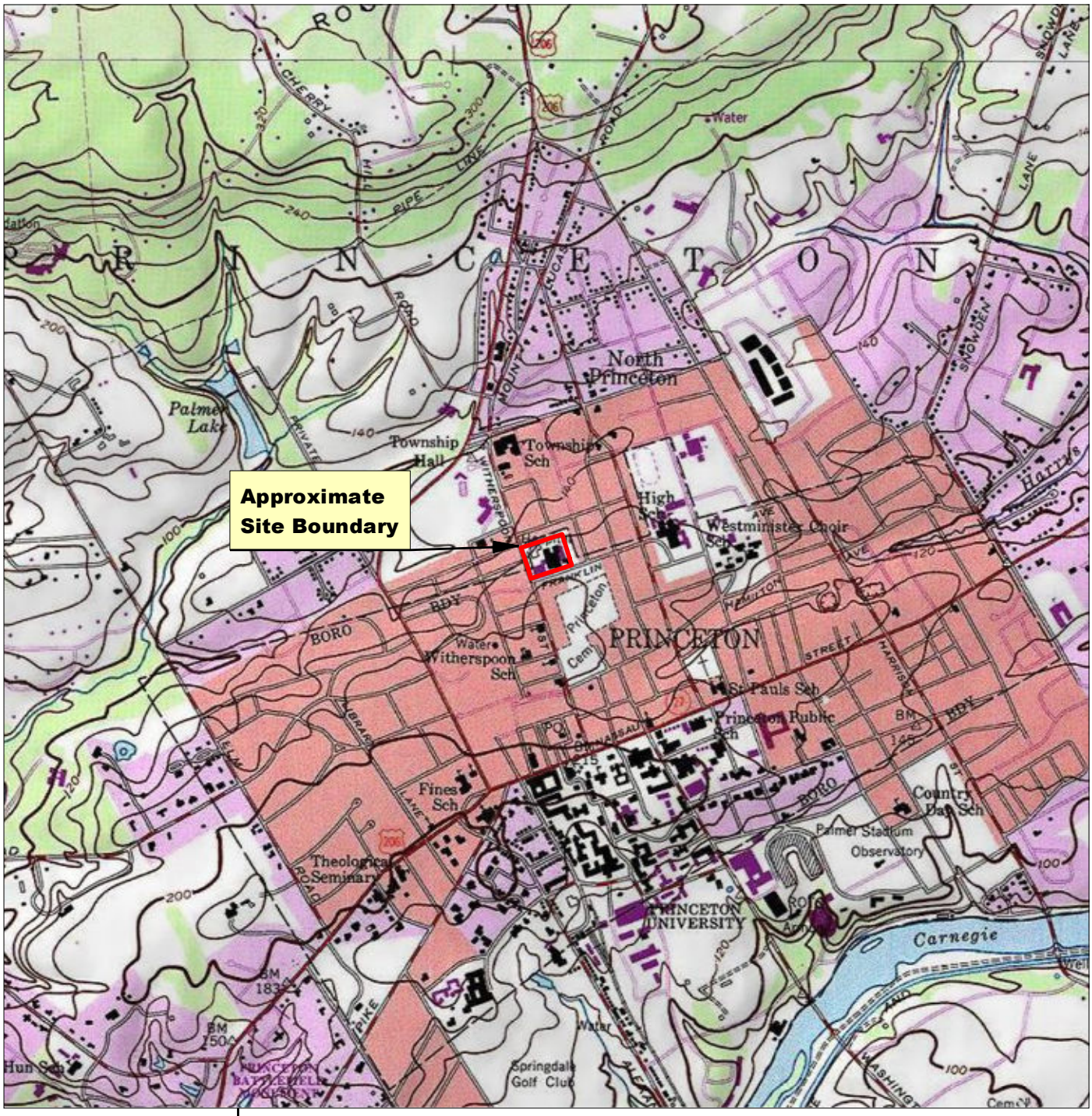
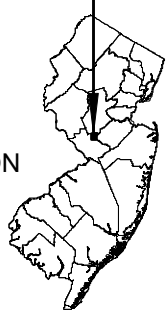
Environmental Management & Regulatory Compliance



SITE LOCATION



State Plane Coordinates (New Jersey NAD 83)
447,073' E; 554,940' N

N

FIGURE 1: USGS SITE LOCATION

Former University Medical Center @ Princeton
Block 21.02, Lot 1
Princeton, Mercer County, New Jersey
SRP PI# 011700

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Date: September 2015

Scale 1:24,000

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HENRY AVENUE
50' WIDE R.O.W. PER TAX MAP

BLOCK 7101
LOT 15

EXISTING 3-STORY MASONRY BUILDING

EXISTING 2-STORY MASONRY BUILDING

BLOCK 7101
LOT 14

EXISTING 3-STORY MASONRY PARKING GARAGE

BLOCK 7101
LOT 13

BLOCK 7101
LOT 12

BLOCK 710
LOT 10

BLOCK 7101
LOT 9

FORMER PRINCETON TOWNSHIP

FORMER PRINCETON BOROUGH

ALBERT WAY

PROPOSED 2 TO 5-STORY
RESIDENTIAL BUILDING #2

PROPOSED 5-STORY
RESIDENTIAL BUILDING #1

POOL

ABOVE GROUND OXYGEN TANK STORAGE AREA (INACCESSIBLE)

WITHERSPOON STREET
66' WIDE R.O.W. PER TAX MAP

FORMER PRINCETON TOWNSHIP

FORMER PRINCETON BOROUGH

LOADING AREA

ALBERT WAY

PAULINE DRIVE

FORMER PRINCETON BOROUGH

FORMER PRINCETON TOWNSHIP

BLOCK 7101
LOT 6

BLOCK 7101
LOT 5

BLOCK 7101
LOT 4

BLOCK 7101
LOT 3

BLOCK 7101
LOT 2

BLOCK 21.02
LOT 22

BLOCK 21.02
LOT 25

ELSA LANE

BUILDING #3
3-4 STORY

BUILDING #4
3-4 STORY

BUILDING #5
3-4 STORY

FRANKLIN AVENUE
60' WIDE R.O.W. PER TAX MAP

N

LEGEND

PROPERTY BOUNDARY

AOC-1

0' 30' 60'
1" = 30'

SOURCE: MASER CONSULTING, P.A., SHEET 5 OF 14, "DIMENSION PLAN", DATED 5/15/13.

TITLE:

FIGURE 2: PROPOSED SITE LAYOUT/AOC MAP

MEDICAL CENTER @ PRINCETON
BLOCK 21.01, LOT 1
253 WITHERSPOON STREET
PRINCETON, MERCER COUNTY, NEW JERSEY
SRP PI# 01170

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

DRAWN BY:	DESIGNED BY:	APPROVED BY:	PLATE NUMBER:
AG	TR	TR	2
DATE: 9/10/15	SCALE: AS SHOWN	PROJECT NO.: XXXXX	

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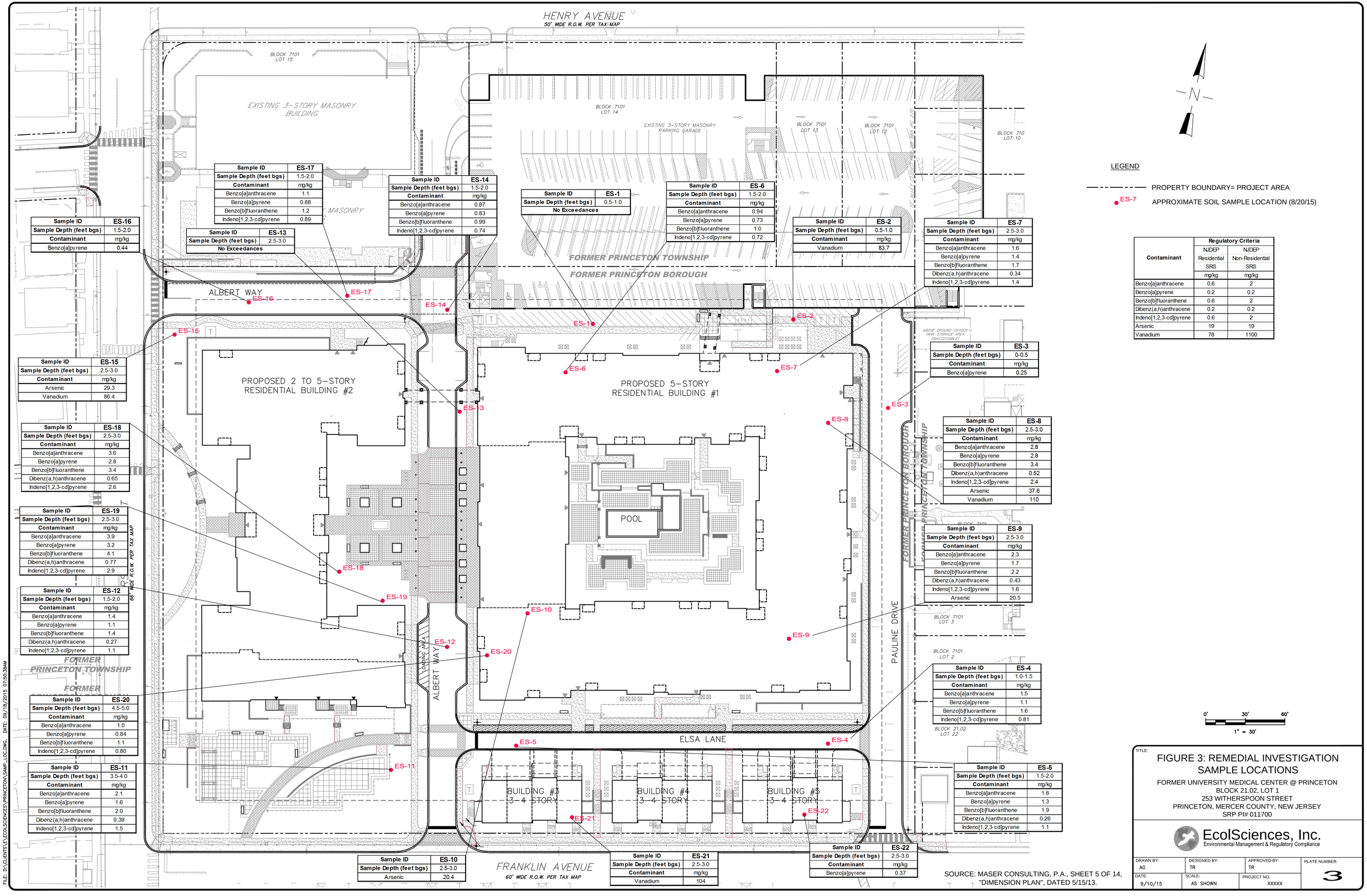

Sample ID	ES-16
Sample Depth (feet bgs)	1.5-2.0
Contaminant	mg/kg
Benzo[a]pyrene	0.44

Sample ID	ES-17
Sample Depth (feet bgs)	1.5-2.0
Contaminant	mg/kg
Benzo[a]anthracene	1.1
Benzo[a]pyrene	0.88
Benzo[b]fluoranthene	1.2
Indeno[1,2,3-cd]pyrene	0.89

Sample ID	ES-13
Sample Depth (feet bgs)	2.5-3.0
No Exceedances	

Sample ID	ES-14
Sample Depth (feet bgs)	1.5-2.0
Contaminant	mg/kg
Benzo[a]anthracene	0.87
Benzo[a]pyrene	0.83
Benzo[b]fluoranthene	0.99
Indeno[1,2,3-cd]pyrene	0.74

Sample ID	ES-1
Sample Depth (feet bgs)	0.5-1.0
No Exceedances	

Sample ID	ES-6
Sample Depth (feet bgs)	1.5-2.0
Contaminant	mg/kg
Benzo[a]anthracene	0.94
Benzo[a]pyrene	0.73
Benzo[b]fluoranthene	1.0
Indeno[1,2,3-cd]pyrene	0.72

Sample ID	ES-2
Sample Depth (feet bgs)	0.5-1.0
Contaminant	mg/kg
Vanadium	83.7

Sample ID	ES-7
Sample Depth (feet bgs)	2.5-3.0
Contaminant	mg/kg
Benzo[a]anthracene	1.6
Benzo[a]pyrene	1.4
Benzo[b]fluoranthene	1.7
Dibenz(a,h)anthracene	0.34
Indeno[1,2,3-cd]pyrene	1.4

Sample ID	ES-3
Sample Depth (feet bgs)	0-0.5
Contaminant	mg/kg
Benzo[a]pyrene	0.25

Sample ID	ES-8
Sample Depth (feet bgs)	2.5-3.0
Contaminant	mg/kg
Benzo[a]anthracene	2.8
Benzo[a]pyrene	2.8
Benzo[b]fluoranthene	3.4
Dibenz(a,h)anthracene	0.52
Indeno[1,2,3-cd]pyrene	2.4
Arsenic	37.6
Vanadium	110

Sample ID	ES-9
Sample Depth (feet bgs)	2.5-3.0
Contaminant	mg/kg
Benzo[a]anthracene	2.3
Benzo[a]pyrene	1.7
Benzo[b]fluoranthene	2.2
Dibenz(a,h)anthracene	0.43
Indeno[1,2,3-cd]pyrene	1.6
Arsenic	20.5

Sample ID	ES-4
Sample Depth (feet bgs)	1.0-1.5
Contaminant	mg/kg
Benzo[a]anthracene	1.5
Benzo[a]pyrene	1.1
Benzo[b]fluoranthene	1.6
Indeno[1,2,3-cd]pyrene	0.81

Sample ID	ES-5
Sample Depth (feet bgs)	1.5-2.0
Contaminant	mg/kg
Benzo[a]anthracene	1.8
Benzo[a]pyrene	1.3
Benzo[b]fluoranthene	1.9
Dibenz(a,h)anthracene	0.26
Indeno[1,2,3-cd]pyrene	1.1

Sample ID	ES-15
Sample Depth (feet bgs)	2.5-3.0
Contaminant	mg/kg
Arsenic	29.3
Vanadium	86.4

Sample ID	ES-18
Sample Depth (feet bgs)	2.5-3.0
Contaminant	mg/kg
Benzo[a]anthracene	3.6
Benzo[a]pyrene	2.8
Benzo[b]fluoranthene	3.4
Dibenz(a,h)anthracene	0.65
Indeno[1,2,3-cd]pyrene	2.6

Sample ID	ES-19
Sample Depth (feet bgs)	2.5-3.0
Contaminant	mg/kg
Benzo[a]anthracene	3.9
Benzo[a]pyrene	3.2
Benzo[b]fluoranthene	4.1
Dibenz(a,h)anthracene	0.77
Indeno[1,2,3-cd]pyrene	2.9

Sample ID	ES-12
Sample Depth (feet bgs)	1.5-2.0
Contaminant	mg/kg
Benzo[a]anthracene	1.4
Benzo[a]pyrene	1.1
Benzo[b]fluoranthene	1.4
Dibenz(a,h)anthracene	0.27
Indeno[1,2,3-cd]pyrene	1.1

Sample ID	ES-20
Sample Depth (feet bgs)	4.5-5.0
Contaminant	mg/kg
Benzo[a]anthracene	1.0
Benzo[a]pyrene	0.84
Benzo[b]fluoranthene	1.1
Indeno[1,2,3-cd]pyrene	0.80

Sample ID	ES-11
Sample Depth (feet bgs)	3.5-4.0
Contaminant	mg/kg
Benzo[a]anthracene	2.1
Benzo[a]pyrene	1.6
Benzo[b]fluoranthene	2.0
Dibenz(a,h)anthracene	0.39
Indeno[1,2,3-cd]pyrene	1.5

Sample ID	ES-10
Sample Depth (feet bgs)	2.5-3.0
Arsenic	20.4

Sample ID	ES-21
Sample Depth (feet bgs)	2.5-3.0
Contaminant	mg/kg
Vanadium	104

Sample ID	ES-22
Sample Depth (feet bgs)	2.5-3.0
Contaminant	mg/kg
Benzo[a]pyrene	0.37

LEGEND

PROPERTY BOUNDARY= PROJECT AREA

ES-7 APPROXIMATE SOIL SAMPLE LOCATION (8/20/15)

Contaminant	Regulatory Criteria	
	NJDEP Residential SRS	NJDEP Non-Residential SRS
	mg/kg	mg/kg
Benzo[a]anthracene	0.6	2
Benzo[a]pyrene	0.2	0.2
Benzo[b]fluoranthene	0.6	2
Dibenz(a,h)anthracene	0.2	0.2
Indeno[1,2,3-cd]pyrene	0.6	2
Arsenic	19	19
Vanadium	78	1100

0' 30' 60'

1" = 30'

SOURCE: MASER CONSULTING, P.A., SHEET 5 OF 14, "DIMENSION PLAN", DATED 5/15/13.

TITLE:

FIGURE 3: REMEDIAL INVESTIGATION SAMPLE LOCATIONS

FORMER UNIVERSITY MEDICAL CENTER @ PRINCETON
BLOCK 21.02, LOT 1
253 WITHERSPOON STREET
PRINCETON, MERCER COUNTY, NEW JERSEY
SRP PI# 011700

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

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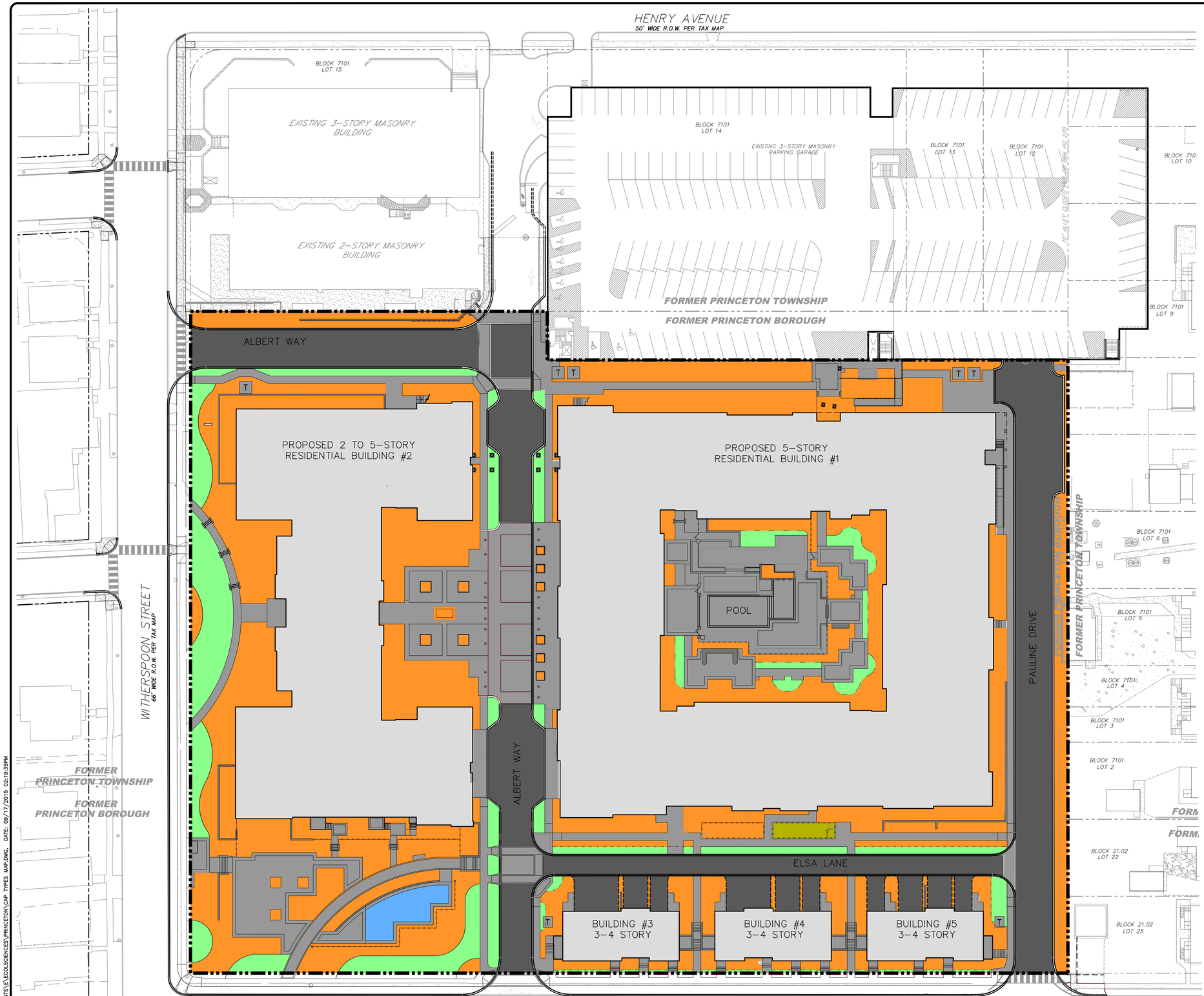

SOURCE: MASER CONSULTING, P.A., SHEET 5 OF 14, "DIMENSION PLAN", DATED 5/15/13.

TITLE:

FIGURE 4: PROPOSED CAPPING PLAN

FORMER UNIVERSITY MEDICAL CENTER @ PRINCETON
BLOCK 21.02, LOT 1
253 WITHERSPOON STREET
PRINCETON, MERCER COUNTY, NEW JERSEY
SRP PI# 011700

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Environmental Management & Regulatory Compliance

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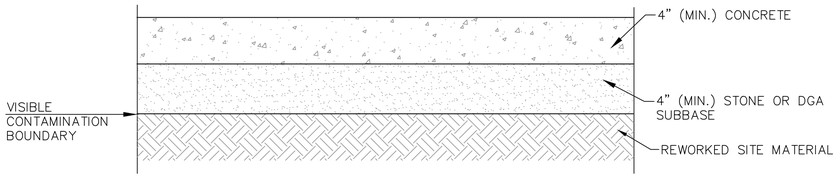
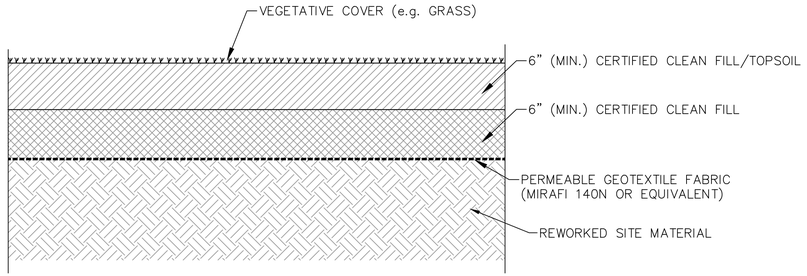


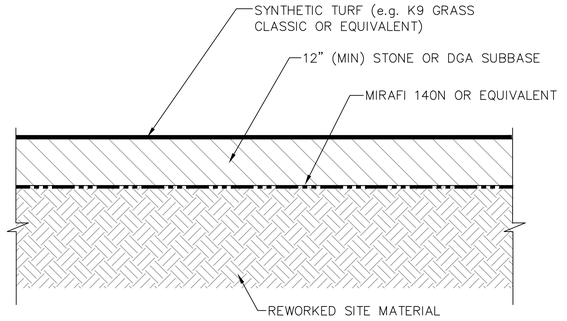
PROPOSED BUILDING SLAB CAP

N.T.S.



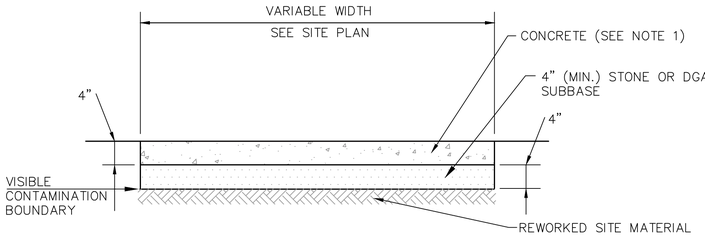
PROPOSED VEGETATIVE COVER AREAS CAP

N.T.S.



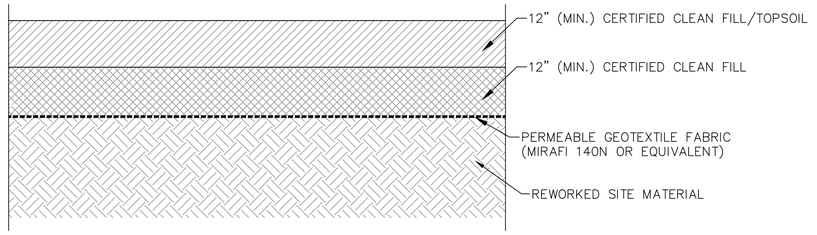
PROPOSED DOG RUN AREA CAP

N.T.S.



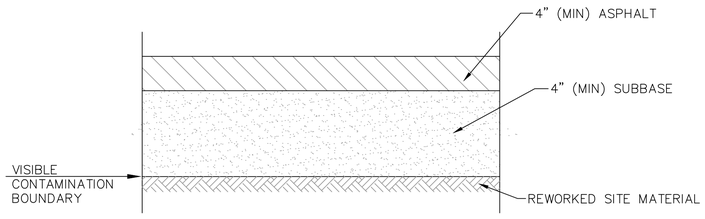
PROPOSED CONCRETE WALKWAY AREAS CAP

N.T.S.



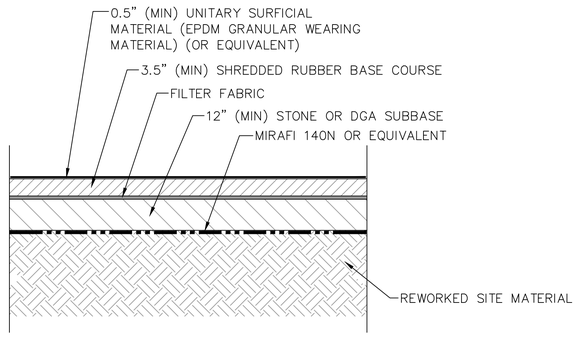
PROPOSED LANDSCAPED AREAS CAP

N.T.S.



PROPOSED ASPHALT-PAVED AREAS CAP

N.T.S.



PROPOSED PLAYGROUND AREA CAP

N.T.S.

NOTE 1: THE CONCRETE WALKWAY AREAS WILL INCLUDE A VARIETY OF SURFICIAL MATERIALS INCLUDING BUT NOT LIMITED TO STAMPED CONCRETE, CONCRETE PAVERS AND/OR BRICKS. THE MANUFACTURED THICKNESS OF CERTAIN PAVERS MAY NOT BE FOUR INCHES THICK; HOWEVER, THE PAVERS WILL BE UNDERLAIN BY POURED CONCRETE, AND THE CRUSHED STONE OR DGA SUB BASE.

TITLE:

FIGURE 5: PROPOSED CAPPING ELEMENT DETAIL

FORMER UNIVERSITY MEDICAL CENTER @ PRINCETON
BLOCK 21.02, LOT 1
253 WITHERSPOON STREET
PRINCETON, MERCER COUNTY, NEW JERSEY
SRP PI# 011700

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

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SIR/RIR/RAW TABLES

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Table 1
Remedial Investigation Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

PAHs-PCBs

Lab ID:	NJDEP	NJDEP	NJDEP	**460-99997-1**			**460-99997-2**			**460-99997-3**			**460-99997-4**			**460-99997-5**			**460-99997-6**			**460-99997-7**			**460-99997-8**		
Client ID:	Residential	Non-Residential	IGW	**ES-1**			**ES-2**			**ES-3**			**ES-4**			**ES-5**			**ES-6**			**ES-7**			**ES-8**		
Date Sampled:	SRS	SRS	Screening	**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**		
Matrix:	2012	2012	2013	**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**		
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Sample Depth (feet below ground surface):				**0.5-1.0**			**0.5-1.0**			**0-0.5**			**1.0-1.5**			**1.5-2.0**			**1.5-2.0**			**2.5-3.0**			**2.5-3.0**		
Sample Depth MSL (feet NAVD 1988):				**167.7-167.2**			**168.7-167.2**			**168.5-168.0**			**178.9-178.4**			**177.6-177.1**			**168.5-168.0**			**165.4-164.9**			**164.6-164.1**		
Easting - NJ State Plane (NAD1983)				**447060.9**			**447205.5**			**447293.9**			**447327.9**			**447104.4**			**447053.1**			**447204.4**			**447253.6**		
Northing - NJ State Plane (NAD1983)				**555115.6**			**555165.5**			**555124.3**			**554867.6**			**554793.0**			**555074.9**			**555124.7**			**555098.2**		
SVOA-8270D-SOIL				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
2-Methylnaphthalene	230	2400	8	0.41	U	0.0091	0.36	U	0.0080	0.74	U	0.016	0.059	J	0.0089	0.058	J	0.0092	0.020	J	0.0086	0.078	J	0.0086	0.090	J	0.0090
Acenaphthene	3400	37000	110	0.027	J	0.0099	0.010	J	0.0088	0.029	J	0.018	0.33	J	0.0097	0.40	J	0.010	0.15	J	0.0095	0.39		0.0094	0.53		0.0098
Acenaphthylene	NA	300000	NA	0.41	U	0.011	0.36	U	0.0094	0.74	U	0.019	0.40	U	0.010	0.42	U	0.011	0.39	U	0.010	0.011	J	0.010	0.41	U	0.010
Anthracene	17000	30000	2400	0.41	U	0.039	0.36	U	0.035	0.072	J	0.071	0.80		0.038	0.92		0.040	0.38	J	0.037	0.88		0.037	1.4		0.039
Benzo[a]anthracene	0.6	2	0.8	0.10		0.034	0.079		0.030	0.27		0.062	**1.5**		0.034	**1.8**		0.035	**0.94**		0.033	**1.6**		0.032	**2.8**		0.034
Benzo[a]pyrene	0.2	0.2	0.2	0.096		0.012	0.073		0.011	**0.25**		0.023	**1.1**		0.012	**1.3**		0.013	**0.73**		0.012	**1.4**		0.012	**2.8**		0.012
Benzo[b]fluoranthene	0.6	2	2	0.13		0.016	0.10		0.014	0.31		0.029	**1.6**		0.016	**1.9**		0.016	**1.0**		0.015	**1.7**		0.015	**3.4**		0.016
Benzo[g,h,i]perylene	380000	30000	NA	0.066	J	0.024	0.068	J	0.021	0.21	J	0.043	0.71		0.023	0.94		0.024	0.64		0.022	1.10		0.022	2.20		0.023
Benzo[k]fluoranthene	6	23	25	0.052		0.018	0.040		0.016	0.12		0.032	0.64		0.017	0.73		0.018	0.40		0.017	0.77		0.017	1.30		0.018
Chrysene	62	230	80	0.12	J	0.011	0.099	J	0.0099	0.33	J	0.020	1.5		0.011	1.8		0.011	1.0		0.011	1.6		0.011	2.8		0.011
Dibenz(a,h)anthracene	0.2	0.2	0.8	0.041	U	0.021	0.021	J	0.019	0.065	J	0.039	0.18		0.021	**0.26**		0.022	0.18		0.020	**0.34**		0.020	**0.52**		0.021
Fluoranthene	2300	24000	1300	0.24	J	0.012	0.15	J	0.011	0.63	J	0.022	4.5		0.012	5.2		0.012	2.3		0.012	4.2		0.012	6.6		0.012
Fluorene	2300	24000	170	0.021	J	0.0089	0.36	U	0.0079	0.023	J	0.016	0.13	J	0.0087	0.19	J	0.0091	0.08	J	0.0085	0.32	J	0.0085	0.55		0.0089
Indeno[1,2,3-cd]pyrene	0.6	2	7	0.083		0.027	0.059		0.024	0.24		0.050	**0.81**		0.027	**1.1**		0.028	**0.72**		0.026	**1.4**		0.026	**2.4**		0.027
Naphthalene	6	17	25	0.013	J	0.010	0.36	U	0.0092	0.74	U	0.019	0.095	J	0.010	0.10	J	0.011	0.037	J	0.0099	0.12	J	0.0099	0.17	J	0.010
Phenanthrene	NA	300000	NA	0.18	J	0.011	0.096	J	0.0097	0.31	J	0.020	4.4		0.011	4.4		0.011	1.4		0.010	3.7		0.010	5.8		0.011
Pyrene	1700	18000	840	0.20	J	0.019	0.13	J	0.017	0.46	J	0.034	3.3		0.018	4.1		0.019	2.0		0.018	3.1		0.018	5.4		0.018
Total Conc	NA	NA	NA	1.328			0.925			3.319			21.654			25.198			11.981			22.709			38.76		

GCSVOA-8082A-SOIL				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aroclor 1016	NA	NA	NA	0.083	U	0.011	0.074	U	0.0098	0.076	U	0.010	0.081	U	0.011	0.085	U	0.011	0.079	U	0.011	0.079	U	0.010	0.082	U	0.011
Aroclor 1221	NA	NA	NA	0.083	U	0.011	0.074	U	0.0098	0.076	U	0.010	0.081	U	0.011	0.085	U	0.011	0.079	U	0.011	0.079	U	0.010	0.082	U	0.011
Aroclor 1232	NA	NA	NA	0.083	U	0.011	0.074	U	0.0098	0.076	U	0.010	0.081	U	0.011	0.085	U	0.011	0.079	U	0.011	0.079	U	0.010	0.082	U	0.011
Aroclor 1242	NA	NA	NA	0.083	U	0.011	0.074	U	0.0098	0.076	U	0.010	0.081	U	0.011	0.085	U	0.011	0.079	U	0.011	0.079	U	0.010	0.082	U	0.011
Aroclor 1248	NA	NA	NA	0.083	U	0.011	0.074	U	0.0098	0.076	U	0.010	0.081	U	0.011	0.085	U	0.011	0.079	U	0.011	0.079	U	0.010	0.082	U	0.011
Aroclor 1254	NA	NA	NA	0.083	U	0.011	0.074	U	0.010	0.076	U	0.010	0.081	U	0.011	0.085	U	0.012	0.079	U	0.011	0.079	U	0.011	0.082	U	0.011
Aroclor 1260	NA	NA	NA	0.083	U	0.011	0.074	U F1	0.010	0.076	U	0.010	0.081	U	0.011	0.085	U	0.012	0.079	U	0.011	0.079	U	0.011	0.082	U	0.011
Aroclor 1262	NA	NA	NA	0.083	U	0.011	0.074	U	0.010	0.076	U	0.010	0.081	U	0.011	0.085	U	0.012	0.079	U	0.011	0.079	U	0.011	0.082	U	0.011
Aroclor 1268	NA	NA	NA	0.083	U	0.011	0.074	U	0.010	0.076	U	0.010	0.081	U	0.011	0.085	U	0.012	0.079	U	0.011	0.079	U	0.011	0.082	U	0.011
Total PCBs	0.2	1	0.2	0.083	U	0.011	0.074	U	0.010	0.076	U	0.010	0.081	U	0.011	0.085	U	0.012	0.079	U	0.011	0.079	U	0.011	0.082	U	0.011

NA: Not Applicable
SRS: Soil Remediation Standard
IGW: Impact to Groundwater
MDL: Method Detection Limit
U : Indicates the analyte was analyzed for but not detected.
J : Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 : MS and/or MSD Recovery is outside acceptance limits.

###	-Boxed bold font: Indicates exceedance of SRS
###	-Yellow-highlighted boxed bold font: Indicates exceedance of SRS and IGW

Table 1
Remedial Investigation Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

PAHs-PCBs

Lab ID:	NJDEP	NJDEP	NJDEP	**460-99997-9**			**460-99997-10**			**460-99997-11**			**460-99997-12**			**460-99997-13**			**460-99997-14**			**460-99997-15**			**460-99997-16**		
Client ID:	Residential	Non-Residential	IGW	**ES-9**			**ES-10**			**ES-11**			**ES-12**			**ES-13**			**ES-14**			**ES-15**			**ES-16**		
Date Sampled:	SRS	SRS	Screening	**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**		
Matrix:	2012	2012	2013	**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**		
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Sample Depth (feet below ground surface):				**2.5-3.0**			**2.5-3.0**			**3.5-4.0**			**1.5-2.0**			**2.5-3.0**			**1.5-2.0**			**2.5-3.0**			**1.5-2.0**		
Sample Depth MSL (feet NAVD 1988):				**173.1-172.6**			**172.0-171.5**			**175.0-174.5**			**173.0-172.5**			**167.2-166.7**			**166.2-165.7**			**158.8-158.3**			**160.1-159.6**		
Easting - NJ State Plane (NAD1983)				**447276.4**			**447080.8**			**447019.3**			**447031.6**			**446985.7**			**446953.2**			**446761.9**			**446807.6**		
Northing - NJ State Plane (NAD1983)				**554934.1**			**554891.2**			**554747.3**			**554848.6**			**555021.5**			**555092.3**			**555010.8**			**555051.8**		
SVOA-8270D-SOIL				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
2-Methylnaphthalene	230	2400	8	0.096	J	0.018	0.42	U	0.0092	0.039	J	0.0088	0.097	J	0.0087	0.012	J	0.0087	0.074	J	0.0085	0.41	U	0.0090	1.9	U	0.041
Acenaphthene	3400	37000	110	0.46	J	0.019	0.024	J	0.010	0.31	J	0.0097	0.65		0.0095	0.031	J	0.0096	0.21	J	0.0093	0.41	U	0.0099	0.13	J	0.045
Acenaphthylene	NA	300000	NA	0.80	U	0.021	0.42	U	0.011	0.40	U	0.010	0.39	U	0.010	0.40	U	0.010	0.030	J	0.0099	0.41	U	0.010	1.9	U	0.048
Anthracene	17000	30000	2400	1.6		0.076	0.11	J	0.040	0.79		0.038	0.79		0.037	0.081	J	0.038	0.35	J	0.036	0.41	U	0.039	0.26	J	0.18
Benzo[a]anthracene	0.6	2	0.8	**2.3**		0.067	0.20		0.035	**2.1**		0.033	**1.4**		0.033	0.22		0.033	**0.87**		0.032	0.041	U	0.034	0.57		0.16
Benzo[a]pyrene	0.2	0.2	0.2	**1.7**		0.024	0.13		0.013	**1.6**		0.012	**1.1**		0.012	0.19		0.012	**0.83**		0.012	0.027	J	0.012	**0.44**		0.056
Benzo[b]fluoranthene	0.6	2	2	**2.2**		0.031	0.21		0.016	**2.0**		0.016	**1.4**		0.015	0.28		0.015	**0.99**		0.015	0.033	J	0.016	0.55		0.073
Benzo[g,h,i]perylene	380000	30000	NA	1.50		0.046	0.062	J	0.024	1.20		0.023	0.91		0.023	0.098	J	0.023	0.64		0.022	0.41	U	0.023	0.33	J	0.11
Benzo[k]fluoranthene	6	23	25	0.87		0.035	0.078		0.018	0.87		0.017	0.60		0.017	0.12		0.017	0.41		0.017	0.041	U	0.018	0.26		0.081
Chrysene	62	230	80	2.5		0.022	0.23	J	0.011	2.3		0.011	1.5		0.011	0.29	J	0.011	1.0		0.010	0.026	J	0.011	0.67	J	0.051
Dibenz(a,h)anthracene	0.2	0.2	0.8	**0.43**		0.042	0.042	U	0.022	**0.39**		0.021	**0.27**		0.020	0.027	J	0.021	0.18		0.020	0.041	U	0.021	0.11	J	0.097
Fluoranthene	2300	24000	1300	7.2		0.024	0.73		0.012	5.7		0.012	3.7		0.012	0.63		0.012	2.0		0.011	0.037	J	0.012	1.6	J	0.055
Fluorene	2300	24000	170	0.25	J	0.017	0.030	J	0.0091	0.20	J	0.0087	0.33	J	0.0086	0.032	J	0.0086	0.16	J	0.0084	0.41	U	0.0089	0.083	J	0.041
Indeno[1,2,3-cd]pyrene	0.6	2	7	**1.6**		0.053	0.079		0.028	**1.5**		0.027	**1.1**		0.026	0.11		0.026	**0.74**		0.026	0.041	U	0.027	0.41		0.12
Naphthalene	6	17	25	0.12	J	0.020	0.012	J	0.011	0.075	J	0.010	0.13	J	0.010	0.020	J	0.010	0.099	J	0.0097	0.41	U	0.010	1.9	U	0.047
Phenanthrene	NA	300000	NA	7.0		0.021	0.64		0.011	3.4		0.011	3.5		0.010	0.44		0.011	1.5		0.010	0.018	J	0.011	1.2	J	0.050
Pyrene	1700	18000	840	4.6		0.036	0.47		0.019	4.1		0.018	2.9		0.018	0.42		0.018	1.5		0.017	0.031	J	0.019	0.96	J	0.085
Total Conc	NA	NA	NA	34.426			3.005			26.574			20.377			3.001			11.583			0.172			7.573		

GCSVOA-8082A-SOIL				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aroclor 1016	NA	NA	NA	0.081	U	0.011	0.084	U	0.011	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.010	0.083	U	0.011	0.076	U	0.010
Aroclor 1221	NA	NA	NA	0.081	U	0.011	0.084	U	0.011	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.010	0.083	U	0.011	0.076	U	0.010
Aroclor 1232	NA	NA	NA	0.081	U	0.011	0.084	U	0.011	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.010	0.083	U	0.011	0.076	U	0.010
Aroclor 1242	NA	NA	NA	0.081	U	0.011	0.084	U	0.011	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.010	0.083	U	0.011	0.076	U	0.010
Aroclor 1248	NA	NA	NA	0.081	U	0.011	0.084	U	0.011	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.010	0.083	U	0.011	0.076	U	0.010
Aroclor 1254	NA	NA	NA	0.081	U	0.011	0.084	U	0.012	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.011	0.083	U	0.011	0.076	U	0.010
Aroclor 1260	NA	NA	NA	0.081	U	0.011	0.084	U	0.012	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.011	0.083	U	0.011	0.076	U	0.010
Aroclor 1262	NA	NA	NA	0.081	U	0.011	0.084	U	0.012	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.011	0.083	U	0.011	0.076	U	0.010
Aroclor 1268	NA	NA	NA	0.081	U	0.011	0.084	U	0.012	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.011	0.083	U	0.011	0.076	U	0.010
Total PCBs	0.2	1	0.2	0.081	U	0.011	0.084	U	0.012	0.081	U	0.011	0.080	U	0.011	0.080	U	0.011	0.078	U	0.011	0.083	U	0.011	0.076	U	0.010

NA: Not Applicable
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Table 1
Remedial Investigation Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

PAHs-PCBs

Lab ID:	NJDEP	NJDEP	NJDEP	**460-99997-17**			**460-99997-18**			**460-99997-19**			**460-99997-20**			**460-99997-21**			**460-99997-22**		
Client ID:	Residential	Non-Residential	IGW	**ES-17**			**ES-18**			**ES-19**			**ES-20**			**ES-21**			**ES-22**		
Date Sampled:	SRS	SRS	Screening	**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**		
Matrix:	2012	2012	2013	**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**		
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Sample Depth (feet below ground surface):				**1.5-2.0**			**2.5-3.0**			**2.5-3.0**			**4.5-5.0**			**2.5-3.0**			**2.5-3.0**		
Sample Depth MSL (feet NAVD 1988):				**162.6-162.1**			**169.5-169.0**			**170.9-170.4**			**170.9-170.4**			**177.0-176.5**			**179.0-178.5**		
Easting - NJ State Plane (NAD1983)				**446877.2**			**446935.7**			**446974.4**			**447062.3**			**447160.7**			**447327.6**		
Northing - NJ State Plane (NAD1983)				**555079.0**			**554877.3**			**554867.9**			**554852.0**			**554754.1**			**554810.7**		
SVOA-8270D-SOIL				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
2-Methylnaphthalene	230	2400	8	0.051	J	0.018	0.17	J	0.018	0.18	J	0.044	0.17	J	0.0086	0.38	U	0.0084	0.39	U	0.0087
Acenaphthene	3400	37000	110	0.27	J	0.019	1.1		0.020	1.2	J	0.048	0.24	J	0.0094	0.38	U	0.0092	0.097	J	0.0095
Acenaphthylene	NA	300000	NA	0.80	U	0.021	0.81	U	0.021	2.0	U	0.051	0.025	J	0.010	0.38	U F1	0.0098	0.39	U	0.010
Anthracene	17000	30000	2400	0.54	J	0.076	2.8		0.077	2.6		0.19	0.54		0.037	0.38	U	0.036	0.25	J	0.037
Benzo[a]anthracene	0.6	2	0.8	**1.10**		0.067	**3.6**		0.068	**3.9**		0.17	**1.00**		0.032	0.038	U F1	0.032	0.44		0.033
Benzo[a]pyrene	0.2	0.2	0.2	**0.88**		0.024	**2.8**		0.025	**3.2**		0.061	**0.84**		0.012	0.038	U	0.012	**0.37**		0.012
Benzo[b]fluoranthene	0.6	2	2	**1.2**		0.031	**3.4**		0.032	**4.1**		0.078	**1.1**		0.015	0.015	J	0.015	0.53		0.015
Benzo[g,h,i]perylene	380000	30000	NA	0.81		0.046	2.20		0.047	2.40		0.12	0.69		0.022	0.38	U F1	0.022	0.24	J	0.023
Benzo[k]fluoranthene	6	23	25	0.45		0.035	1.50		0.035	1.50		0.087	0.41		0.017	0.038	U	0.017	0.23		0.017
Chrysene	62	230	80	1.2		0.022	3.9		0.022	4.2		0.054	1.0		0.011	0.012	J	0.010	0.45		0.011
Dibenz(a,h)anthracene	0.2	0.2	0.8	0.20		0.042	**0.65**		0.042	**0.77**		0.10	0.20		0.020	0.038	U	0.020	0.062		0.020
Fluoranthene	2300	24000	1300	2.8		0.024	12.0		0.024	11.0		0.059	2.6		0.011	0.027	J	0.011	1.0		0.012
Fluorene	2300	24000	170	0.15	J	0.017	0.73	J	0.018	0.98	J	0.044	0.25	J	0.0084	0.38	U	0.0083	0.082	J	0.0086
Indeno[1,2,3-cd]pyrene	0.6	2	7	**0.89**		0.053	**2.6**		0.054	**2.9**		0.13	**0.80**		0.026	0.038	U	0.025	0.24		0.026
Naphthalene	6	17	25	0.075	J	0.020	0.35	J	0.021	0.32	J	0.051	0.18	J	0.0098	0.38	U F1	0.0097	0.39	U	0.010
Phenanthrene	NA	300000	NA	2.7		0.021	12		0.022	9.7		0.053	2.7		0.010	0.016	J	0.010	0.87		0.010
Pyrene	1700	18000	840	2.5		0.036	7.0		0.037	7.8		0.091	2.0		0.018	0.020	J F1	0.017	0.97		0.018
Total Conc	NA	NA	NA	15.816			56.8			56.75			14.745			0.09			5.831		

GCSVOA-8082A-SOIL				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aroclor 1016	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.010	0.077	U	0.010	0.080	U	0.011
Aroclor 1221	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.010	0.077	U	0.010	0.080	U	0.011
Aroclor 1232	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.010	0.077	U	0.010	0.080	U	0.011
Aroclor 1242	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.010	0.077	U	0.010	0.080	U	0.011
Aroclor 1248	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.010	0.077	U	0.010	0.080	U	0.011
Aroclor 1254	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011
Aroclor 1260	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U F1	0.011	0.080	U	0.011
Aroclor 1262	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011
Aroclor 1268	NA	NA	NA	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011
Total PCBs	0.2	1	0.2	0.081	U	0.011	0.082	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011

NA: Not Applicable
SRS: Soil Remediation Standard
IGW: Impact to Groundwater
MDL: Method Detection Limit
U : Indicates the analyte was analyzed for but not detected.
J : Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 : MS and/or MSD Recovery is outside acceptance limits.

###	-Boxed bold font: Indicates exceedance of SRS
###	-Yellow-highlighted boxed bold font: Indicates exceedance of SRS and IGW

Table 1
Remedial Investigation Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

Metals

Lab ID:	NJDEP	NJDEP	NJDEP	**460-99997-1**			**460-99997-2**			**460-99997-3**			**460-99997-4**			**460-99997-5**			**460-99997-6**			**460-99997-7**			**460-99997-8**		
Client ID:	Residential	Non-Residential	IGW	**ES-1**			**ES-2**			**ES-3**			**ES-4**			**ES-5**			**ES-6**			**ES-7**			**ES-8**		
Date Sampled:	SRS	SRS	Screening	**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**		
Matrix:	2012	2012	2013	**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**		
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Sample Depth (feet below ground surface):				**0.5-1.0**			**0.5-1.0**			**0-0.5**			**1.0-1.5**			**1.5-2.0**			**1.5-2.0**			**2.5-3.0**			**2.5-3.0**		
Sample Depth MSL (feet NAVD 1988):				**167.7-167.2**			**168.7-167.2**			**168.5-168.0**			**178.9-178.4**			**177.6-177.1**			**168.5-168.0**			**165.4-164.9**			**164.6-164.1**		
Easting - NJ State Plane (NAD1983)				**447060.9**			**447205.5**			**447293.9**			**447327.9**			**447104.4**			**447053.1**			**447204.4**			**447253.6**		
Northing - NJ State Plane (NAD1983)				**555115.6**			**555165.5**			**555124.3**			**554867.6**			**554793.0**			**555074.9**			**555124.7**			**555098.2**		
METALS-SOIL BY 6020A				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aluminum	78000	NA	6000	**20000**		8.0	**20200**		8.0	**13000**		7.9	**10700**		8.7	**11600**		9.2	**18700**		7.9	**20800**		7.7	**26800**		8.7
Antimony	31	450	6	1.1	U	0.45	1.1	U	0.44	0.44	J	0.44	1.0	J	0.49	1.7		0.52	0.69	J	0.44	1.0		0.43	1.2	U	0.49
Arsenic	19	19	19	7.7		0.49	13.0		0.48	7.3		0.48	11.1		0.53	10.4		0.56	12.7		0.48	17.2		0.47	**37.6**		0.53
Barium	16000	59000	2100	146		0.72	111		0.71	52.7		0.71	78.8		0.78	101		0.83	131		0.70	120		0.69	127		0.78
Beryllium	16	140	0.7	**1.2**		0.14	**1.7**		0.14	**0.72**		0.14	0.62		0.15	0.65		0.16	**1.2**		0.13	**1.4**		0.13	**2.0**		0.15
Cadmium	78	78	2	1.1	U	0.34	1.1	U	0.34	1.1	U	0.34	0.44	J	0.37	1.3	U	0.39	1.1	U	0.33	1.0	U	0.33	1.2	U	0.37
Calcium	NA	NA	NA	4620		39.1	5260		38.7	30100		38.5	82500		42.3	92400		44.9	35600		38.2	21000		37.6	4860		42.4
Chromium	NA	NA	NA	28.6		0.85	47.4		0.84	36.9		0.83	47.5		0.92	30.5		0.97	45.2		0.83	50.3		0.81	54.6		0.92
Cobalt	1600	590	90	12.3		0.84	23.8		0.83	10.5		0.83	4.6		0.91	5.5		0.96	11.9		0.82	13.3		0.81	17.3		0.91
Copper	3100	45000	11000	25.2		0.74	40.9		0.73	54.0		0.72	30.8		0.80	26.8		0.84	39.4		0.72	39.8		0.71	47.3		0.80
Iron	NA	NA	NA	25000		28.3	39900		28.0	25500		27.9	16300		30.6	13100		32.5	27900		27.7	36500		27.2	45300		30.7
Lead	400	800	90	29.5		0.24	26.0		0.24	15.5		0.24	32.7		0.26	39.0		0.28	38.6		0.24	41.6		0.23	24.7		0.26
Magnesium	NA	NA	NA	5240		39.2	9650		38.8	8350		38.6	7510		42.4	9640		45.0	8840		38.3	9930		37.7	13400		42.6
Manganese	11000	5900	65	**702**		1.7	**908**		1.7	**390**		1.7	**292**		1.9	**406**		2.0	**512**		1.7	**495**		1.7	**394**		1.9
Nickel	1600	23000	48	20.9		0.85	30.9		0.85	27.9		0.84	14.7		0.92	17.6		0.98	23.7		0.84	29.7		0.82	40.6		0.93
Potassium	NA	NA	NA	2470		37.1	4020		36.8	2200		36.6	2160		40.2	2100		42.6	3810		36.3	4670		35.7	6820		40.3
Selenium	390	5700	11	0.66	J	0.42	0.46	J	0.42	5.4	U	0.41	5.9	U	0.45	6.3	U	0.48	0.43	J	0.41	0.49	J	0.40	5.9	U	0.46
Silver	390	5700	1	1.1	U	0.82	1.1	U	0.81	1.1	U	0.81	1.2	U	0.89	1.3	U	0.94	1.1	U	0.80	1.0	U	0.79	1.2	U	0.89
Sodium	NA	NA	NA	440		41.9	337		41.5	824		41.3	766		45.4	1030		48.1	738		41.0	698		40.3	432		45.5
Thallium	5	79	3	0.27	J	0.17	0.45		0.17	0.43	U	0.17	0.47	U	0.18	0.50	U	0.19	0.30	J	0.17	0.43		0.16	0.74		0.18
Vanadium	78	1100	NA	53.4		0.84	**83.7**		0.84	47.8		0.83	34.2		0.91	26.0		0.97	58.8		0.83	65.9		0.81	**110**		0.92
Zinc	23000	110000	930	71.8		2.7	82.9		2.6	57.0		2.6	146		2.9	208		3.1	155		2.6	110		2.6	98.3		2.9

SOIL BY 7471B				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Mercury	23	65	0.1	0.063		0.014	**0.31**		0.012	0.083		0.013	**0.26**		0.014	**0.22**		0.014	**0.22**		0.014	0.10		0.014	0.038		0.014

NA: Not Applicable
SRS: Soil Remediation Standard
IGW: Impact to Groundwater
MDL: Method Detection Limit
U : Indicates the analyte was analyzed for but not detected.
J : Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 : MS and/or MSD Recovery is outside acceptance limits.

###	-Boxed BLUE bold font: Indicates exceedance of IGW
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Table 1
Remedial Investigation Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

Metals

Lab ID:	NJDEP	NJDEP	NJDEP	460-99997-9			460-99997-10			460-99997-11			460-99997-12			460-99997-13			460-99997-14			460-99997-15			460-99997-16		
Client ID:	Residential	Non-Residential	IGW	ES-9			ES-10			ES-11			ES-12			ES-13			ES-14			ES-15			ES-16		
Date Sampled:	SRS	SRS	Screening	08/20/2015			08/20/2015			08/20/2015			08/20/2015			08/20/2015			08/20/2015			08/20/2015			08/20/2015		
Matrix:	2012	2012	2013	Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Unit:	mg/kg	mg/kg	mg/kg	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample Depth (feet below ground surface):				2.5-3.0			2.5-3.0			3.5-4.0			1.5-2.0			2.5-3.0			1.5-2.0			2.5-3.0			1.5-2.0		
Sample Depth MSL (feet NAVD 1988):				173.1-172.6			172.0-171.5			175.0-174.5			173.0-172.5			167.2-166.7			166.2-165.7			158.8-158.3			160.1-159.6		
Easting - NJ State Plane (NAD1983)				447276.4			447080.8			447019.3			447031.6			446985.7			446953.2			446761.9			446807.6		
Northing - NJ State Plane (NAD1983)				554934.1			554891.2			554747.3			554848.6			555021.5			555092.3			555010.8			555051.8		
METALS-SOIL BY 6020A				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aluminum	78000	NA	6000	**10500**		8.4	**26700**		9.1	**13300**		8.7	**13800**		8.5	**16600**		7.4	**19700**		7.2	**34200**		8.7	**13300**		7.4
Antimony	31	450	6	0.77	J	0.47	1.2	U	0.51	1.1	J	0.48	1.1	J F1	0.48	0.41	J	0.41	0.98	U	0.40	1.2	U	0.48	1.0	U	0.42
Arsenic	19	19	19	**20.5**		0.51	**20.4**		0.55	8.8		0.52	5.6		0.52	7.0		0.45	9.4		0.44	**29.3**		0.53	7.3		0.45
Barium	16000	59000	2100	69.8		0.76	111		0.82	98.8		0.78	117		0.76	97.7		0.66	123		0.65	267		0.78	62.6		0.67
Beryllium	16	140	0.7	0.58		0.14	**2.1**		0.16	**0.92**		0.15	**0.89**		0.15	**0.76**		0.13	**1.3**		0.12	**2.4**		0.15	**0.82**		0.13
Cadmium	78	78	2	1.1	U	0.36	1.2	U	0.39	1.2	U	0.37	1.2	U	0.36	1.0	U	0.31	0.98	U	0.31	1.2	U	0.37	1.0	U	0.32
Calcium	NA	NA	NA	73200		41.0	4700		44.2	66900		42.1	88900		41.5	12000		36.1	8720		35.3	2830		42.1	28600		36.2
Chromium	NA	NA	NA	40.5		0.89	61.5		0.96	35.4		0.91	28.7		0.90	30.3		0.78	34.5		0.76	55.0		0.91	29.2		0.78
Cobalt	1600	590	90	5.4		0.88	12.9		0.95	8.7		0.90	6.0		0.89	7.6		0.77	16.3		0.76	11.3		0.90	8.8		0.78
Copper	3100	45000	11000	29.7		0.77	44.6		0.83	31.1		0.79	30.0	F1	0.78	28.9		0.68	45.9		0.66	33.2		0.79	73.7		0.68
Iron	NA	NA	NA	13900		29.7	42600		32.0	20800		30.5	14700		30.0	25500		26.1	31600		25.5	42800		30.5	23900		26.2
Lead	400	800	90	45.8		0.25	15.6		0.27	40.9		0.26	35.2		0.26	37.9		0.22	44.5		0.22	20.9		0.26	20.5		0.22
Magnesium	NA	NA	NA	6670		41.2	12400		44.3	8010		42.2	10700		41.6	5150		36.2	6810		35.4	10200		42.3	6990		36.3
Manganese	11000	5900	65	**259**		1.8	**325**		2.0	**429**		1.9	**483**		1.8	**316**		1.6	**691**		1.6	**204**		1.9	**293**		1.6
Nickel	1600	23000	48	18.2		0.90	28.9		0.97	21.3		0.92	17.5		0.91	18.8		0.79	23.5		0.77	35.9		0.92	19.7		0.79
Potassium	NA	NA	NA	1660		39.0	3500		42.0	2790		40.0	2300		39.4	2040		34.2	3470		33.5	6190		40.0	3010		34.4
Selenium	390	5700	11	5.7	U	0.44	0.50	J	0.48	5.9	U	0.45	5.8	U	0.45	0.43	J	0.39	0.51	J	0.38	0.49	J	0.45	0.40	J	0.39
Silver	390	5700	1	1.1	U	0.86	1.2	U	0.93	1.2	U	0.88	1.2	U	0.87	1.0	U	0.76	0.98	U	0.74	1.2	U	0.89	1.0	U	0.76
Sodium	NA	NA	NA	615		44.0	238		47.4	668		45.2	807		44.5	195		38.7	459		37.8	1050		45.2	712		38.8
Thallium	5	79	3	0.46	U	0.18	0.38	J	0.19	0.47	U	0.18	0.46	U	0.18	0.17	J	0.16	0.31	J	0.15	0.60		0.18	0.17	J	0.16
Vanadium	78	1100	NA	32.3		0.89	67.7		0.96	40.4		0.91	27.9		0.90	43.0		0.78	59.7		0.76	**86.4**		0.91	52.6		0.78
Zinc	23000	110000	930	152		2.8	71.9		3.0	296		2.9	169	F1	2.8	110		2.5	119		2.4	70.7		2.9	193		2.5

SOIL BY 7471B				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Mercury	23	65	0.1	**0.20**		0.013	0.043		0.013	**0.20**		0.014	**0.14**		0.014	0.063		0.013	**0.13**		0.014	0.023		0.014	**0.16**		0.013

NA: Not Applicable
SRS: Soil Remediation Standard
IGW: Impact to Groundwater
MDL: Method Detection Limit
U : Indicates the analyte was analyzed for but not detected.
J : Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 : MS and/or MSD Recovery is outside acceptance limits.

###	-Boxed BLUE bold font: Indicates exceedance of IGW
###	-Boxed bold font: Indicates exceedance of SRS
###	-Yellow-highlighted boxed bold font: Indicates exceedance of SRS and IGW

Table 1
Remedial Investigation Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

Metals

Lab ID:	NJDEP	NJDEP	NJDEP	**460-99997-17**			**460-99997-18**			**460-99997-19**			**460-99997-20**			**460-99997-21**			**460-99997-22**		
Client ID:	Residential	Non-Residential	IGW	**ES-17**			**ES-18**			**ES-19**			**ES-20**			**ES-21**			**ES-22**		
Date Sampled:	SRS	SRS	Screening	**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**			**08/20/2015**		
Matrix:	2012	2012	2013	**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**		
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Sample Depth (feet below ground surface):				**1.5-2.0**			**2.5-3.0**			**2.5-3.0**			**4.5-5.0**			**2.5-3.0**			**2.5-3.0**		
Sample Depth MSL (feet NAVD 1988):				**162.6-162.1**			**169.5-169.0**			**170.9-170.4**			**170.9-170.4**			**177.0-176.5**			**179.0-178.5**		
Easting - NJ State Plane (NAD1983)				**446877.2**			**446935.7**			**446974.4**			**447062.3**			**447160.7**			**447327.6**		
Northing - NJ State Plane (NAD1983)				**555079.0**			**554877.3**			**554867.9**			**554852.0**			**554754.1**			**554810.7**		
METALS-SOIL BY 6020A				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aluminum	78000	NA	6000	**10200**		8.3	**9440**		8.5	**10900**		8.7	**18600**		7.3	**25100**		7.8	**28900**		8.2
Antimony	31	450	6	1.1		0.46	1.7		0.48	1.3		0.49	0.41	J	0.41	1.1	U F1	0.44	1.1	U	0.46
Arsenic	19	19	19	10.3		0.50	7.2		0.52	5.8		0.53	6.2		0.44	2.8		0.47	9.3		0.50
Barium	16000	59000	2100	77.4		0.74	87.2		0.77	80.3		0.78	147		0.65	75.1		0.70	240		0.73
Beryllium	16	140	0.7	0.65		0.14	0.65		0.15	0.70		0.15	**1.5**		0.12	0.47		0.13	**1.7**		0.14
Cadmium	78	78	2	1.1	U	0.35	1.2	U	0.36	1.2	U	0.37	0.99	U	0.31	1.1	U	0.33	1.1	U	0.35
Calcium	NA	NA	NA	51900		40.3	97000		41.5	92000		42.5	27000		35.3	7240		38.0	2160		39.8
Chromium	NA	NA	NA	31.2		0.87	29.6		0.90	30.2		0.92	55.1		0.77	155		0.82	37.6		0.86
Cobalt	1600	590	90	7.1		0.86	4.7		0.89	5.8		0.91	15.1		0.76	36.3		0.82	13.2		0.85
Copper	3100	45000	11000	31.2		0.76	33.5		0.78	34.2		0.80	39.9		0.67	95.4		0.72	31.3		0.75
Iron	NA	NA	NA	14000		29.2	11800		30.1	14100		30.8	34700		25.6	41600		27.5	31800		28.8
Lead	400	800	90	40.9		0.25	41.3		0.26	38.4		0.26	27.6		0.22	10.3		0.23	86.4		0.25
Magnesium	NA	NA	NA	5820		40.4	9170		41.7	8380		42.7	12900		35.4	12700		38.1	6190		39.9
Manganese	11000	5900	65	**306**		1.8	**305**		1.8	**368**		1.9	**569**		1.6	**929**		1.7	**942**		1.8
Nickel	1600	23000	48	18.9		0.88	15.8		0.91	18.5		0.93	36.3		0.77	**101**		0.83	26.5		0.87
Potassium	NA	NA	NA	2310		38.3	1700		39.5	1900		40.4	5690		33.6	854		36.1	3660		37.8
Selenium	390	5700	11	5.6	U	0.43	5.8	U	0.45	5.9	U	0.46	4.9	U	0.38	5.3	U	0.41	0.81	J	0.43
Silver	390	5700	1	1.1	U	0.85	1.2	U	0.87	1.2	U	0.89	0.99	U	0.74	1.1	U	0.80	1.1	U	0.84
Sodium	NA	NA	NA	715		43.2	843		44.6	745		45.6	748		37.9	602		40.8	156		42.7
Thallium	5	79	3	0.45	U	0.17	0.46	U	0.18	0.48	U	0.18	0.29	J	0.15	0.42	U	0.16	0.29	J	0.17
Vanadium	78	1100	NA	31.5		0.87	26.3		0.90	30.1		0.92	47.6		0.76	**104**		0.82	45.4		0.86
Zinc	23000	110000	930	171		2.7	224		2.8	213		2.9	103		2.4	56.4		2.6	113		2.7

SOIL BY 7471B				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Mercury	23	65	0.1	**0.44**		0.013	**0.17**		0.014	**0.21**		0.014	**0.85**		0.012	0.015	J	0.012	**0.23**		0.014

NA: Not Applicable
SRS: Soil Remediation Standard
IGW: Impact to Groundwater
MDL: Method Detection Limit
U : Indicates the analyte was analyzed for but not detected.
J : Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 : MS and/or MSD Recovery is outside acceptance limits.

###	-Boxed BLUE bold font: Indicates exceedance of IGW
###	-Boxed bold font: Indicates exceedance of SRS
###	-Yellow-highlighted boxed bold font: Indicates exceedance of SRS and IGW

TABLE 2
Data Quality Assessment/Data Usability Evaluation
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI # 011700, Case 15-09-09-1706-55
SVOC-8270D

LABORATORY SDG ID:	**TestAmerica (Edison) 460-99997-1**	
Preparation Batch ID(s):	460-318152, 460-318158	
Analysis Batch ID(s):	460-318190, 460-318191, 460-318357, 460-318575	
DATA OF KNOWN QUALITY PROTOCOL REQUIREMENT	**COMMENT**	**Qualification Required**
GC/MS dftpp Tune (every 12 hours, criteria per SW-846)	All aspects acceptable	N/A
Initial Calibration (ICAL): Minimum five standards %RSD ≤ 20% or "r" ≥ 0.99 for all compounds	All acceptable	N/A
Method Blank Contamination: (Target Analytes < RL; except phthalates < 5x RL)	Acceptable, no contamination	N/A
Field/Equipment Blank Contamination: (Not required if using dedicated sampling equipment)	No Field Blank Collected	N/A
MS/MSD (Site Specific QC): Target Analytes 70<%R<130; "difficult" analytes 20<%R<160 MS/MSD RPD: <20% Aqueous matrix, <30% Solid matrix	Batches 460-318152 and 460-318158: MS and/or MSD %R outside QC limits (low) for several compounds. DUE: LCS OK. No qualification needed.	No
Laboratory Control Sample (LCS): Target Analytes 70<%R<130; "difficult" analytes 20<%R<160	All acceptable, no outliers	N/A
Sample Duplicate: For compounds > 2x RL RPD: ≤ 20% Aqueous matrix, ≤ 30% Solid matrix	All acceptable	N/A
Surrogate Recovery: Minimum 3 BN and 3 Acid Surrogates: Solid Matrix %R: 30<%R<130; Aqueous Matrix: BN %R: 30<%R<130, Acid %R: 15<%R<110	All acceptable, no outliers	N/A
Internal Standards Data: Minimum 6 IS; Area 50%-200% of CCV, RTs ± 30 sec	All acceptable	N/A
Continuing Calibration Verification (CCV): 1 CCV per 12 hours; %D ≤ 20% for all CCCs; ≤ 30% for all others	All acceptable	N/A
Quantitation: All compounds: RL ≤ results ≤ Upper Calibration Range Detections between MDL and RL qualified with "J"	All acceptable	N/A
Field Duplicate - Site Specific QC: For compounds > 2x RL RPD: <30% Aqueous matrix, <50% Solid matrix	Site Specific sample duplicate not required	N/A
Sample Preservation Requirements Met (≤ 6 □C)?	Met	N/A
Holding Time Requirements Met? Aqueous: extract w/in 7 days of sample; Solid: extract w/in 14 days; Analyze within 40 days of extraction	Met	N/A
Target Analyte Reporting: Samples	All acceptable	N/A
OVERALL DISPOSITION	All SVOC data are reported as provided in the data deliverable and are not qualified, rejected, or negated.	

TABLE 2
Data Quality Assessment/Data Usability Evaluation
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI # 011700, Case 15-09-09-1706-55
PCBs

LABORATORY SDG ID:	**TestAmerica (Edison) 460-99997-1**	
Preparation Batch ID(s):	460-318165, 460-318167	
Analysis Batch ID(s):	460-318197, 460-318286	
DATA OF KNOWN QUALITY PROTOCOL REQUIREMENT	**COMMENT**	**Qualification Required**
Method Blank Contamination: (Target Analytes < RL)	Acceptable, no contamination	N/A
Field/Equipment Blank Contamination: (Not required if using dedicated sampling equipment)	No Field Blank Collected	N/A
MS/MSD (Site Specific QC): Must include Aroclor 1016 & 1260 Target Analytes 40<%R<140 MS/MSD RPD: <20% Aqueous matrix; <30% Solid matrix	Batches 460-318165 and 460-318167: MS and/or MSD %R outside QC limits (high) for aroclor 1260. DUE: LCS OK. Samples ND. No qualification needed.	No
Laboratory Control Sample (LCS):Must include Aroclor 1016 & 1260 Target Analytes 40<%R<140	All acceptable, no outliers	N/A
Sample Duplicate: For compounds > 2x RL RPD: ≤ 20% Aqueous matrix, ≤ 30% Solid matrix	All acceptable	N/A
Surrogate Recovery: Minimum 2 Surrogates: %R: 30<%R<150 on both primary and secondary columns	All acceptable, no outliers	N/A
Initial Calibration (ICAL): Minimum five standards for Aroclor 1016 & 1260; 3-5 levels for others %RSD ≤ 20% or "r" ≥ 0.99 for 1016 & 1260	All acceptable	N/A
Continuing Calibration Verification (CCV): for Aroclor 1016 & 1260 1 CCV per 12 hours or 20 samples; %D ≤ 20%	All acceptable	N/A
Quantitation: All compounds: RL ≤ results ≤ Upper Calibration Range Report highest concentration from two GC columns. Detections between MDL and RL qualified with "J"	All acceptable	N/A
Quantitation: All compounds: RPD or %D ≤ 40% between two columns	All acceptable	N/A
Field Duplicate - Site Specific QC: For compounds > 2x RL RPD: <30% Aqueous matrix, <50% Solid matrix	Site Specific sample duplicate not required	N/A
Sample Preservation Requirements Met (≤ 6 □C)?	Met	N/A
Holding Time Requirements Met? Aqueous: extract w/in 7 days of sample; Solid: extract w/in 14 days; Analyze within 40 days of extraction	Met	N/A
Target Analyte Reporting: Samples	All acceptable	N/A
OVERALL DISPOSITION	All PCB data are reported as provided in the data deliverable and are not qualified, rejected, or negated.	

TABLE 2
Data Quality Assessment/Data Usability Evaluation
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI # 011700, Case 15-09-09-1706-55
Metals (ICPMS-6020A)

LABORATORY SDG ID:	**TestAmerica (Edison) 460-99997-1**	
Preparation Batch ID(s):	460-319427, 460-319429	
Analysis Batch ID(s):	460-319928	
DATA OF KNOWN QUALITY PROTOCOL REQUIREMENT	**COMMENT**	**Qualification Required**
Tuning: SW-846 tuning criteria	All acceptable	N/A
Linear Dynamic Range: checked every 6 months	All acceptable	N/A
Initial Calibration (ICAL):daily prior to analysis of samples; blank plus 3 standards plus blank; linear curve fit r ≤ 0.998	All acceptable	N/A
Initial Calibration Verification (ICV): ICV daily after ICAL; separate source from calibration standards; %R: 90 ≤ %R ≤ 110%	All acceptable	N/A
Continuing Calibration Verification (CCV): CCV after 10 samples; separate source from calibration standards; %R: 80 ≤ %R ≤ 120%	All acceptable	N/A
Initial & Continuing Calibration Blanks (ICB & CCB): after ICV or CCV, result < RL	All acceptable	N/A
Low Level Continuing Calibration Verification (LLCCV): daily only if RL STD not in ICAL, same source as ICAL standards; All elements: 70≤ %R ≤ 130%	All acceptable	N/A
Method Blank Contamination: (Target Analytes < RL)	Acceptable, no contamination	N/A
Field/Equipment Blank Contamination: (Not required if using dedicated sampling equipment)	No Field Blank Collected	N/A
Laboratory Control Sample (LCS): Aqueous Target Analytes: 80 < %R < 120 Soil/Sediment/Solid LCS: LCS Vendor Limits (95% confidence limit)	All acceptable, no outliers	N/A
Sample Duplicate: For analytes ≥ 5x RL: RPD: ≤ 20% AQ matrix, ≤ 35% Solid matrix	Duplicate RPD outside QC limit: Batch 460-319427: Sodium Batch 460-319429: Manganese All others acceptable	N/A
MS/MSD (Site Specific QC): Target Analytes 75 < %R < 125; professional judgement if concentration >4X spiked amount; For analytes ≥ 5x RL: RPD: ≤ 20% AQ matrix, ≤ 35% Solid matrix	Batches 460-319427 and 460-319429: MS %R outside QC limit for several elements. LCS acceptable. All others acceptable, no outliers	No
Post-Digestion Spike: 80 < %R < 120	Batch 460-319427: Copper post-dige spike outside QC limit (low). All others acceptable, no outliers	No
Serial Dilution: 5x dilution on MS sample: For results > 50x RL: %D ≤ 10%	All acceptable, no outliers	N/A
Internal Standards: Intensity of IS 70%-130% of ICAL standard	All acceptable, no outliers	
Quantitation: All compounds: RL ≤ results ≤ Linear Calibration Range Detections between MDL and RL qualified with "J"	All acceptable	N/A
Site Specific Field Duplicate - For analytes ≥ 5x RL: RPD: ≤ 30% AQ matrix, ≤ 50% Solid matrix For analytes < 5x RL: professional judgement	Site Specific sample duplicate not required	N/A
Sample Preservation Requirements Met (≤ 6 □C, AQ pH < 2 HNO_3)?	Met	N/A
Holding Time Requirements Met? 180 days	Met	N/A
Target Analyte Reporting: Samples	All acceptable	N/A
OVERALL DISPOSITION	All metals data are reported as provided in the data deliverable and are not qualified, rejected, or negated.	

TABLE 2
Data Quality Assessment/Data Usability Evaluation
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI # 011700, Case 15-09-09-1706-55
Mercury

LABORATORY SDG ID:	**TestAmerica (Edison) 460-99997-1**	
Preparation Batch ID(s):	460-318643, 460-318651	
Analysis Batch ID(s):	460-318713	
DATA OF KNOWN QUALITY PROTOCOL REQUIREMENT	**COMMENT**	**Qualification Required**
Initial Calibration (ICAL):daily prior to analysis of samples; Minimum five standards plus blank; linear regression r ≥ 0.995	All acceptable	N/A
Initial Calibration Verification (ICV): daily after ICAL; separate source from calibration standards; All elements: 90≤ %R ≤ 110%	All acceptable	N/A
Low Level Initial Calibration Verification (LLICV): daily after ICV and at end of run, same source as ICAL standards; All elements: 70≤ %R ≤ 130%	All acceptable	N/A
Initial & Continuing Calibration Blanks (ICB & CCB): after ICV or CCV, result < RL	All acceptable	N/A
Continuing Calibration Verification (CCV): 1 CCV for every 10 samples; All elements: 90≤ %R ≤ 110%	All acceptable	N/A
Low Level Continuing Calibration Verification (LLCCV): daily only if RL STD not in ICAL, same source as ICAL standards; All elements: 70≤ %R ≤ 130%	All acceptable	N/A
Method Blank Contamination: (Target Analytes < RL)	Acceptable, no contamination	N/A
Field/Equipment Blank Contamination: (Not required if using dedicated sampling equipment)	No Field Blank Collected	N/A
Interference Check Standards (ICSA & ICSB): daily after ICAL ISCA & ISCB: 80≤ %R ≤ 120; ISCA: non-spiked analytes ≤ 2x RL	All acceptable, no outliers	N/A
Laboratory Control Sample (LCS): Aqueous Target Analytes: 80<%R<120 Soil/Sediment/Solid LCS: LCS Vendor Limits (95% confidence limit)	All acceptable, no outliers	N/A
Sample Duplicate: For analytes ≥ 5x RL: RPD: ≤ 20% AQ matrix, ≤ 35% Solid matrix For analytes < 5x RL: absolute difference between result ≤ RL	All acceptable	N/A
MS/MSD (Site Specific QC): Target Analytes 75<%R<125; professional judgement if concentration >4X spiked amount; For analytes ≥ 5x RL: RPD: ≤ 20% AQ matrix, ≤ 35% Solid matrix For analytes < 5x RL: absolute difference between result ≤ RL	All acceptable, no outliers	N/A
Quantitation: All compounds: RL ≤ results ≤ Linear Calibration Range Detections between MDL and RL qualified with "J"	All acceptable	N/A
Site Specific Field Duplicate - For analytes ≥ 5x RL: RPD: ≤ 30% AQ matrix, ≤ 50% Solid matrix For analytes < 5x RL: professional judgement	Site Specific sample duplicate not required	N/A
Sample Preservation Requirements Met (≤ 6 □C, AQ pH < 2 HNO_3)?	Met	N/A
Holding Time Requirements Met? 28 days	Met	N/A
Target Analyte Reporting: Samples	All acceptable	N/A
OVERALL DISPOSITION	All metals data are reported as provided in the data deliverable and are not qualified, rejected, or negated.	

Table 3
Remedial Investigation (Waste Characterization) Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

PAHs-PCBs

Lab ID:	NJDEP	NJDEP	NJDEP	**460-100972-1**			**460-100972-2**			**460-100972-3**			**460-100972-4**			**460-100972-5**			**460-100972-6**			**460-100972-7**			**460-100972-8**			**460**
Client ID:	Residential	Non-Residential	IGW	**WC-1**			**WC-2**			**WC-3**			**WC-4**			**WC-5**			**WC-6**			**WC-7**			**WC-8**			
Date Sampled:	SRS	SRS	Screening	**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09**
Matrix:	2012	2012	2013	**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			
Dilution				**1**			**1**			**5**			**1**			**1**			**1**			**5**			**1**			
SVOA-8270D-SOIL				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**
2-Methylnaphthalene	230	2400	8	0.035	J	0.0087	0.026	J	0.0087	0.11	J	0.043	0.016	J	0.0088	0.019	J	0.0087	0.035	J	0.0091	0.17	J	0.0450	0.050	J	0.0089	0.17
Acenaphthene	3400	37000	110	0.13	J	0.0096	0.07	J	0.0096	1.6	J	0.047	0.08	J	0.0096	0.05	J	0.0095	0.26	J	0.0099	1.1	J	0.0490	0.41		0.0098	1.1
Acenaphthylene	NA	300000	NA	0.04	J	0.010	0.06	J	0.010	0.09	J	0.05	0.02	J	0.010	0.04	J	0.010	0.02	J	0.011	2.0	U	0.052	0.03	J	0.010	2.0
Anthracene	17000	30000	2400	0.40		0.038	0.25	J	0.038	12.0		0.19	0.24	J	0.038	0.14	J	0.037	0.72		0.039	2.8		0.190	1.10		0.038	2.7
Benzo[a]anthracene	0.6	2	0.8	**0.90**		0.033	**0.84**		0.033	**10.0**		0.16	**0.94**		0.033	0.54		0.033	**2.4**		0.034	**6.0**		0.170	**2.5**		0.034	**4.0**
Benzo[a]pyrene	0.2	0.2	0.2	**0.84**		0.012	**0.83**		0.012	**6.0**		0.059	**0.81**		0.012	**0.54**		0.012	**2.0**		0.012	**3.8**		0.061	**2.1**		0.012	**3.0**
Benzo[b]fluoranthene	0.6	2	2	**1.1**		0.015	**1.1**		0.015	**8.3**		0.077	**1.2**		0.015	**0.77**		0.015	**3.1**		0.016	**5.0**		0.079	**3.2**		0.016	**4.1**
Benzo[g,h,i]perylene	380000	30000	NA	0.32	J	0.023	0.33	J	0.023	5.4		0.11	0.30	J	0.023	0.21	J	0.023	0.68		0.024	3.60		0.120	0.71		0.023	1.60
Benzo[k]fluoranthene	6	23	25	0.40		0.017	0.40		0.017	3.1		0.085	0.50		0.017	0.25		0.017	1.10		0.018	1.90		0.088	1.20		0.018	1.60
Chrysene	62	230	80	1.1		0.011	0.9		0.011	15.0		0.053	1.1		0.011	0.7		0.011	2.6		0.011	6.6		0.055	2.7		0.011	4.4
Dibenz(a,h)anthracene	0.2	0.2	0.8	0.14		0.021	0.13		0.021	**1.5**		0.10	0.14		0.021	0.10		0.020	**0.3**		0.02	**1.0**		0.11	**0.3**		0.02	**0.6**
Fluoranthene	2300	24000	1300	2.2		0.012	1.7		0.012	33.0		0.058	2.1		0.012	1.3		0.012	5.8		0.012	19.0		0.060	7.4		0.012	13.0
Fluorene	2300	24000	170	0.16	J	0.0086	0.06	J	0.0086	1.4	J	0.043	0.05	J	0.0086	0.04	J	0.0085	0.19	J	0.0089	0.67	J	0.0440	0.30	J	0.0088	0.77
Indeno[1,2,3-cd]pyrene	0.6	2	7	0.43		0.026	0.43		0.026	**6.5**		0.13	0.42		0.026	0.27		0.026	**0.95**		0.027	**4.2**		0.130	**0.98**		0.027	**1.9**
Naphthalene	6	17	25	0.039	J	0.0100	0.034	J	0.0100	0.17	J	0.05	0.034	J	0.010	0.023	J	0.0100	0.082	J	0.0100	0.340	J	0.0510	0.100	J	0.0100	0.310
Phenanthrene	NA	300000	NA	1.4		0.011	0.8		0.011	30.0		0.052	0.9		0.011	0.5		0.010	2.7		0.011	17.0		0.054	3.8		0.011	12.0
Pyrene	1700	18000	840	1.3		0.018	1.1		0.018	22.0		0.089	1.1		0.018	0.8		0.018	3.6		0.019	12.0		0.092	3.6		0.018	6.9
Total Conc	NA	NA	NA	10.936			9.064			156.2			9.949			6.256			26.487			85.170			30.458			58.130

GCSVOA-8082A-SOIL				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**
Aroclor 1016	NA	NA	NA	0.080	U	0.0110	0.080	U	0.0110	0.080	U	0.0110	0.081	U	0.0110	0.080	U	0.0110	0.083	U	0.0110	0.082	U	0.0110	0.082	U	0.0110	0.082
Aroclor 1221	NA	NA	NA	0.080	U	0.0110	0.080	U	0.0110	0.080	U	0.0110	0.081	U	0.0110	0.080	U	0.0110	0.083	U	0.0110	0.082	U	0.0110	0.082	U	0.0110	0.082
Aroclor 1232	NA	NA	NA	0.080	U	0.0110	0.080	U	0.0110	0.080	U	0.0110	0.081	U	0.0110	0.080	U	0.0110	0.083	U	0.0110	0.082	U	0.0110	0.082	U	0.0110	0.082
Aroclor 1242	NA	NA	NA	0.080	U	0.0110	0.080	U	0.0110	0.080	U	0.0110	0.081	U	0.0110	0.080	U	0.0110	0.083	U	0.0110	0.082	U	0.0110	0.082	U	0.0110	0.082
Aroclor 1248	NA	NA	NA	0.080	U	0.0110	0.080	U	0.0110	0.080	U	0.0110	0.081	U	0.0110	0.080	U	0.0110	0.083	U	0.0110	0.082	U	0.0110	0.082	U	0.0110	0.082
Aroclor 1254	NA	NA	NA	0.080	U	0.011	0.080	U	0.011	0.080	U	0.011	0.081	U	0.011	0.080	U	0.011	0.083	U	0.011	0.082	U	0.011	0.082	U	0.011	0.082
Aroclor 1260	NA	NA	NA	0.080	U	0.011	0.080	U	0.011	0.080	U	0.011	0.081	U	0.011	0.080	U	0.011	0.083	U	0.011	0.082	U	0.011	0.082	U	0.011	0.082
Aroclor 1262	NA	NA	NA	0.080	U	0.011	0.080	U	0.011	0.080	U	0.011	0.081	U	0.011	0.080	U	0.011	0.083	U	0.011	0.082	U	0.011	0.082	U	0.011	0.082
Aroclor 1268	NA	NA	NA	0.080	U	0.011	0.080	U	0.011	0.080	U	0.011	0.081	U	0.011	0.080	U	0.011	0.083	U	0.011	0.082	U	0.011	0.082	U	0.011	0.082
Total PCBs	0.2	1	0.2	0.080	U	0.011	0.080	U	0.011	0.080	U	0.011	0.081	U	0.011	0.080	U	0.011	0.083	U	0.011	0.082	U	0.011	0.082	U	0.011	0.082

NA: Not Applicable
SRS: Soil Remediation Standard
IGW: Impact to Groundwater
MDL: Method Detection Limit
U : Indicates the analyte was analyzed for but not detected.
J : Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 : MS and/or MSD Recovery is outside acceptance limits.

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Table 3
Remedial Investigation (Waste Characterization) Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

PAHs-PCBs

Lab ID:	NJDEP	NJDEP	NJDEP	**-100972-9**		**460-100972-10**			**460-100972-11**			**460-100972-12**			**460-100972-13**			**460-100972-14**		
Client ID:	Residential	Non-Residential	IGW	**WC-9**		**WC-10**			**WC-11**			**WC-12**			**WC-13**			**WC-14**		
Date Sampled:	SRS	SRS	Screening	**/11/2015**		**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**		
Matrix:	2012	2012	2013	**Soil**		**Soil**			**Soil**			**Soil**			**Soil**			**Soil**		
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**		**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Dilution				**5**		**2**			**1**			**1**			**1**			**1**		
SVOA-8270D-SOIL				**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
2-Methylnaphthalene	230	2400	8	J	0.0450	0.032	J	0.0170	0.016	J	0.0088	0.020	J F1	0.0086	0.38	U	0.0083	0.009	J	0.0088
Acenaphthene	3400	37000	110	J	0.0490	0.27	J	0.0190	0.08	J	0.0096	0.16	J F1	0.0094	0.02	J *	0.0091	0.06	J *	0.0096
Acenaphthylene	NA	300000	NA	U	0.052	0.02	J	0.020	0.02	J	0.010	0.39	U F1	0.010	0.01	J	0.010	0.01	J	0.010
Anthracene	17000	30000	2400		0.190	0.84		0.074	0.26	J	0.038	0.53	F1	0.037	0.06	J	0.036	0.17	J	0.038
Benzo[a]anthracene	0.6	2	0.8		0.170	**2.7**		0.065	**1.1**		0.033	**1.3**	F1	0.032	0.27		0.031	**0.75**		0.033
Benzo[a]pyrene	0.2	0.2	0.2		0.061	**2.2**		0.024	**0.90**		0.012	**1.0**	F1	0.012	**0.25**		0.011	**0.66**		0.012
Benzo[b]fluoranthene	0.6	2	2		0.079	**2.8**		0.030	**1.4**		0.015	**1.4**	F1	0.015	0.37		0.015	**0.96**		0.016
Benzo[g,h,i]perylene	380000	30000	NA	J	0.120	1.30		0.045	0.32	J	0.023	0.64		0.022	0.09	J	0.022	0.21	J	0.023
Benzo[k]fluoranthene	6	23	25		0.088	1.10		0.034	0.58		0.017	0.52	F1	0.017	0.15		0.016	0.33		0.017
Chrysene	62	230	80		0.055	3.1		0.021	1.1		0.011	1.4	F1	0.011	0.3	J	0.010	0.9		0.011
Dibenz(a,h)anthracene	0.2	0.2	0.8		0.11	**0.4**		0.04	0.15		0.021	**0.2**		0.020	0.047		0.020	0.089		0.021
Fluoranthene	2300	24000	1300		0.060	5.9		0.023	2.3		0.012	3.0	F1	0.012	0.7		0.011	1.6		0.012
Fluorene	2300	24000	170	J	0.0440	0.25	J	0.0170	0.06	J	0.0086	0.13	J F1	0.0085	0.02	J	0.0082	0.05	J	0.0087
Indeno[1,2,3-cd]pyrene	0.6	2	7		0.130	**1.6**		0.052	0.45		0.026	**0.76**		0.026	0.11		0.025	0.26		0.026
Naphthalene	6	17	25	J	0.0510	0.100	J	0.0200	0.030	J	0.0100	0.031	J F1	0.0099	0.380	U	0.0096	0.017	J	0.0100
Phenanthrene	NA	300000	NA		0.054	3.2		0.021	1.0		0.011	1.7	F1	0.010	0.3	J	0.010	0.8		0.011
Pyrene	1700	18000	840		0.092	4.9		0.035	1.3		0.018	2.6	F1	0.018	0.4	J	0.017	1.1		0.018
Total Conc	NA	NA	NA			30.745			11.042			15.401			2.992			7.906		

GCSVOA-8082A-SOIL				**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aroclor 1016	NA	NA	NA	U	0.0110	0.079	U	0.0100	0.081	U	0.0110	0.079	U	0.0100	0.077	U	0.0100	0.080	U	0.0110
Aroclor 1221	NA	NA	NA	U	0.0110	0.079	U	0.0100	0.081	U	0.0110	0.079	U	0.0100	0.077	U	0.0100	0.080	U	0.0110
Aroclor 1232	NA	NA	NA	U	0.0110	0.079	U	0.0100	0.081	U	0.0110	0.079	U	0.0100	0.077	U	0.0100	0.080	U	0.0110
Aroclor 1242	NA	NA	NA	U	0.0110	0.079	U	0.0100	0.081	U	0.0110	0.079	U	0.0100	0.077	U	0.0100	0.080	U	0.0110
Aroclor 1248	NA	NA	NA	U	0.0110	0.079	U	0.0100	0.081	U	0.0110	0.079	U	0.0100	0.077	U	0.0100	0.080	U	0.0110
Aroclor 1254	NA	NA	NA	U	0.011	0.079	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011
Aroclor 1260	NA	NA	NA	U	0.011	0.079	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011
Aroclor 1262	NA	NA	NA	U	0.011	0.079	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011
Aroclor 1268	NA	NA	NA	U	0.011	0.079	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011
Total PCBs	0.2	1	0.2	U	0.011	0.079	U	0.011	0.081	U	0.011	0.079	U	0.011	0.077	U	0.011	0.080	U	0.011

NA: Not Applicable
SRS: Soil Remediation Standard
IGW: Impact to Groundwater
MDL: Method Detection Limit
U : Indicates the analyte was analyzed for but not detected.
J : Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
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Table 3
Remedial Investigation (Waste Characterization) Sampling Results
Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

Metals

Lab ID:	NJDEP	NJDEP	NJDEP	460-100972-1			460-100972-2			460-100972-3			460-100972-4			460-100972-5			460-100972-6			460-100972-7			460-100972-8		
Client ID:	Residential	Non-Residential	IGW	**WC-1**			**WC-2**			**WC-3**			**WC-4**			**WC-5**			**WC-6**			**WC-7**			**WC-8**		
Date Sampled:	SRS	SRS	Screening	**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**		
Matrix:	2012	2012	2013	**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**		
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Dilution																											
METALS-SOIL BY 6020A				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aluminum	78000	NA	6000	**26500**		24.5	**23100**		24.0	**18800**		21.9	**17200**		24.8	**16400**		24.3	**19200**		25.1	**12100**		24.7	**17800**		24.7
Antimony	31	450	6	2.2	J	1.90	4.7	U	1.80	4.2	U F1	1.70	4.8	U	1.90	4.7	U	1.90	4.9	U	1.90	1.9	J	1.90	4.8	U	1.90
Arsenic	19	19	19	9.9		1.20	10.2		1.10	18.8		1.00	9.9		1.20	10.1		1.20	10.9		1.20	7.9		1.20	7.4		1.20
Barium	16000	59000	2100	265		1.70	208		1.70	166		1.50	139		1.70	107		1.70	159		1.70	125		1.70	125		1.70
Beryllium	16	140	0.7	**1.5**		0.40	**1.2**		0.39	0.5		0.36	**1.0**		0.41	**1.1**		0.40	**1.2**		0.41	**1.0**		0.41	**0.79**		0.41
Cadmium	78	78	2	1.0	U	0.50	0.9	U	0.49	0.9	U	0.44	1.0	U	0.50	0.9	U	0.49	1.0	U	0.51	1.0	U	0.50	1.0	U	0.50
Calcium	NA	NA	NA	11200		70.4	20100		68.9	78100		174.0	21200		71.2	18300		69.7	45300		72.2	111000		178.0	41200		71.1
Chromium	NA	NA	NA	38.8		1.20	41.2		1.10	56.6	F1	1.00	40.7		1.20	34.6		1.10	43.7		1.20	33.4		1.20	61.2		1.20
Cobalt	1600	590	90	14.8		1.40	16.6		1.30	8.6	J	1.20	12.5		1.40	12.4		1.40	12.0	J	1.40	7.7	J	1.40	14.8		1.40
Copper	3100	45000	11000	32.8		1.50	46.8		1.50	34.8		1.50	37.1		1.60	45.5		1.50	667.0		1.60	55.9		1.60	55.4		1.60
Iron	NA	NA	NA	34000		26.9	34300		26.3	19400		24.0	30800		27.2	27900		26.6	28900		27.5	14600		27.1	29000		27.1
Lead	400	800	90	49.7		0.93	27.5		0.91	34.5		0.83	29.3		0.94	28.7		0.92	33.4		0.96	60.2		0.94	45.6		0.94
Magnesium	NA	NA	NA	7460		59.4	9210		58.1	11000		53.0	6200		60.0	7290		58.8	9410		60.8	11100		59.9	9520		59.9
Manganese	11000	5900	65	**850**		1.2	**831**		1.2	**587**		1.1	**438**		1.3	**519**		1.2	**533**		1.3	**406**		1.3	**466**		1.3
Nickel	1600	23000	48	30.5		1.70	30.4		1.70	24.8		1.50	22.3		1.80	22.9		1.70	27.5		1.80	23.2		1.80	**53.0**		1.80
Potassium	NA	NA	NA	4490		36.0	4110		35.3	4100	F1	32.2	3220		36.4	3570		35.7	4310		36.9	2150		36.4	2700		36.4
Selenium	390	5700	11	4.80	U	1.60	4.70	U	1.60	4.20	U	1.50	4.80	U	1.70	4.70	U	1.60	4.90	U	1.70	4.80	U	1.70	4.80	U	1.70
Silver	390	5700	1	2.4	U	0.42	2.3	U	0.41	2.1	U	0.37	2.4	U	0.42	2.4	U	0.42	2.4	U	0.43	2.4	U	0.42	2.4	U	0.42
Sodium	NA	NA	NA	817	J	80.5	802	J	78.8	3570	F1	71.9	557	J	81.4	644	J	79.7	1660		82.5	874	J	81.3	1270		81.3
Thallium	5	79	3	4.80	U	2.10	4.70	U	2.10	4.20	U	1.90	4.80	U	2.10	4.70	U	2.10	4.90	U	2.20	4.80	U	2.10	4.80	U	2.10
Vanadium	78	1100	NA	47.4		1.20	58.7		1.20	35.3		1.10	52.8		1.20	51.7		1.20	50.3		1.20	30.4		1.20	46.2		1.20
Zinc	23000	110000	930	109.0		1.7	99.1		1.7	173.0	F1	1.5	87.1		1.8	87.9		1.7	155.0		1.8	428.0		1.8	163.0		1.8

SOIL BY 7471B				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Mercury	23	65	0.1	0.086		0.014	0.076		0.013	**0.18**		0.014	**0.15**		0.013	**0.15**		0.013	**0.14**		0.015	**0.21**		0.013	**0.11**		0.014

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Former University Medical Center @ Princeton, 253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

Metals

Lab ID:	NJDEP	NJDEP	NJDEP	**460-100972-9**			**460-100972-10**			**460-100972-11**			**460-100972-12**			**460-100972-13**			**460-100972-14**		
Client ID:	Residential	Non-Residential	IGW	**WC-9**			**WC-10**			**WC-11**			**WC-12**			**WC-13**			**WC-14**		
Date Sampled:	SRS	SRS	Screening	**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**			**09/11/2015**		
Matrix:	2012	2012	2013	**Soil**			**Soil**			**Soil**			**Soil**			**Soil**			**Soil**		
Unit:	mg/kg	mg/kg	mg/kg	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Dilution																					
METALS-SOIL BY 6020A				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Aluminum	78000	NA	6000	**12800**		25.3	**19500**		23.6	**18200**		24.1	**19400**		23.4	**16100**		22.9	**17200**		24.1
Antimony	31	450	6	**7.7**	F1	1.90	4.6	U	1.80	4.7	U	1.80	4.5	U	1.80	4.4	U	1.80	4.7	U	1.80
Arsenic	19	19	19	10.1		1.20	12.4		1.10	11.5		1.10	18.6		1.10	14.0		1.10	11.5		1.10
Barium	16000	59000	2100	116		1.80	147		1.60	148		1.70	124		1.60	77		1.60	124		1.70
Beryllium	16	140	0.7	0.6		0.42	**1.3**		0.39	**1.1**		0.40	**1.5**		0.38	**1.1**		0.38	**1.1**		0.40
Cadmium	78	78	2	1.0	U	0.51	0.7	J	0.48	0.93	U	0.49	0.9	U	0.47	0.9	U	0.46	0.9	U	0.49
Calcium	NA	NA	NA	89000		363.0	36000		67.7	28700		69.2	17400		67.2	14400		65.7	26000		69.2
Chromium	NA	NA	NA	43.0		1.20	38.4		1.10	34.3		1.10	56.0		1.10	38.9		1.10	36.8		1.10
Cobalt	1600	590	90	6.5	J	1.40	12.7		1.30	12.5		1.30	12.9		1.30	16.2		1.30	12.5		1.30
Copper	3100	45000	11000	37.3		1.60	43.1		1.50	37.9		1.50	38.2		1.50	56.2		1.40	52.6		1.50
Iron	NA	NA	NA	16400		27.7	30000		25.9	27700		26.4	39400		25.6	33400		25.1	29200		26.4
Lead	400	800	90	42.4		0.96	37.0		0.90	33.9		0.92	29.1		0.89	21.3		0.87	30.8		0.92
Magnesium	NA	NA	NA	7650		61.2	9360		57.1	7630		58.3	7420		56.6	9490		55.4	8450		58.3
Manganese	11000	5900	65	**344**		1.3	**663**		1.2	**693**		1.2	**402**		1.2	**503**		1.2	**561**		1.2
Nickel	1600	23000	48	20.8		1.80	24.6		1.70	23.1		1.70	27.6		1.70	27.0		1.60	23.5		1.70
Potassium	NA	NA	NA	2120		37.2	3530		34.7	3290		35.4	4040		34.4	3370		33.6	3460		35.4
Selenium	390	5700	11	4.90	U	1.70	4.60	U	1.60	4.70	U	1.60	4.50	U	1.60	4.40	U	1.50	4.70	U	1.60
Silver	390	5700	1	2.5	U F1	0.43	2.3	U	0.40	2.3	U	0.41	2.3	U	0.40	2.2	U	0.39	2.3	U	0.41
Sodium	NA	NA	NA	1200	J	83.0	924	J	77.5	667	J	79.1	476	J	76.8	916	J	75.1	786	J	79.1
Thallium	5	79	3	4.90	U	2.20	4.60	U	2.00	4.70	U	2.10	4.50	U	2.00	4.40	U	2.00	4.70	U	2.10
Vanadium	78	1100	NA	35.1	F1	1.20	61.2		1.10	59.0		1.20	74.4		1.10	67.9		1.10	55.0		1.20
Zinc	23000	110000	930	198.0	F1	1.8	114.0		1.7	115.0		1.7	101.0		1.7	80.0		1.6	128.0		1.7

SOIL BY 7471B				**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**	**Conc.**	**Qual**	**MDL**
Mercury	23	65	0.1	**0.24**		0.013	**0.27**		0.014	0.10		0.014	**0.14**		0.013	0.06		0.012	**0.14**		0.014

NA: Not Applicable
SRS: Soil Remediation Standard
IGW: Impact to Groundwater
MDL: Method Detection Limit
U : Indicates the analyte was analyzed for but not detected.
J : Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 : MS and/or MSD Recovery is outside acceptance limits.

###	-Boxed BLUE bold font: Indicates exceedance of IGW
###	-Boxed bold font: Indicates exceedance of SRS
###	-Yellow-highlighted boxed bold font: Indicates exceedance of SRS and IGW

SIR/RIR/RAW ATTACHMENT A

Copies of NJDEP Site Remediation Reform Act (SRRA) Forms:

Case Inventory Document
Cover/Certification Form
Preliminary Assessment/Site Investigation Form
Remedial Investigation Report Form
Remedial Action Workplan Form
Receptor Evaluation Form
Alternate Remedy/Remedial Action Pre-Approval Form

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

	A	B	D	E	F	H	I	J	K	L	M
1	**Case Name:**	Former University Medical Center at Princeton									
2	**PI #:**	011700									
3	IMPORTANT: *Do not copy and paste into more than 1 cell at a time because it can disrupt hidden equations*										
4	**Case Inventory Document Version 1.3 06/25/14**										
5	**AOC ID**	**AOC Type**	**AOC Details**	**Confirmed Contamination**	**AOC Status**	**Status Date**	**Incident #**	**DEP AOC Number**	**Contaminated Media**	**Contaminants of Concern**	**Additional Contaminants of Concern**
6	AOC-1	Other areas of concern - Other discharge area	Reworked Site Materials throughout the Site contain PAHs and certain metals at concentrations in excess of the RDCSRS. Constituents above RDCSRS were also identified in the stockpile of surplus crushed masonry material.	Yes	RAW	9/21/2015	15-09-09-1706-55		Soil	PAHs	Metals

	N	O	P	Q	R	S	T	U	V
1									
2									
3									
4									
5	**Additional Contaminants of Concern**	**Applicable Remediation Standard**	**Exposure Route**	**Additional Exposure Route**	**RA Type**	**Additional RA Type**	**Additional RA Type**	**Was an Order of Magnitude Evaluation Conducted?**	**Activity**
6		Remediation Standards	Ingestion/Dermal						Site Investigation: All structures at the Site were decommissioned and demolished in 2014-2015. A portion of the Reworked Site Materials were placed throughout the property and compacted. The remainder is stockpiled for disposal. The stockpiled Rewoked Site Materials were sampled for disposal characterization. This sampling revealed minor Residential Direct Contact Soil Remediation Standard (RDCSRS) exceedances. Remedial Investigation: Reworked Site Materials were documented to be present throughout the Site, extending to depths of up to seven feet below ground surface, and exhibiting exceedances of PAHs and metals above RCDSRS. Remedial Action Workplan: Surplus stockpiled Reworked Site Material will be removed for offsite disposal. The remedial action consists of the engineering controls (cap) and institutional control (Deed Notice) in accordance with the NJDEP Presumptive and Alternative Remedy Technical Guidance. The majority of the subgrade Site utilities were installed within the Reworked Site Materials prior to the discovery of contaminants above RDCSRS. The RAW includes an Alternative Remedy application. The proposed Alternative Remedy consists of using Reworked Site Materials in the utility corridors. The Alternative Remedy is equally protective over time as the Presumptive Remedy because the Site will be a rental community under the oversight and control of the property owner. Disruptions to the utility corridors in the future will be conducted under the oversight of the LSRP or his designee. The Presumptive Remedy is also impactical due to Site conditions. All other components of the proposed engineering controls conform to the respective Presumptive Remedy specifications.

New Jersey Department of Environmental Protection
Site Remediation Program

COVER/CERTIFICATION FORM

(Submit with Remedial Phase Report, Receptor Evaluation, and CEA Forms)

Date Stamp
(For Department use only)

SECTION A. SITE INFORMATION

Site Name: Former Medical Center at Princeton

AKAs:

Street Address: 253 Witherspoon Street

Municipality: Princeton (*Township, Borough or City*)

County: Mercer Zip Code: 08540

Program Interest (PI) Number(s): 011700

Case Tracking Number(s) for this submission: 15-09-09-1706-55

Date Remediation Initiated Pursuant to N.J.A.C. 7:26C-2: 09/09/2015

State Plane Coordinates for a central location at the site: Easting: 446991 Northing: 554801

List current Municipal Block and Lot Numbers of the Site:

Block # 21.02	Lot #(s) 1	Block #	Lot #(s)
Block #	Lot #(s)	Block #	Lot #(s)
Block #	Lot #(s)	Block #	Lot #(s)
Block #	Lot #(s)	Block #	Lot #(s)

SECTION B. SUBMISSION STATUS

1. Indicate how the Electronic Data Deliverable (EDD) for this submission is being provided to the NJDEP:
   - ☒ Via Email at srpedd@dep.state.nj.us (attach NJDEP confirmation email); or
   - ☐ CD (attach to this submission)
   - ☐ Not Applicable – No EDD

   (See Attachment C)
2. Complete the following Submission and Permit Status Table:

Remedial Phase Documents	N/A	Included in this Submission	Previously Submitted	Date of Submission	Date of Revised Submission	Date of Previous NJDEP Approval	Date of Document Withdrawal
Preliminary Assessment Report	☒	☐	☐				
Site Investigation Report	☐	☒	☐				
Remedial Investigation Report	☐	☒	☐				
Remedial Action Work Plan	☐	☒	☐				
Remedial Action Report	☒	☐	☐				
Response Action Outcome	☒	☐	☐				
Other Submissions							
Alternative Soil Remediation Standard and/or Screening level Application Form	☒	☐	☐				
Case Inventory Document		☒					
Classification Exception Area / Well Restriction Area (CEA/WRA)	☒	☐	☐				
Discharge to Ground Water Permit by Rule Authorization Request	☒	☐	☐				

IEC Engineered System Response Action Report	☒	☐	☐				
Immediate Environmental Concern Report	☒	☐	☐				
LNAPL Interim Remedial Measure Report	☒	☐	☐				
Public Notification	☐	☒	☐				
Receptor Evaluation	☐	☒	☐				
Technical Impracticability Determination	☒	☐	☐				
Vapor Concern Mitigation Report	☒	☐	☐				
Permit Application – list:	☐						
		☐	☐				
		☐	☐				
		☐	☐				
		☐	☐				
Radionuclide Remedial Action Report	☒	☐	☐				
Radionuclide Remedial Action Workplan	☒	☐	☐				
Radionuclide Remedial Investigation Report	☒	☐	☐				
Radionuclide Remedial Investigation Workplan	☒	☐	☐				

SECTION C. SITE USE

Current Site Use: (*check all that apply*)

- ☐ Industrial
- ☐ Residential
- ☐ Commercial
- ☐ School or child care
- ☐ Agricultural
- ☐ Park or recreational use
- ☐ Vacant
- ☐ Government
- ☒ Other: Under Construction

Intended Future Site Use, if known: (*check all that apply*)

- ☐ Industrial
- ☒ Residential
- ☐ Commercial
- ☐ School or child care
- ☐ Park or recreational use
- ☐ Vacant
- ☐ Government
- ☐ Future site use unknown
- ☐ Other: _____

SECTION D. CASE TYPE: (*check all that apply*)

- ☐ Administrative Consent Order (ACO)
- ☐ Brownfield Development Area (BDA)
- ☐ Child Care Facility
- ☐ Chrome Site (Chromate chemical production waste)
- ☐ Coal Gas
- ☐ Due Diligence with RAO
- ☐ Hazardous Discharge Remediation Fund (HDSRF) Grant/Loan
- ☐ ISRA
- ☐ Landfill (SRP subject only)
- ☐ Regulated Underground Storage Tank (UST)
- ☐ Remediation Agreement (RA)/Remediation Certification
- ☐ School Development Authority (SDA)
- ☐ School facility
- ☐ Spill Act Defense – Government Entity
- ☐ Spill Act Discharge
- ☐ UST Grant/Loan
- ☒ Other: Testing of reworked site material revealed the presence of low concentrations of certain base/neutral compounds and metals.

Federal Case (*check all that apply*)

☐ RCRA GPRA 2020 ☐ CERCLA/NPL ☐ USDOD ☐ USDOE

1. Is the party conducting remediation a government entity? ..... ☐ Yes ☒ No

   If "Yes," check one: ☐ Federal ☐ State ☐ Municipal ☐ County

SECTION E. PUBLIC FUNDS

Did the remediation utilize public funds? ..... ☐ Yes ☒ No

If "Yes," check applicable:

- ☐ UST Grant
- ☐ HDSRF Grant
- ☐ Spill Fund
- ☐ UST Loan
- ☐ HDSRF Loan
- ☐ Schools Development Authority
- ☐ Brownfield Reimbursement Program
- ☐ Landfill Reimbursement Program
- ☐ Environmental Infrastructure Trust

SECTION F. PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: Avalon Princeton, LLC

Representative First Name: Ronald Representative Last Name: Ladell

Title: Senior Vice President - AvalonBay Communities, Inc.

Phone Number: (732) 404-4820 Ext: Fax: (732) 283-9101

Mailing Address: 517 Route One South, Suite 5500

City/Town: Iselin State: New Jersey Zip Code: 08830

Email Address: Ronald_Ladell@avalonbay.com

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: Date: 9/21/15

Name/Title: Ronald Ladell/Senior Vice President

For CEA Submissions:

☐ Check this box if the person above is also the property owner of the site or their representative. If this person is not the site property owner, please ensure the site property owner's name and address is in the first line of the table in Section E.2 of the Classification Exception Area / Well Restriction Area (CEA/WRA) Fact Sheet Form.

SECTION G. LICENSED SITE REMEDIATION PROFESSIONAL INFORMATION AND STATEMENT

LSRP ID Number: 585775

First Name: Peter Last Name: Hansen

Phone Number: (973) 366-9500 Ext: Fax: (973) 366-9593

Mailing Address: 75 Fleetwood Drive, Suite 250

City/Town: Rockaway State: New Jersey Zip Code: 07866

Email Address: phansen@ecolsciences.com

This statement shall be signed by the LSRP who is submitting this notification in accordance with section 14 of P.L.2009 c.60 (N.J.S.A. 58:10C-14), and paragraphs (1) and (2) of subsection b. of section 30 of P.L.2009 c.60 (N.J.S.A. 58:10B=1.3b(1) and (2)).

I certify that I am a Licensed Site Remediation Professional authorized pursuant to N.J.S.A. 58:10C to conduct business in New Jersey. As the Licensed Site Remediation Professional of record for this remediation, I:

[SELECT ONE OR BOTH OF THE FOLLOWING AS APPLICABLE]:

☐ *directly oversaw and supervised all of the referenced remediation, and\or*

☒ *personally reviewed and accepted all of the referenced remediation presented herein.*

I believe that the information contained herein, and including all attached documents, is true, accurate and complete.

It is my independent professional judgment and opinion that the remediation conducted at this site, as reflected in this submission to the Department, conforms to, and is consistent with, the remediation requirements in N.J.S.A. 58:10C-14.

My conduct and decisions in this matter were made upon the exercise of reasonable care and diligence, and by applying the knowledge and skill ordinarily exercised by licensed site remediation professionals practicing in good standing, in accordance with N.J.S.A. 58:10C-16, in the State of New Jersey at the time I performed these professional services.

I am aware pursuant to N.J.S.A. 58:10C-17 that for purposely, knowingly or recklessly submitting false statement, representation or certification in any document or information submitted to the board or Department, etc., that there are significant civil, administrative and criminal penalties, including license revocation or suspension, fines and being punished by imprisonment for conviction of a crime of the third degree.

LSRP Signature: Date: 9/21/2015

LSRP Name/Title: Peter A. Hansen/Assistant Vice President

Company Name: EcolSciences, Inc.

Completed forms should be sent to:

Bureau of Case Assignment & Initial Notice
Site Remediation Program
NJ Department of Environmental Protection
401-05H
PO Box 420
Trenton, NJ 08625-0420

New Jersey Department of Environmental Protection
Site Remediation Program
PRELIMINARY ASSESSMENT / SITE INVESTIGATION FORM
(Also Use this Form For Unknown Source Investigations)
☐ PA ☒ SI ☐ Unknown Source Investigation

Date Stamp
(For Department use only)

A Phase I or Phase II is not equivalent to a Preliminary Assessment or Site Investigation; therefore, they are not acceptable substitutions.

SECTION A. SITE

Site Name: Former Medical Center at Princeton

Program Interest (PI) Number(s): 011700

Case Tracking Number(s) for this submission: 15-09-09-1706-55

This form must be attached to the Cover/Certification Form

SECTION B. GENERAL

1. Prior to this submission have any NFAs/RAOs been issued for this site? ☒ Yes ☐ No
   a. Does the site currently have a Deed Notice? ☐ Yes ☒ No
   b. Does the site currently have a Classification Exception Area (CEA)? ☐ Yes ☒ No
   c. Has an order of magnitude evaluation been performed? ☐ Yes ☐ No ☒ N/A
2. Is the ground water at the site classified as a Class I Ground Water? ☐ Yes ☒ No
3. Are there potable wells on-site? ☐ Yes ☒ No
4. Has the remediation varied from the Technical Rules? ☐ Yes ☒ No

   If "Yes." provide the citation(s) from which the remediation has varied and the page(s) in the attached document where the rationale for the variance is provided.

   N.J.A.C. 7:26E-_____ Page_____

   N.J.A.C. 7:26E-_____ Page_____

   N.J.A.C. 7:26E-_____ Page_____

5. **Areas of Concern:**
   a) For PA or PA/SI Report, list each AOC.
   b) For SI Report or Unknown Source Investigation, check **only** AOCs documented in this submission

	Area of Concern	Currently Exists? ☒ if "Yes"	Formerly Existed? ☒ if "Yes"	Investigation: SI Conducted ☒ if "Yes"	Investigation: RI Proposed ☒ if "Yes"
1	Above ground storage tank and associated piping	☐	☐	☐	☐
2	Area of stressed vegetation	☐	☐	☐	☐
3	Area which receives flood or storm water from potentially contaminated areas	☐	☐	☐	☐
4	Chemical storage cabinet and closet	☐	☐	☐	☐
5	Compressor vent discharge	☐	☐	☐	☐
6	Discharge area pursuant to N.J.A.C. 7:1E	☐	☐	☐	☐
7	Discolored or spill area	☐	☐	☐	☐
8	Drainage swale and culvert	☐	☐	☐	☐
9	Drywell and sump	☐	☐	☐	☐
10	Dumpster	☐	☐	☐	☐
11	Electrical transformer and capacitor	☐	☐	☐	☐

12	Floor drain collection system	☐	☐	☐	☐
13	Former agricultural applied pesticide area	☐	☐	☐	☐
14	Hazardous material storage or handling area	☐	☐	☐	☐
15	Historic fill or any other fill material	☐	☐	☐	☐
16	Hydraulic lift	☐	☐	☐	☐
17	Incinerator	☐	☐	☐	☐
18	Landfill or landfarm	☐	☐	☐	☐
19	Loading and unloading area	☐	☐	☐	☐
20	Non-contact cooling water discharge	☐	☐	☐	☐
21	Open area away from production area	☐	☐	☐	☐
22	Piping, above ground and below ground pumping station, sump and pit	☐	☐	☐	☐
23	Process area sink and piping which receive process waste	☐	☐	☐	☐
24	Rail car	☐	☐	☐	☐
25	Roof leader when process operations vent to the roof	☐	☐	☐	☐
26	Septic system, leachfield or seepage pit	☐	☐	☐	☐
27	Silo	☐	☐	☐	☐
28	Sprayfield	☐	☐	☐	☐
29	Storage pad including drum and/or waste storage	☐	☐	☐	☐
30	Storm sewer and spill containment collection system	☐	☐	☐	☐
31	Storm water detention pond and fire pond	☐	☐	☐	☐
32	Surface impoundment and lagoon	☐	☐	☐	☐
33	Surface water body	☐	☐	☐	☐
34	Underground piping including industrial process sewer	☐	☐	☐	☐
35	Underground storage tank and associated piping	☐	☐	☐	☐
36	Waste pile as defined by N.J.A.C. 7:26	☐	☐	☐	☐
37	Waste water treatment	☐	☐	☐	☐
38	Other: Reworked Site Material	☒	☐	☒	☒

SECTION C. PRELIMINARY ASSESSMENT

N/A

Complete this section only if you are submitting a PA

1. Was an inspection of the site conducted? ..... ☐ Yes ☐ No

   Date of the most recent inspection: _____

2. Did the PA identify any areas of concern? ..... ☐ Yes ☐ No
3. Identify the location in the report (e.g. page #, Figure #, Appendix #) of the site map showing AOCs: _____
4. Identify all current and historic industrial, commercial, agricultural or residential uses at the site dating back to the time the site was naturally vegetated.

   Provide the current and historic operators/operations. (attach additional sheets as necessary)

Name of Operator	Type of Operation – e.g., dry cleaning, electro-plating, residence	Dates of Operation Start	End

5. Have all regulated USTs on site been registered with the NJDEP? ☐ Yes ☐ No ☐ NA
   If "No," complete and submit an UST Facility Certification Questionnaire to the NJDEP to update the registration prior to submitting this form.
6. Have all regulated USTs that have been closed been delisted from the registration? ☐ Yes ☐ No ☐ NA
   If "No," complete and submit an UST Facility Certification Questionnaire to the NJDEP to update the registration prior to submitting this form.
7. Have any USTs been removed on/after September 4, 1990? ☐ Yes ☐ No ☐ NA
8. Including this submission, has an SI/RI report been submitted for all USTs closed on/after September 4, 1990? ☐ Yes ☐ No ☐ NA

SECTION D. SITE INVESTIGATION

Complete this section only if you are submitting a SI or Unknown Source Investigation Report

1. Does the SI address:
   ☒ Area(s) of Concern (AOCs) Only
   ☐ Entire Site (Based on a completed and submitted Preliminary Assessment/Site Investigation)
2. Total number of contaminated AOCs associated with the case: 1
3. Total number of contaminated AOCs addressed in this submission: 1
4. Identify the media impacted above applicable standards/screening levels (*check all that apply*).
   ☒ Soil ☐ Ground water ☐ Sediment ☐ Surface water
   ☐ Soil gas ☐ Indoor air
   ☐ No sampling results above applicable standards/screening levels.

   If any media have been impacted above applicable standards/screening levels, identify the type of contamination below (*check all that apply*).

Soil	Ground Water	Sediment	Surface Water	Type Of Contamination
☐	☐	☐	☐	Volatile Organics
☒	☐	☐	☐	Polycyclic Aromatic Hydrocarbons(PAHs)
☐	☐	☐	☐	Acid Extractables
☐	☐	☐	☐	Base Neutrals (non-PAHs)
☒	☐	☐	☐	Metals (other than arsenic, chromium & mercury)
☐	☐	☐	☐	Pesticides
☐	☐	☐	☐	PHC
☐	☐	☐	☐	PCBs
☐	☐	☐	☐	Chromium
☐	☐	☐	☐	Dioxin
☐	☐	☐	☐	Mercury
☒	☐	☐	☐	Arsenic
☐	☐	☐	☐	Perchlorate, RDX, TNT, etc.
☐	☐	☐	☐	Other, specify: _____

5. Has a well search been conducted pursuant to N.J.A.C. 7:26E-1.14? ☐ Yes ☒ No

   If "Yes," are there any potable wells within 200' of the contaminated AOCs listed in Section F above or within 200' of the site boundary? ☐ Yes ☐ No

6. Has the presence of free product been identified? ☐ Yes ☒ No

7. Is an environmentally sensitive natural resource (ESNR) present on, adjacent to, or potentially impacted by the site? ☐ Yes ☒ No

   If "Yes," provide the following information:

   a. Specify the section/page(s) of the report where the site map showing the location of all ESNRs can be found (e.g. page #, Figure #, Appendix #): _____

   b. Are there visible signs of impact/impairment (e.g., discolored media, stressed vegetation, discharge/spill, seeps, fish kill)? ☐ Yes ☐ No

   c. Were land use permits required to complete any of the investigative activities? ☐ Yes ☐ No

   d. Specify the section/page(s) of the report where the land use permits are discussed: _____

8. Have Alternative Soil Remediation Standards (ASRS) been utilized for Inhalation and/or Ingestion/Dermal pathways? ☐ Yes ☒ No

9. Are you proposing an alternative remediation standard pursuant to N.J.A.C. 7:26D-7.4, alternate vapor intrusion screening level, or ecological site specific goal? ☐ Yes ☒ No

   If "Yes," attach the Alternative Remediation Standard and/or Screening Level Application Form as an addendum.

10. Was a site-specific screening level developed for the evaluation of the VI pathway? ☐ Yes ☒ No

11. Have any site specific Impact to Groundwater Soil Remediation Standards (IGWSRS) been established? ☐ Yes ☒ No

12. Was an Interim Soil Remediation Standard proposed where a Standard does not currently exist? ☐ Yes ☒ No

    If "Yes," attach the Alternative Remediation Standard and/or Screening Level Application Form as an addendum.

13. Is Historic Fill present? ☐ Yes ☒ No

    If "Yes":

    a). What is the evidence that Historic Fill is present?

    b). Are any other AOCs co-located within the Historic Fill? ☐ Yes ☐ No

    If "Yes," have the same contaminant types (e.g. lead arsenic, etc.) characterized as being present in the Historic Fill been sampled for as contaminants of concern at these co-located AOCs? ☐ Yes ☐ No

14. Is ground water contamination present above applicable standards? ☐ Yes ☒ No

    If "Yes,":

    a). Describe conditions:

    b). Is contaminated ground water present in bedrock aquifer? ☐ Yes ☐ No

    c). Is ground water contamination present at levels above Vapor Intrusion Screening Levels? ☐ Yes ☐ No

    If "Yes,":

    1). Was a vapor intrusion investigation conducted? ☐ Yes ☐ No

    2). Has a Vapor Concern (VC) or Immediate Environmental Concern (IEC) condition been identified? ☐ Yes ☐ No

15. Does this investigation address a discharge/release from a federally regulated UST? ☐ Yes ☒ No

Note: An UST system **is** Federally regulated *unless* one of the following conditions apply:

- The UST system is less than 110 gallons in rated volume;
- The UST system is a SUMP as defined in the UST regulations at N.J.A.C. 7:14B-1.6;
- The hazardous substance stored in the UST system is a RCRA regulated waste;
- The UST system contained heating oil used exclusively for onsite consumption;
- The UST system was used for motor fuel for non-commercial farm or residential purposes and the total rated capacity of all motor fuel USTs at the site is less than 1,100 gallons.

If you answered "Yes" to question 15, provide the following information:

Date Discharge Occurred or Identified: _____

Date Discharge Reported to the NJDEP: _____

Media Contaminated (*check all that apply*):
☐ Soil ☐ Groundwater ☐ Surface Water Receiving Water: _____

Tank ID (from Registration): _____ Tank System Size: _____

Contents: _____

If a Confirmed Discharge Notification (CDN) form has not been previously submitted to the NJDEP specifically for the discharge from a Federally Regulated UST, attach a completed CDN form to this submission.

16. Have all regulated USTs addressed in this submission been registered with the NJDEP? ☐ Yes ☐ No ☒ NA
If "No," complete and submit an UST Facility Certification Questionnaire to the NJDEP to update the registration prior to submitting this form.

17 Have all regulated USTs addressed in this submission that have been closed been delisted from the registration? ☐ Yes ☐ No ☒ NA
If "No," complete and submit an UST Facility Certification Questionnaire to the NJDEP to update the registration prior to submitting this form.

18. Are there any AOCs at which an SI was conducted and an RI/RA is not proposed? ☐ Yes ☒ No
If "Yes," answer the following questions, if "No," proceed to next section.

Answer the following questions ONLY for AOCs at which an SI was conducted and an RI and/or RA is not proposed:

19. Are any soil analytical results greater than the most stringent Direct Contact Soil Remediation Standards (DCSRS)? ☐ Yes ☐ No

20 Are any soil analytical results greater than the default Impact to Ground Water Soil Screening Levels (IGWSSL)? ☐ Yes ☐ No

21. Are any ground water analytical results greater than the Ground Water Quality Standards (GWQS)? ☐ Yes ☐ No ☐ NA

22. Are any Reporting Limits (RLs) greater than the applicable soil and/or ground water standards or screening levels? ☐ Yes ☐ No

23. Are any surface water analytical results greater than the most stringent Surface Water Quality Standards? ☐ Yes ☐ No ☐ NA

24. Are any sediment analytical results above the screening levels? ☐ Yes ☐ No ☐ NA

25. Are any soil analytical results greater than Soil Ecological Screening Criteria in an Environmentally Sensitive Natural Resource (ESNR)? ☐ Yes ☐ No ☐ NA

26. Are any analytical results above the vapor intrusion screening levels? ☐ Yes ☐ No ☐ NA

27. Did the SI demonstrate via background investigation per N.J.A.C. 7:26E-3.8 that contamination is naturally occurring? ☐ Yes ☐ No ☐ NA

28. Did the SI demonstrate via background investigation per N.J.A.C. 7:26E-3.9, that contamination is migrating onto this site? ☐ Yes ☐ No ☐ NA

29. Contamination is associated with an ongoing ISRA remediation not related to this investigation. ☐ Yes ☐ No ☐ NA

SECTION E. LABORATORY DATA

Complete only if sampling was conducted

1. Were all data submitted in the appropriate full and/or reduced formats according to the deliverables defined in N.J.A.C. 7:26E-2? Sampling for waste characterization was not provided in full or reduced formats ☒ Yes ☐ No
2. Do all data submitted meet the quality assurance/quality control (QA/QC) requirements incorporated by reference in N.J.A.C. 7:26E-2 for:
   - sampling ☒ Yes ☐ No
   - analysis ☒ Yes ☐ No
3. How was it determined that the data complied with the QA/QC requirements? *(check all that apply)*
   - ☒ Laboratory non-conformance summary/narrative
   - ☐ Laboratory correspondence
   - ☒ LSRP review (See Section 3.3)
   - ☐ Independent contractor review
   - ☐ Other: _____
4. Has any data been qualified and used? ☐ Yes ☒ No
5. Has any data been rejected and used? ☐ Yes ☒ No
6. Provide the page number for the "Reliability of Data" section of the report: 9

New Jersey Department of Environmental Protection
Site Remediation Program

REMEDIAL INVESTIGATION REPORT FORM

Date Stamp
(For Department use only)

SECTION A. SITE

Site Name: Former Medical Center at Princeton

Program Interest (PI) Number(s): 011700

Case Tracking Number(s) for this submission: 15-09-09-1706-55

This form must be attached to the Cover/Certification Form

SECTION B. SCOPE OF THE REMEDIAL INVESTIGATION REPORT

1. Does the Remedial Investigation address:
   - ☒ Area(s) of Concern (AOCs) Only
   - ☐ Entire Site (based on a completed and submitted Preliminary Assessment/Site Investigation)
2. Total number of contaminated AOCs associated with the case: 1
3. Total number of contaminated AOCs addressed in this submittal: 1
4. Is the Remedial Investigation complete for the contaminated AOCs addressed in this submittal? ☒ Yes ☐ No
5. Is the Remedial Investigation complete for all AOCs associated with this case? ☒ Yes ☐ No

   If "Yes," provide date: 09/09/2015

When answering the remaining questions on this form consider only the AOCs addressed in this submission.

SECTION C. GENERAL

1. Are you proposing an alternative remediation standard pursuant to N.J.A.C. 7:26D-7.4, alternate vapor intrusion screening level, or ecological site specific goal? ☐ Yes ☒ No

   If "Yes," attach the Alternative Remediation Standard and/or Screening Level Application Form as an addendum.
2. Was a site-specific screening level developed for the evaluation of the VI pathway? ☐ Yes ☒ No
3. Has/will the remediation vary from the Technical Rules? ☐ Yes ☒ No

   If "Yes." provide the citation(s) from which the remediation has/will vary and the page(s) in the attached document where the rationale for the variance is provided.

   N.J.A.C. 7:26E- _____ Page _____

   N.J.A.C. 7:26E- _____ Page _____

   N.J.A.C. 7:26E- _____ Page _____
4. Were the laboratory reporting minimum detection limits below applicable remediation standards/ screening levels required for the site? ☒ Yes ☐ No
5. Have past deficiencies/notice of deficiencies been addressed in this submittal? N/A ☐ Yes ☐ No

SECTION D. SITE CONDITIONS

1. Is any radiological contamination currently present at the AOCs addressed in this submission? ☐ Yes ☒ No
2. At any time, did any of the AOCs addressed in this submission contain Ordnance and Explosives/ Unexploded Ordnance (OE/UXO)? ☐ Yes ☒ No
3. Is free product present? ☐ Yes ☒ No

4. Has dioxin been detected at levels above NJDEP's interim direct contact soil screening level of 50 ppt dioxin TEQ (TCDD Toxicity Equivalence Quotient) in any AOCs addressed in this submission? ☐ Yes ☒ No

5. Have any of the following contaminants *ever* been detected in sediment above the ecological screening levels at the AOCs addressed in this submission? ☐ Yes ☒ No

   If "Yes," check all that apply:

   ☐ Arsenic ☐ Dioxin ☐ Mercury ☐ PCBs ☐ Pesticides

6. Did contaminants from the AOCs addressed in this submission discharge to surface water? ☐ Yes ☒ No

7. Did contaminants from the AOCs addressed in this submission discharge to an Environmentally Sensitive Natural Resource (ESNR)? ☐ Yes ☒ No

8. Are any of the following conditions currently present? *(check all that apply)*

Ground water:

- ☐ Contaminated ground water in the overburden aquifer
- ☐ Contaminated ground water in a confined aquifer
- ☐ Contaminated ground water in the bedrock aquifer
- ☐ Contaminated ground water in multiple aquifer units
- ☐ Multiple distinct ground water plumes
- ☐ Contaminated ground water migrating off-site
- ☐ Natural background ground water contamination
- ☐ Contaminated ground water discharging to surface water or Environmentally Sensitive Natural Resource (ESNR)
- ☐ Residual or free product
- ☐ Radionuclides

Soil:

- ☐ On-site discharge(s) impacting soil off-site
- ☐ Chromate Chemical Production Waste/COPR
- ☐ Munitions and explosives of concern
- ☐ Contaminated soil in the saturated zone
- ☐ Historic pesticide impacts to soil
- ☐ Residual or free product
- ☐ Radionuclides
- ☐ Historic Fill
- ☐ Natural background only above Impact to Ground Water Cleanup Criteria
- ☐ Natural background above Direct Contact Remediation Standards
- ☐ Soil contamination in an ESNR

SECTION E. APPLICABLE REMEDIATION STANDARDS

1. Were Default Remediation Standards used for all contaminants? ☒ Yes ☐ No

   (If "Yes," check all that apply)

   - ☒ Direct Contact
   - ☒ Impact to Ground Water Soil Screening Levels
   - ☐ Ecological Screening Levels

2. Has compliance averaging been utilized to determine compliance with the Soil Remediation Standards? ☐ Yes ☒ No

   If "Yes," check all that apply:

	Compliance Averaging Method Utilized			
Pathway	Arithmetic Mean	95 Percent UCL	Spatially Weighted Average	75 Percent/ 10X Procedure
☐ Ingestion-Dermal Pathway	☐	☐	☐	☐
☐ Inhalation Pathway	☐	☐	☐	☐
☐ Impact to Ground Water Pathway	☐	☐	☐	☐

3. Has a compliance option been utilized to determine compliance with the Impact to Ground Water Pathway? (If "Yes," check all that apply) ☒ Yes ☐ No

   - ☒ Immobile Compounds
   - ☒ Data evaluation for metals and semi-volatiles
   - ☐ Data evaluation for volatile organics derived from discharges of petroleum mixtures

4. Was an interim standard used for a contaminant where a standard does not exist? ☐ Yes ☒ No

5. Were Alternate Remediation Standards used for the Ingestion/Dermal Pathway? ☐ Yes ☒ No

6. Were Alternate Remediation Standards used for the Inhalation Pathway? ☐ Yes ☒ No

7. Were Site Specific Standards used for the Impact to Ground Water Pathway? ☐ Yes ☒ No
If "Yes," check all that apply:
☐ Soil-Water Partitioning Equation ☐ SPLP ☐ Sesoil ☐ Sesoil/AT123D
☐ DAF Modification

8. Were Site Specific Ecological Remediation Goals used? ☐ Yes ☒ No

9. What is the ground water classification for this site as per N.J.A.C. 7:9C? (check all that apply)
☐ Class I-A ☒ Class II-A
☐ Class I-PL Pinelands Protection Area ☐ Class III-A
☐ Class I-PL Pinelands Preservation Area ☐ Class III-B

SECTION F. BACKGROUND CONDITIONS

Did the RI demonstrate via a background investigation, outside the influence of on-site AOCs **and** operational areas, that:

1. All or any part of the ground water contamination is migrating onto this site per N.J.A.C. 7:26E-3.9? ☐ Yes ☐ No ☒ NA
2. Soil contamination is naturally occurring per N.J.A.C. 7:26E-3.8 ☐ Yes ☐ No ☒ NA

SECTION G. HISTORIC FILL

1. Is Historic Fill present at the site? ☐ Yes ☒ No

If "Yes":

a). What is the evidence that Historic Fill is present?

b). Are any other AOCs co-located within the Historic Fill? ☐ Yes ☐ No

If "Yes," have the same contaminant types (e.g. lead arsenic, etc.) characterized as being present in the Historic Fill been sampled for as contaminants of concern at these co-located AOCs? ☐ Yes ☐ No

2. Was the historic fill characterized pursuant to N.J.A.C. 7:26E-4.7 and the NJDEP Historic Fill Material Technical Guidance Document? ☐ Yes ☒ No

SECTION H. GROUND WATER TRIGGER

1. Was a ground water investigation conducted at all AOCs where a ground water investigation was triggered pursuant to N.J.A.C. 7:26E-3.5 and 4.3? ☐ Yes ☐ No ☒ NA
2. Is contamination in soils fully delineated? Not Applicable ☐ Yes ☐ No

SECTION I. GROUND WATER REMEDIAL INVESTIGATION INFORMATION (N/A)

1. Are contaminants present with a specific gravity less than that of water? ☐ Yes ☐ No
   a. If "Yes," were any monitor wells installed in unconfined aquifers in which the water table is higher than the top of the well screen? ☐ Yes ☐ No

   If "Yes" to 1a, identify the affected wells. _____
2. Are contaminants present with a specific gravity greater than that of water? ☐ Yes ☐ No
   a. If "Yes," were multiple depth discrete ground water samples collected in a vertical profile at each ground water sampling location where dense contaminants were suspected? ☐ Yes ☐ No
3. Is ground water in the bedrock aquifer contaminated? ☐ Yes ☐ No

   If "Yes," answer questions 3a and 3b.
   a. Were bedrock cores collected? ☐ Yes ☐ No
   b. Were geophysical logging methods conducted to characterize the bedrock aquifer in accordance with the NJDEP Ground Water Technical Guidance (3.4.2.2)? ☐ Yes ☐ No
4. Is contamination in ground water fully delineated? ☐ Yes ☐ No

SECTION J. ECOLOGICAL RECEPTORS

1. Have soil, sediment, and/or surface water data been collected from Environmentally Sensitive Natural Resources (ESNR)? No ESNR on or in the vicinity of the site ☐ Yes ☐ No ☒ NA
   a. If "Yes," do contaminant concentrations at the ESNR exceed ecological screening criteria or the aquatic chronic NJSWQS [N.J.A.C.7:9B]? ☐ Yes ☐ No
   b. If "Yes," have soil and sediment data been collected from both surface and subsurface intervals in the ESNR? ☐ Yes ☐ No
   c. If "No" for 1b, provide explanation _____
2. Have contaminant migration pathways from the site/AOC to the ESNR been identified? ☐ Yes ☒ No
3. Do the results of the Ecological Evaluation require a remedial investigation of ecological receptors? ☐ Yes ☒ No
   If "No," provide explanation _____
4. Has an Ecological Risk Assessment been conducted [N.J.A.C.7:26E-4.8]? ☐ Yes ☒ No
5. Is remediation required in an ESNR? ☐ Yes ☒ No

SECTION K. MISCELLANEOUS

1. Were any regulated USTs identified during the course of the RI that were not previously known? ☐ Yes ☒ No
   If "Yes," list tank size, contents and registration number(s):
   _____
   a. If "Yes," and if these USTs were Federally Regulated, was the source/cause of release identified on a Confirmed Discharge Notification form? ☐ Yes ☐ No
      If "No," to 1.a., complete and submit a revised Confirmed Discharge Notification form.
2. Were additional Areas of Concern identified during the RI? ☐ Yes ☒ No
   If "Yes," identify AOC(s): _____
3. Identify Remedial Measures (RMs) conducted during the RI (check all that apply):
   - ☐ Soil excavation
   - ☐ Potable water supply treatment or replacement
   - ☐ Hydraulic containment of source area
   - ☐ Soil vapor extraction
   - ☐ Enhanced fluid recovery (EFR)
   - ☐ Other(s), specify: _____
   - ☐ UST closure
   - ☐ Free product recovery
   - ☐ Vapor intrusion mitigation
   - ☒ No RMs were conducted during the RI
4. Has new information (material facts, data or other information) been generated during the RI that corrects or contradicts information, or changes conclusions from, previously submitted reports or information? ☐ Yes ☒ No
   If "Yes," explain:

SECTION L. LABORATORY DATA

1. Were all data submitted in the appropriate full and/or reduced formats according to the deliverables defined in N.J.A.C. 7:26E-2? Sampling for waste characterization was not provided in full or reduced formats. ☒ Yes ☐ No
2. Do all data submitted meet the quality assurance/quality control (QA/QC) requirements incorporated by reference in N.J.A.C. 7:26E-2 for:
   - sampling ☒ Yes ☐ No
   - analysis ☒ Yes ☐ No
3. How was it determined that the data complied with the QA/QC requirements?
   - ☒ Laboratory non-conformance summary/narrative
   - ☐ Laboratory correspondence
   - ☒ LSRP review (See Section 3.3)
   - ☐ Independent contractor review
   - ☐ Other: _____
4. Has any data been qualified and used? ☐ Yes ☒ No
5. Has any data been rejected and used? ☐ Yes ☒ No
6. Provide the page number for the "Reliability of Data" section of the report: 9

New Jersey Department of Environmental Protection
Site Remediation Program

REMEDIAL ACTION WORKPLAN FORM

Date Stamp
(For Department use only)

SECTION A. SITE

Site Name: Former Medical Center at Princeton

Program Interest (PI) Number(s): 011700

Case Tracking Number(s) for this submission: 15-09-09-1706-55

This form must be attached to the Cover/Certification Form

SECTION B. ALTERNATIVE FILL / PBR REQUEST

1. Is this submission a proposal to obtain NJDEP pre-approval for using alternative fill in excess of the volume required for a remedial action? ☐ Yes ☒ No

   If "Yes," has notification been provided to:

   - ☐ Each owner of real property and the tenants of those properties, located within 200 feet of the site boundary;
   - ☐ The mayor of each municipality which the site is located;
   - ☐ The county designated solid waste coordinator(s);
   - ☐ The municipal clerk of each municipality in which the site is located; and
   - ☐ The county health department(s) and local health agency(ies).

2. Is a Discharge to Ground Water Permit by Rule Authorization Request required? ☐ Yes ☒ No

   If "Yes," indicate below if the permit application is attached to this submission or was previously submitted.

   - ☐ Permit Application is attached to this submission
   - ☐ Permit Application submitted to the NJDEP on this date: _____

SECTION C. SCOPE OF REMEDIAL ACTION WORKPLAN

1. Does the RAW address:

   - ☒ Area(s) of Concern (AOCs) Only
   - ☐ Entire Site (Based on a completed and submitted Preliminary Assessment/Site Investigation)

2. Total number of contaminated AOCs associated with the case: 1

3. Total number of contaminated AOCs addressed in this submission: 1

When answering the remaining questions on this form consider only the AOCs addressed in this submission.

SECTION D. GENERAL

1. Is an unrestricted use or a presumptive remedy required? ☒ Yes ☐ No

   If "Yes," is an unrestricted use or a presumptive remedy being proposed? With the exception of one proposed alternative remedy ☒ Yes ☐ No

2. Is the proposed remedial action an alternative remedy pursuant to N.J.A.C. 7:26E-5.3? ☒ Yes ☐ No

   If "Yes," specify the section/page(s) of the RAW where the alternative remedy is proposed:

   Section 4.4, page 14

3. Has/will the remediation vary from the Technical Rules? ☐ Yes ☒ No

   If "Yes." provide the citation(s) from which the remediation has/will vary and the page(s) in the attached document where the rationale for the variance is provided.

   N.J.A.C. 7:26E- _____ Page _____

   N.J.A.C. 7:26E- _____ Page _____

   N.J.A.C. 7:26E- _____ Page _____

4. Will the proposed remedial action render the property unusable for future redevelopment or for recreational use (N.J.A.C. 7:26C-6.4(b))? ☐ Yes ☒ No

SECTION E. SITE CONDITIONS

1. Is any radiological contamination currently present at the AOCs addressed in this submission? ☐ Yes ☒ No
2. At any time, did any of the AOCs addressed in this submission contain Ordnance and Explosives/ Unexploded Ordnance (OE/UXO)? ☐ Yes ☒ No
3. Does the proposed remedial action involve containment of free product? ☐ Yes ☒ No
4. Have any of the following contaminants *ever* been detected in sediment above the ecological screening levels at the AOCs addressed in this submission? ☐ Yes ☒ No

   If "yes," check all that apply:

   ☐ Arsenic ☐ Dioxin ☐ Mercury ☐ PCBs ☐ Pesticides

5. Are any of the following conditions currently present for the AOCs addressed in this submission: *(check all that apply)*

Ground water:

- ☐ Contaminated ground water in the overburden aquifer
- ☐ Contaminated ground water in a confined aquifer
- ☐ Contaminated ground water in the bedrock aquifer
- ☐ Contaminated ground water in multiple aquifer units
- ☐ Multiple distinct ground water plumes
- ☐ Contaminated ground water migrating off-site
- ☐ Natural background ground water contamination
- ☐ Contaminated ground water discharging to surface water or Environmentally Sensitive Natural Resource (ESNR)
- ☐ Residual or free product
- ☐ Radionuclides

Soil:

- ☐ On-site discharge(s) impacting soil off-site
- ☐ Chromate Chemical Production Waste/COPR
- ☐ Munitions and explosives of concern
- ☐ Contaminated soil in the saturated zone
- ☐ Historic pesticide impacts to soil
- ☐ Residual or free product
- ☐ Radionuclides
- ☐ Historic Fill
- ☐ Natural background only above Impact to Ground Water Cleanup Criteria
- ☐ Natural background above Direct Contact Remediation Standards
- ☐ Soil contamination in an ESNR

SECTION F. ALTERNATIVE AND CLEAN FILL USE

1. Will alternative fill be used? ☐ Yes ☒ No
2. Will clean fill be used? ☒ Yes ☐ No
3. Will material be sent off-site for use as alternative and/or clean fill at a Site Remediation Program (SRP) site? ☐ Yes ☒ No

   If "Yes," specify the section/page in the RAW where it states the SRP site receiving this alternative and/or clean fill: _____

4. Will material be sent off-site for use as alternative and/or clean fill at a non-SRP site? ☐ Yes ☒ No

   If "Yes," specify the section/page in the RAW where it states the non-SRP site receiving this alternative and/or clean fill: _____

5. Specify the section/pages where the Fill Use Plan pursuant to N.J.A.C. 7:26E-5.2(g) can be found:
   Section 4.6, page 17

SECTION G. REMEDIAL ACTION WORKPLAN INFORMATION

Permit Information

1. Does the site contain any land use features (e.g. wetlands, flood hazard area, etc.) that have been or will be impacted by remedial activities? ☐ Yes ☒ No
2. Are land use permits required prior to the implementation of the remedial action? ☐ Yes ☒ No

   If "Yes," specify the section/page(s) in the RAW where land use permits are discussed:

   _____

3. Are any federal, state, or local permits, permit modifications, or certifications, other than those listed in question 2 above, needed for this remedial action? ☐ Yes ☒ No

If "Yes," specify the section/page(s) in the RAW where any federal, state, or local permits, permit modifications, or certifications are discussed:

_____

Soils

4. Is a soil remedial action required? ☒ Yes ☐ No

If "No," skip to **Ground Water**

5. Check each type of remediation being proposed for soils:

☐ Excavation	☐ Soil Washing
☒ Capping/other Engineering Control	☐ Bioremediation
☒ Institutional Control	☐ Soil Vapor Extraction
☐ Chemical Oxidation	☐ Chemical Reduction
☐ Thermal desorption	☐ Other (specify): _____

6. Does the proposed remedial action address all saturated zone source material? ☐ Yes ☐ No ☒ N/A

7. Is an engineering control proposed in this submission? ☒ Yes ☐ No

If "Yes," indicate the receptor(s) each engineering control is intended to protect. *(check all that apply)*

☒ Human ☐ Ecological ☐ Offsite Impacts

8. If a restricted use remedy is being proposed, has consent from all involved property owners been obtained? ☒ Yes ☐ No ☐ N/A

Ground Water

9. Is a ground water remedial action required? ☐ Yes ☒ No

If "No," skip to **Non-Aqueous Phase Liquid (NAPL)**

10. Check each type of remediation being proposed for ground water:

☐ Containment	☐ Hydraulic Control
☐ Multiple Phase Extraction System	☐ Monitored Natural Attenuation
☐ SVE/Air Sparging	☐ Chemical Oxidation
☐ Ozone Sparging	☐ Other (specify): _____
☐ Pump & Treat	

Non-Aqueous Phase Liquid (NAPL)

11. Does the proposed remediation include a remedial action for LNAPL or DNAPL? ☐ Yes ☒ No

If "Yes," check all that apply:

	Containment/Control	Removal	Other
LNAPL	☐	☐	☐
DNAPL	☐	☐	☐

If you checked "Other," specify the type of remediation proposed:

Environmentally Sensitive Natural Resource (ESNR)

12. Is a remedial action required for an ESNR? ☐ Yes ☒ No

If "No," skip to **Indoor Air**

13. Check each type of remediation being proposed for ESNR(s):

☐ Capping ☐ Excavation/Dredging ☐ Other (specify): _____

Indoor Air

14. Was a soil gas investigation required? ☐ Yes ☒ No
15. Are soil gas concentrations currently greater than10 times SGSLs? ☐ Yes ☒ No
16. Is a vapor intrusion engineering control/mitigation system required? ☐ Yes ☒ No

If "Yes," Check each type of mitigation being proposed for indoor air:

☐ Subsurface Depressurization System
☐ HVAC Positive Pressure ☐ Subsurface Ventilation Systems
☐ Soil Vapor Extraction System ☐ Other (specify): _____

New Jersey Department of Environmental Protection
Site Remediation Program

RECEPTOR EVALUATION (RE) FORM

Date Stamp
(For Department use only)

SECTION A. SITE

Site Name: Former Medical Center at Princeton

Program Interest (PI) Number(s): 011700

Case Tracking Number(s) for this submission: 15-09-09-1706-55

This form must be attached to the Cover/Certification Form if not submitted through the RIR Online Service

Indicate the type of submission:

☒ Initial RE Submission

☐ Updated RE Submission

Indicate the reason for submission of an updated RE form

- ☐ Submission of an Immediate Environmental Concern (IEC) source control report;
- ☐ Submission of a Remedial Investigation Report;
- ☐ Submission of a Remedial Action Report;

Check if included in updated RE

- ☐ The known concentration or extent of contamination in any medium has increased;
- ☐ A new AOC has been identified;
- ☐ A new receptor is identified;
- ☐ A new exposure pathway has been identified.

SECTION B. ON SITE AND SURROUNDING PROPERTY USE

1. Identify any sensitive populations/uses that are currently on-site or surrounding property usage within 200 feet of the site boundary (check all that apply):

	On-site	Off-site
None of the following	☒	☐
Residences or residential property	☐	☒
Public or Private Schools grades K-12	☐	☐
Child care centers	☐	☐
Public parks, playgrounds or other recreation areas	☐	☐
Other sensitive population use(s) Explain _____	☐	☐

If any of the above applies, attach a list of addresses, facility names, type of use, and a map depicting each location relative to the site. (See Figure attached to Receptor Evaluation Form)

2. Current site uses (check all that apply):

☐ Industrial ☐ Residential ☐ Commercial ☐ Agricultural
☐ School or child care ☐ Government ☐ Park or recreational use
☐ Vacant ☒ Other: under construction for residential use

3. Planned future site uses and off-site use within 200 ft of site boundary (check all that apply):

☐ Industrial ☒ Residential ☒ Commercial ☐ Agricultural
☐ School or child care ☐ Government ☐ Park or recreational use
☐ Vacant ☐ Other: _____

Provide a map depicting the location of the proposed changes in land use. None

SECTION C. DESCRIPTION OF CONTAMINATION

1. Identify if any of the following exist at the site (check all that apply):
   - ☐ Free product [N.J.A.C. 7:26E-1.8] identified is ☐ LNAPL* or ☐ DNAPL**. Date identified: _____
   - ☐ Residual product [N.J.A.C. 7:26E-1.8]
   - ☐ Other high concentration source materials not identified above (e.g., buried drums, containers, unsecured friable asbestos)

     Explain: _____

   * LNAPL – measured thickness of .01 feet or more

   **DNAPL – See US EPA DNAPL Overview

2. Soil Migration Pathway

   Has soil contamination been delineated to the applicable Direct Contact Soil Remediation Standard? ..... ☒ Yes ☐ No

   Are all soils either below the applicable Direct Contact Criteria or under an institutional control (i.e. deed notice)? ..... ☐ Yes ☒ No

3. If this evaluation is submitted with a technical document that includes contaminant summary information, proceed to Section D. Otherwise attach a brief summary of all currently available data and information to be included in the site investigation or remedial investigation report. (See attached SI/RI/RAW report)

SECTION D. GROUND WATER USE

1. Has the requirement for ground water sampling been triggered? ..... ☐ Yes ☒ No ☐ Unknown
   If "No," proceed to Section F. If "Unknown," explain:

   _____

2. Is Ground water contaminated above the Ground Water Remediation Standards [N.J.A.C.7:9C]? ..... ☐ Yes ☐ No ☐ Unknown

   Or ☐ Awaiting laboratory data with the expected due date: _____

   If "Yes," provide the date that the laboratory data was available and confirmed contamination above the Ground Water Remediation Standards. Date: _____

   If "Unknown," explain: _____

   If "No," or awaiting laboratory data proceed to Section F.

3. Has ground water contamination been delineated to the applicable Remediation Standard? ..... ☐ Yes ☐ No
4. Has a well search been completed? ..... ☐ Yes ☐ No

   Date of most recent or updated well search: _____

   Identify if any of the following conditions exist based on the well search [N.J.A.C.7:26E-1.14(a)] (check all that apply):
   - ☐ Potable wells located within 500 feet from the downgradient edge of the currently known extent of contamination.
   - ☐ Potable well located 250 feet upgradient or 500 feet side gradient of the currently known extent of contamination.
   - ☐ Ground water contamination is located within a Tier 1 wellhead protection area (WHPA).

5. Is a completed Well Search Spreadsheet or historical well search table attached and has an electronic copy of the spreadsheet been submitted to srpgis_wrs@dep.state.nj.us. ..... ☐ Yes ☐ No

   If "No," explain: _____

6. Are any private potable or irrigation wells located within ½ mile of the currently known extent of contamination? ..... ☐ Yes ☐ No

   If "Yes," was a door to door survey completed? ..... ☐ Yes ☐ No

   If survey was not completed explain: _____

7. Has sampling been conducted of ☐ potable well(s) and /or ☐ non-potable use well(s)? ..... ☐ Yes ☐ No

   If "No," provide justification then proceed to Section E.

   _____

8 Has contamination been identified in potable well(s) above Ground Water Remediation Standards that is not suspected to be from the site? (If "Yes," provide justification) ..... ☐ Yes ☐ No

_____

9 Has contamination been identified in potable well(s) that is above the Ground Water Remediation Standards or Federal Drinking Water Standards? ..... ☐ Yes ☐ No

Provide date laboratory data was received: _____

Or ☐ awaiting laboratory data with the expected due date: _____

If "Yes" for potable well contamination **not attributable to background**, follow the IEC Guidance Document at http://www.nj.gov/dep/srp/guidance/index.html#iec for required actions and answer the following:

Has an engineered system response action been completed on all receptors? ..... ☐ Yes ☐ No
Provide a brief narrative description:

Date completed: _____ NJDEP Case Manager: _____

10. Were Non-potable use well(s) sampled and results were above Class II Ground Water Remediation Standards? ..... ☐ Yes ☐ No

Provide date laboratory data was received: _____

Or ☐ awaiting laboratory data with the expected due date: _____

11. Has the ground water use evaluation been completed? ..... ☐ Yes ☐ No

SECTION E. VAPOR INTRUSION (VI)

1. Contaminants present in ground water exceed the Vapor Intrusion Ground Water Screening Levels that trigger a VI evaluation. (see NJDEP Vapor Intrusion Technical Guidance). ... ☐ Yes ☐ No ☐ Unknown

Or ☐ Awaiting laboratory data and the expected due date: _____

Provide the date that the laboratory data was available and confirmed contamination above the Vapor Intrusion Trigger Levels. Date: _____

2. Other existing conditions that trigger a VI evaluation. (see NJDEP Vapor Intrusion Technical Guidance)

☐ Wet basement or sump containing free product or ground water containing volatile organics
☐ Methane generating conditions causing oxygen deficient or explosion concern
☐ Other human or safety concern from the VI pathway (i.e. elemental mercury, unsaturated contamination, elevated soil gas or indoor vapor (explain):

If you answered "No," or awaiting laboratory data to Question 1., *and* did not check any boxes in Question 2, proceed to Section F, "Ecological Receptors", otherwise complete the rest of this section.

3. Has ground water contamination been delineated to the applicable Ground Water Vapor Screening Level? ..... ☐ Yes ☐ No

4. Was a site specific screening level, modeling or other alternative approach employed for the VI pathway? ..... ☐ Yes ☐ No

5. Identify and locate on a scaled map any buildings/sensitive populations that exist within the following distances from ground water contamination with concentrations above the Vapor Intrusion Ground Water Screening Levels or specific threats (check all that apply):

☐ 30 feet of petroleum free product or dissolved petroleum hydrocarbon contamination in ground water
☐ 100 feet of any non-petroleum free product or any non-petroleum dissolved volatile organic ground water contamination
☐ No buildings exist within the specified distances

6. The vapor intrusion pathway is a concern at or adjacent to the site (if "No," attach justification) ..... ☐ Yes ☐ No

7. Has soil gas sampling of the building(s) been conducted? ☐ Yes ☐ No ☐ N/A
   If "No," or "N/A," proceed to #12

8. Has indoor air sampling been conducted at the identified building(s)? ☐ Yes ☐ No
   If "No," proceed to #12

9 Has indoor air contamination been identified but not suspected to be from the site?
   (if "Yes," attach justification) ☐ Yes ☐ No

10. Indoor air results were above the NJDEP's Rapid Action Levels. ☐ Yes ☐ No

    Provide the date that the laboratory data was available. Date: _____

    Or ☐ Awaiting laboratory data with the expected due date: _____

    If "Yes" to #10 above, follow the IEC Guidance Document at
    http://www.nj.gov/dep/srp/guidance/index.html#iec **for required actions.**

    The IEC engineering system response for control was implemented for all
    identified structures ☐ Yes ☐ No

    Date: _____ NJDEP Case Manager: _____

11. Indoor air sampling was conducted and results were above the NJDEP's Indoor Air Screening
    Levels but at or below the Rapid Action Levels ☐ Yes ☐ No

    Provide the date that the laboratory data was available. Date: _____

    Or ☐ Awaiting laboratory data with the expected due date: _____

    If "Yes" to #11 above, answer the following:

    Has the Vapor Concern (VC) Response Action Form notifying the NJDEP of the exceedances
    been submitted? ☐ Yes ☐ No

    Date: _____

    Has a plan to mitigate and monitor the exposure been submitted? ☐ Yes ☐ No

    Date: _____

    Has the Mitigation Response Action Report been submitted? ☐ Yes ☐ No

    Date: _____

12. Has the vapor intrusion investigation been completed? ☐ Yes ☐ No
    If "No", is the vapor intrusion investigation stepping out as part of the site
    investigation or remedial investigation. (If "No," attach justification) ☐ Yes ☐ No

SECTION F. ECOLOGICAL RECEPTORS

1. Has an Ecological Evaluation (EE) has been conducted? [N.J.A.C. 7:26E-1.16] ☒ Yes ☐ No

   Date conducted: 08/20/2015

2. Do the results of an EE trigger a remedial investigation of ecological receptors? [N.J.A.C. 7:26E-4.8] ☐ Yes ☒ No

3. Has a remedial investigation of ecological receptors been conducted? ☐ Yes ☒ No

   Date conducted: _____

4. Provide the following information for any surface water body on or within 200 feet of the site:

Surface Water Body Name	Stream Classification	Antidegradation Designation	Trout Production	Trout Maintenance
None			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐

5. Does the site contain any features regulated by the Land Use Regulation Program (LURP)? (e.g. wetlands, flood hazard area, tidelands, etc.). ☐ Yes ☒ No

   If "Yes," identify the type(s) of features: _____

6. Have any formal LURP jurisdiction letters or approvals been issued for the site? ☐ Yes ☒ No

   If "Yes," what is the LURP Program Interest (PI) number(s) for the site? _____

7. Have any applications for formal LURP jurisdiction letters or approvals been submitted the NJDEP? ☐ Yes ☒ No

   If "Yes," what is the LURP Program Interest (PI) number(s) for the site? _____

8. Is free product or residual product located within 100 feet from an ecological receptor? ☐ Yes ☒ No

9. Available data indicate an impact on: ☐ Ecological receptor(s) ☐ Surface water ☐ Sediment

   If this evaluation is submitted with a technical document that includes contaminant summary information, proceed to Section G. Otherwise attach a description of the type of contamination and provide a schedule and a description of all actions to be taken to mitigate exposure.

   (See attached SI/RI/RAW report)

Completed forms should be sent to the municipal clerk, designate health department, and:

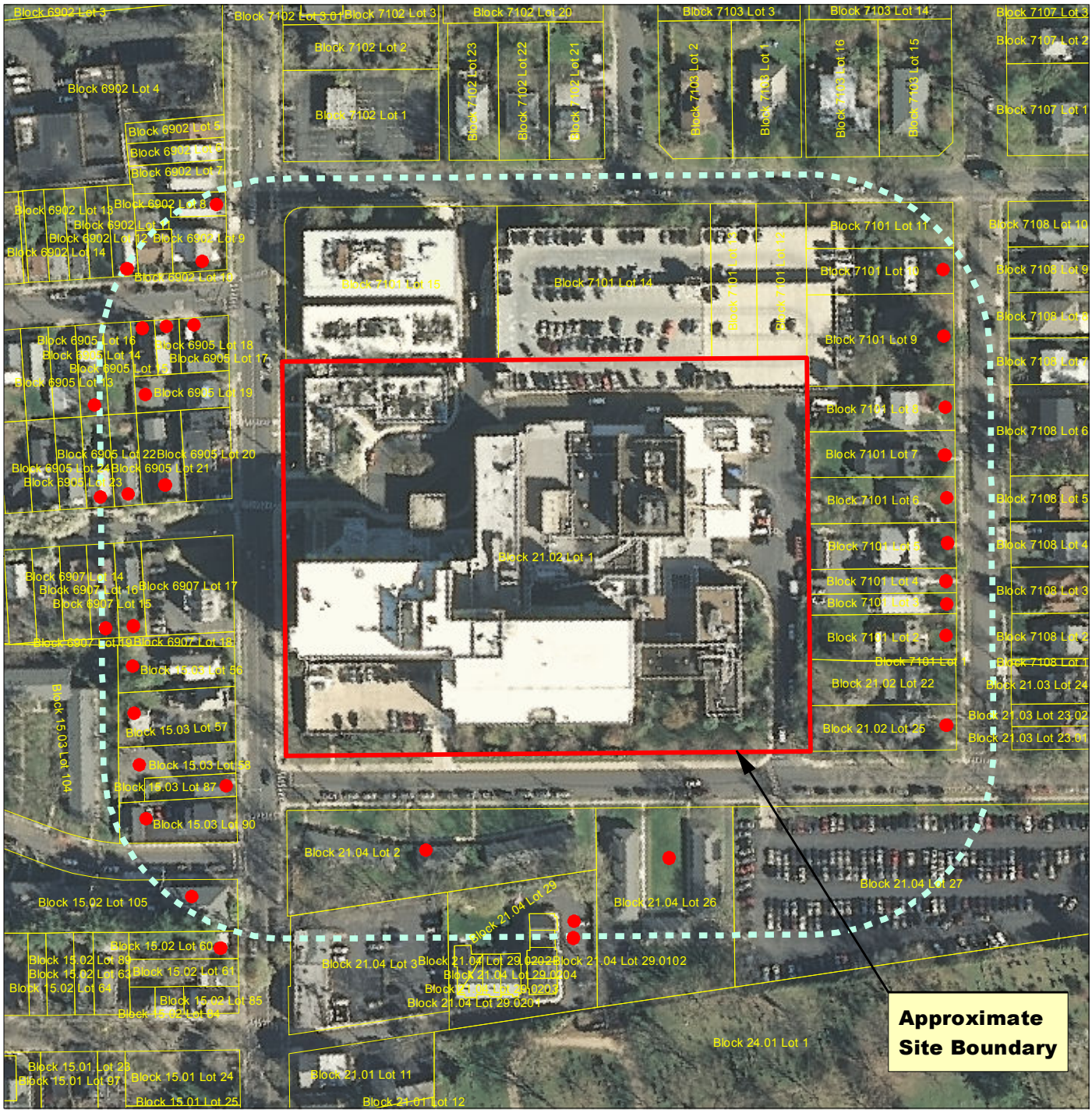
Bureau of Case Assignment & Initial Notice
Site Remediation Program
NJ Department of Environmental Protection
401-05H
PO Box 420
Trenton, NJ 08625-0420

Receptor Evaluation – Attachment A
Supplementary Information
Former University Medical Center @ Princeton
253 Witherspoon Street, Block 21.02, Lot 1
Princeton, Mercer County, New Jersey
SRP PI# 011700, Case #15-09-09-1706-55

Receptor Evaluation Form – Section B.1. Surrounding Property Use

Pursuant to N.J.A.C. 7:26E-1.13(a)2, the following table contains a list of all residences, schools, childcare centers, parks, playgrounds, or other recreational areas, if any, that are within 200 feet of the property boundary.

Block	Lot	Street Address Princeton, NJ 08540	Property Use
15.02	60	216 WITHERSPOON STREET	Residential
15.02	105	16-82 CLAY STREET	Residential
15.03	56	246 WITHERSPOON ST	Residential
15.03	57	244 WITHERSPOON ST	Residential
15.03	58	238 WITHERSPOON ST	Residential
15.03	87	232 WITHERSPOON ST	Residential
15.03	90	230 WITHERSPOON ST	Residential
15.03	104	50 CLAY STREET	Residential
21.02	25	2 & 4 HARRIS ROAD	Residential
21.04	2	1-10 FRANKLIN AVENUE	Residential
21.04	26	1-10 FRANKLIN AVENUE	Residential
21.04	29.0104	28 WITHERSPOON LANE	Residential
21.04	29.0105	30 WITHERSPOON LANE	Residential
6902	8	288 WITHERSPOON ST	Residential
6902	9	282-284 WITHERSPOON ST	Residential
6902	11	21 BIRCH AVE	Residential
6905	14	20 BIRCH AVE	Residential
6905	16	12 BIRCH AVE	Residential
6905	17	8 BIRCH AVE	Residential
6905	18	276 WITHERSPOON ST	Residential
6905	19	272 WITHERSPOON ST	Residential
6905	21	7 LEIGH AVE	Residential
6905	22	11 LEIGH AVE	Residential
6905	23	13 LEIGH AVE	Residential
6907	15	14 LEIGH AVE	Residential
6907	16	12 LEIGH AVE	Residential
7101	2	10 HARRIS RD	Residential
7101	3	12 HARRIS RD	Residential
7101	4	14 HARRIS RD	Residential
7101	5	16-18 HARRIS RD	Residential
7101	6	22 HARRIS RD	Residential
7101	7	26 HARRIS RD	Residential
7101	8	30 HARRIS RD	Residential
7101	9	36 HARRIS RD	Residential
7101	10	42 HARRIS RD	Residential



Location of potential land-use sensitive receptor.
See table in Receptor Evaluation Form Attachment A for details.

0 100 200 Feet

Subject Property

Property 200 Foot Buffer

N

RECEPTOR EVALUATION: LAND USE

Former University Medical Center @ Princeton
Block 21.02, Lot 1
Princeton, Mercer County, New Jersey
SRP PI# 011700

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Date: September 2015

Scale 1:1,961

F:\JOBS11\HW11-191 Avalonbay princeton\GIS\RecEval.mxd

New Jersey Department of Environmental Protection
Site Remediation Program

ALTERNATIVE REMEDY / REMEDIAL ACTION PRE-APPROVAL FORM

FOR RESIDENCES, SCHOOLS, AND CHILD CARE CENTERS

Date Stamp
(For Department use only)

NOTE: This form shall be completed for any remediation initiated after May 7, 2010 by the person responsible for conducting the remediation, when new construction of, or a change in use to, a residence, a child care center or a school will occur and an alternative remedy is proposed, or pre-approval of a remedial action is required.

This form may be submitted for a residence, child care center, or school when pre-approval from the NJDEP for the specific issues detailed below is desired but not required. See instructions for limitations.

SECTION A. SITE NAME AND LOCATION

Site Name: Former Medical Center at Princeton

List all AKAs:

Street Address: 253 Witherspoon Street

Municipality: Princeton (Township, Borough or City)

County: Mercer Zip Code: 08540

Program Interest (PI) Number(s): 011700

Case Tracking Number(s): 15-09-09-1706-55

Date Remediation Initiated Pursuant to N.J.A.C. 7:26C-2.2 or 2.3(b): 09/09/2015

State Plane Coordinates for a central location at the site: Easting: 446991 Northing: 554801

Municipal Block(s) and Lot(s):

Block #	21.02	Lot #	1	Block #		Lot #	
Block #		Lot #		Block #		Lot #	
Block #		Lot #		Block #		Lot #	
Block #		Lot #		Block #		Lot #	

SECTION B. REMEDIAL ACTION WORKPLAN

1. Is the remediation at a residence, school, or child care center? ☒ Yes ☐ No

   If "No" STOP ! DO NOT SUBMIT THIS FORM.

2. Is the remediation for new construction of, or a change in use to a residence, school, or child care center *and* was remediation initiated *after* May 7, 2010? ☒ Yes ☐ No

   If "Yes": Is the proposed remedial action required to be approved by the NJDEP? ☒ Yes ☐ No

   If "Yes," please indicate reason(s) below: *(check all that apply)*

   - ☐ Containment of free product
   - ☐ Unexploded Ordnance
   - ☐ Chlorinated Dioxins and Furans
   - ☐ Hexavalent Chromium
   - ☐ Landfills not prohibited by N.J.S.A. 58:10B-12(g)
   - ☒ Alternative Remedy **– (If checked complete Section C)**

   If "No": You are not required to submit this form. However, you may submit this form if you desire pre-approval from the NJDEP of your remedial action for **only** a residence, a school, or child care center for the **specific issues** listed below. **BE ADVISED:** Once you submit this form, you must comply with all Department's recommendations and modifications to your submittal.

   Are you requesting voluntary pre-approval of your proposed remedial action? ☐ Yes ☐ No

If "Yes," indicate the issue(s) to be reviewed: *(check all that apply)*

- ☐ Containment of free product
- ☐ Unexploded Ordnance
- ☐ Chlorinated Dioxins and Furans
- ☐ Hexavalent Chromium
- ☐ Landfills not prohibited by N.J.S.A. 58:10B-12(g)
- ☐ Alternative Remedy

SECTION C. ALTERNATIVE REMEDY *(complete only if submitting an alternative remedy)*

1. The alternative remedy is: *(Check one only)*

The request for an Alternative Remedy approval is limited to the "clean utility corridor" requirement. The proposed alternative remedy in the RAW is equally protective over time as indicated in this section. However, the presumptive remedy for clean utility corridors is also impractical due to site conditions as detailed in the RAW.

- ☐ Proposed because the presumptive remedy is impractical due to conditions at the site;

OR

- ☒ Equally protective over time" as the applicable presumptive remedy.

2. Provide the page number in the RAW where the detailed description of the alternative remedy is located: 14 .

SECTION D. PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: Avalon Princeton, LLC

Representative First Name: Ronald Representative Last Name: Ladell

Title: Senior Vice President - AvalonBay Communities, Inc.

Phone Number: (732) 404-4820 Ext: Fax: (732) 283-9101

Mailing Address: 517 Route One South, Suite 5500

City/Town: Iselin State: New Jersey Zip Code: 08830

Email Address: Ronald_Ladell@avalonbay.com

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: Ronald S. Ladell Date: 9/21/15

Name/Title: Ronald Ladell/Senior Vice President

No changes to contact information since last submittal ☐

SECTION E. LICENSED SITE REMEDIATION PROFESSIONAL INFORMATION AND STATEMENT

LSRP ID Number: 585775

First Name: Peter Last Name: Hansen

Phone Number: (973) 366-9500 Ext: Fax: (973) 366-9593

Mailing Address: 75 Fleetwood Drive, Suite 250

City/Town: Rockaway State: New Jersey Zip Code: 07866

Email Address: phansen@ecolsciences.com

This statement shall be signed by the LSRP who is submitting this notification in accordance with SRRA Section 16 d. and Section 30 b.2.

I certify that I am a Licensed Site Remediation Professional authorized pursuant to N.J.S.A. 58:10C to conduct business in New Jersey. As the Licensed Site Remediation Professional of record for this remediation, I:

[SELECT ONE OR BOTH OF THE FOLLOWING AS APPLICABLE]:

☐ *directly oversaw and supervised all of the referenced remediation, and\or*

☒ *personally reviewed and accepted all of the referenced remediation presented herein.*

I believe that the information contained herein, and including all attached documents, is true, accurate and complete.

It is my independent professional judgment and opinion that the remediation conducted at this site, as reflected in this submission to the Department, conforms to, and is consistent with, the remediation requirements in N.J.S.A. 58:10C-14.

My conduct and decisions in this matter were made upon the exercise of reasonable care and diligence, and by applying the knowledge and skill ordinarily exercised by licensed site remediation professionals practicing in good standing, in accordance with N.J.S.A. 58:10C-16, in the State of New Jersey at the time I performed these professional services.

I am aware pursuant to N.J.S.A. 58:10C-17 that for purposely, knowingly or recklessly submitting false statement, representation or certification in any document or information submitted to the board or Department, etc., that there are significant civil, administrative and criminal penalties, including license revocation or suspension, fines and being punished by imprisonment for conviction of a crime of the third degree.

LSRP Signature: Date: 9/21/2015

LSRP Name/Title: Peter A. Hansen/Assistant Vice President

Company Name: EcolSciences, Inc.

No changes to contact information since last submittal ☐

Completed forms should be sent to:

Bureau of Case Assignment & Initial Notice
Site Remediation Program
NJ Department of Environmental Protection
401-05H
PO Box 420
Trenton, NJ 08625-0420

SIR/RIR/RAW ATTACHMENT B

Quality Assurance Project Plan (QAPP)

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

QUALITY ASSURANCE PROJECT PLAN
FOR
FORMER UNIVERSITY MEDICAL CENTER AT PRINCETON
253 WITHERSPOON STREET
BLOCK 2102, LOT 1
PRINCETON, MERCER COUNTY, NEW JERSEY
SRPID # 011700, CASE # 15-09-09-1706-55

Prepared for:

NJ Department of Environmental Protection

Division of Remediation Support

401 East State Street

Trenton, New Jersey 08625-0433

Prepared on Behalf of:

Avalon Princeton LLC
517 Route One South
Iselin, New Jersey

Prepared by:

EcolSciences, Inc.

75 Fleetwood Drive, Suite 250

Rockaway, New Jersey 07866

(973) 366-9500

September 2015

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1. QUALITY ASSURANCE PROJECT PLAN INTRODUCTION

EcolSciences, Inc. was retained by AvalonBay Princeton LLC to prepare this Quality Assurance Project Plan (QAPP) for the former University Medical Center at Princeton (SRP PI# 011700, Case # 15-09-09-1706-55), 253 Witherspoon Street, Princeton, Mercer County, New Jersey ("Site"), and referenced as Block 21.02, Lot 1. This QAPP was prepared in accordance with the New Jersey Department of Environmental Protection (NJDEP) Technical Requirements for Site Remediation (N.J.A.C. 7:26E) dated July 1, 2013.

The 5.63-acre Site is located at the intersection of Franklin Avenue and Witherspoon Road. Prior to closure of the facility, the Site was improved with a 308-bed acute care hospital operating as the University Medical Center at Princeton ("Hospital"). This facility included four hospital wings and a power plant, with a detached multi-level Parking Garage north of the Site. In 2014, EcolSciences oversaw the removal and closure of six regulated underground storage tanks (Incident # 14-05-22-1548-10), and an unrestricted use Response Action Outcome was issued for these tanks (six AOCs) on January 19, 2015.

With the exception of a portion of a Parking Garage that is present on the Site (the remainder of the Parking Garage is present on a separate lot as shown on QAPP Figure 1), the structures at the Site were decommissioned and then demolished in 2014 and 2015. Masonry material (concrete and brick) generated from the former structures and site improvements was crushed and included with other site materials (sub-base beneath foundations, walkways, and roadways, site soils, and a limited amount of pavement) for re-use on site ("Reworked Site Materials"). A portion of the reworked site material has been placed throughout the property and compacted. The remainder is stockpiled for offsite disposal. Sampling for disposal characterization indicated exceedances of the NJDEP Residential Direct Contact Soil Remediation Standard (RDCSRS). EcolSciences proposes to conduct a test pit study (i.e. Remedial Investigation) to assess the conditions of the site.

This Quality Assurance Project Plan (QAPP) summarizes the quality assurance/quality control (QA/QC) procedures that will be incorporated into the Remedial Investigation (RI) activities planned for reworked site material. Procedures in the QAPP identify proper sample collection, handling, documentation, derived waste management plan, on-site field laboratory and laboratory protocols to be used throughout all remedial activities.

2. DATA QUALITY OBJECTIVES

Field sampling procedures, data reduction, and reporting procedures for this project will be performed in accordance with applicable Federal and State guidelines and industry-wide standards. Project-specific data quality objectives are as follows:

- Environmental samples will be collected in accordance with the NJDEP *Field Sampling Procedures Manual* (Rev. 2011);

- NJDEP *Field Sampling Procedures Manual* Data generated from field sampling activities will be gathered in accordance with the procedures set forth in the NJDEP *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E);

- Data generated will be reviewed and verified to confirm that it is of known and acceptable precision, accuracy, representativeness, completeness, and comparability, in accordance with the NJDEP Data of Known Quality Protocols Technical Guidance, and the NJDEP Data Quality Assessment and Data Usability Evaluation Technical Guidance.; and,

- Data generated will be of sufficient quality and quantity sufficient quality to meet the project-specific DQOs and support the environmental decisions to be made, to document that investigative sampling adequately defines the extent of impacts (if any), and to confirm that the remedial action (if any) has met its objective of mitigating reworked site material to the appropriate remedial standard and is protective of both human health and the environment.

3. SAMPLE DESIGN AND RATIONALE

The Remedial Investigation sampling design and rationale is as follows. If Remedial Activity Verification sampling are required, the sampling design rationale will be addressed in a revision to this QAPP.

3.1 Remedial Investigation Sampling

A Remedial investigation (RI) will be conducted to evaluate the Reworked Site Material present on the Site. Samples will be collected from test pits installed throughout the Site. Samples will be collected biased suspected areas of greatest contamination based upon site conditions (i.e., visual staining), at locations of elevated PID readings, at the groundwater level (if encountered), at the end of the contracted boring depth, at the top of bedrock (if encountered), and/or at locations based upon professional judgment.

4. KEY PERSONNEL AND SUBCONTRACTOR SUPPORT

The following is a listing of the principal personnel involved with the investigation and remediation of the site, including a description of the role, responsibilities, and authority on the project.

Licensed Site Remediation Professional: Peter Hansen, LSRP, LEP
Assistant Vice President

EcolSciences, Inc.
75 Fleetwood Drive, Suite 250
Rockaway, New Jersey 07866
(973) 366-9500
LSRP No. 585775

Mr. Hansen is responsible for the coordination of environmental activities, project management and for review and approval of environmental documents prior to submission to NJDEP.

Project Manager/Administrator: Timothy Rutka
Project Manager
EcolSciences, Inc.

Mr. Rutka is responsible for overall project management activities, for developing the site sampling strategy with the LSRP, quality assurance and quality control, and preparation/review of environmental documents prior to submission to the client and/or regulatory agencies.

Field Manager: Andrei Ivanciu
Senior Project Geologist
EcolSciences, Inc.

Mr. Ivanciu is responsible for field project management activities, developing the site sampling strategy with the LSRP, health & safety during sampling activities, coordination with excavation and laboratory subcontractors, and supervision of all field activities with oversight from the LSRP.

Laboratory: TestAmerica – Edison
NJDEP Certification No. 12028
777 New Durham Road
Edison, New Jersey 08817
732-549-3900
Contact: Ms. Laura Sneed

5. ANALYTICAL METHODS AND QUALITY ASSURANCE

The Field Investigation Sample table below summarizes the environmental sampling that are anticipated as part of the site investigation.

FIELD INVESTIGATION SAMPLES				
Investigation Phase	**Matrix**	**Analytical Parameter**	**# Samples Anticipated**	**Sample Locations**
Remedial Investigation	Reworked Onsite Material	PAH, PCB, Metals	22	To be determined

6. SAMPLING METHODOLOGY

The sampling methodologies for the Investigation are outlined as follows.

6.1 Test Pits

Soil samples will be collected from select test pit locations using a back hoe. All samples will be field-screened using a photo-ionization detector. The individual samples will be biased to the six-inch interval where contamination is anticipated to be the greatest, using professional judgement.

6.2 Material Sampling Methods

All samples will be collected using pre-cleaned scoopulas following procedures set forth in the New Jersey Department of Environmental Protection Field Sampling Procedures Manual.

7. FIELD DOCUMENTATION PROCEDURES

Field documentation procedures include the notation of the sampling locations, measurement of sample depths, and the preparation of soil logs as summarized in the following subsections.

7.1 Sampling Location and Depth

The sample locations will be determined based upon field conditions specific to the site, as described in Section 3. Coordinates of the sample locations will be reported in New Jersey state plane coordinates (NAD 1983). All vertical data points will be reported as depth below ground surface (bgs), and in Mean Sea Level (msl) using the North American Vertical Datum of 1988 (NAVD 1988).

7.2 Soil Logs

A log of the soil profile at each sampling location will be compiled using the *Unified Soil Classification System*.

8. FIELD INSTRUMENTATION

All soil samples will be field-screened using a photo-ionization detector (PID). The Standard Operation Procedures for the PID are provided in Section 9.

9. FIELD INSTRUMENTATION STANDARD OPERATING PROCEDURES

Field instrument standard operating procedures for the photo-ionization detector and the dust meter are provided in the following Subsections.

9.1 Photo-ionization Detector Operating Procedures

All samples will be field screened using a ThermoEnvironmental Model 580B photo-ionization detector (or equivalent). The Model 580B photo-ionization detector uses a 10.0 electron volt ultraviolet light source to ionize volatile organic compounds in air. The ionized compounds emit electrons, which are first captured in the ionization chamber and converted into electronic signals, which are then calibrated against a known standard gas to yield a reading as to the concentration of total organic vapors in air. The PID will be calibrated prior to the start of each day of field sampling activities using a standard calibration gas (isobutylene in air/100 ppm supplied by Scott Specialty Gases). The response factor for this instrument is 1:1 meaning that 1 ppm of standard gas equates to 1 ppm of total volatile organic vapors in air

The PID employs a standard calibration curve that is set using an internal, computer-controlled calibration sequence, and isobutylene as the standard calibration gas. Specific instrument calibration procedures are as follows:

- **To Calibrate the PID** - Press "RESET TO CALIBRATE" to initiate the calibration sequence.

- **To Zero the PID** - The PID will display: "ZERO GAS RESET WHEN READY" The RESET switch should be pressed to zero the instrument to ambient air. The PID will display: "MODEL 580B ZEROING."

- **To Set Span (Calibration Gas)** - Once the PID has been zeroed, the PID will display: "SPAN PPM = 0000." The Span gas concentration (100 ppm Isobutylene in air) should now be entered by simultaneously pressing the RESET switch and either the +/INC switch to increment the digit above the cursor or the -/CRSR switch to move the cursor. Once the span gas concentration has been entered (i.e., 100 ppm), the +/INC switch should be pressed. The PID will then display: "SPAN GAS RESET WHEN READY."

- **Instrument Calibration** - Once the span gas has been introduced, the RESET switch should be pressed. The PID will then calibrate the instrument. The PID will display: "MODEL 580B CALIBRATING." Once the PID has been calibrated, the PID will go back to the

beginning and display: "RESET TO CALIBRATE." If during the zeroing or calibrating of the PID a correct reading was not recorded, then the PID will display: "CAL ERROR RESET WHEN READY." Pressing the RESET switch will return the 580B to zeroing or calibrating mode.

- **Field QA/QC Procedures** - The PID should be field checked prior to using the "Marker Test." A "Sharpie" marking pen will usually produce a reading of between 20 and 50 ppm on the PID.

10. SAMPLE HANDLING AND CHAIN-OF-CUSTODY PROCEDURES

The sample handling and chain-of-custody procedures employed during the investigation will be as follows:

- **Sample Identification and Labeling** – Individual sample bottles will have identification labels that include the project name, project number, sample number, listing of analytical parameters, sample preservation, and the time and date of sampling.

- **Field Sample Shipment and Preservation Procedures** – All samples will be transported to the laboratory in a cooler containing wet ice to thermally preserve samples at 4±2 degrees Centigrade.

- **Sample Shipment/Chain-of-Custody –** All sample bottles will be obtained from the contract laboratory prior to sampling, with the samples shipped in coolers under Chain-of-Custody. The laboratory will provide blank Chain-of-Custody forms. The samples will be transported by laboratory courier under Chain-of-Custody to document sample shipment and receipt by the laboratory. Every sample collected in the field will be included on the Chain-of-Custody Record. Information of the Chain-of-Custody will include the Company name and address, project name and number, sample numbers, sample matrix, number of sample containers per sample, date and time of sample collection, analytical parameters for each sample, the type of laboratory deliverables to be completed for each sample, and the type of sample preservation. The Chain-of-Custody will also include the time, date and signatures of the persons involved with transporting the samples to the contract laboratory.

11. FIELD STORAGE OF SAMPLES AND SAMPLE TRANSPORT PROCEDURES

The soil samples will be placed on ice immediately upon collection in coolers supplied by the laboratory. The samples will be transported daily to the laboratory under chain-of-custody by laboratory courier.

12. SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIME

Sample container types, sample preservation and analytical methods, and sample holding times are summarized in the following table.

Analytical Parameter	Matrix	Analytical Method	Container Type	Preservation Method	Holding Time
SVOC+TIC/ PAH	Reworked Site Material	USEPA SW-846 Method 8270D	8 oz. Glass	4°C	14 Days to Extract 40 Days to Analyze
PCBs	Reworked Site Material	USEPA SW-846 Method 8081/8082	8 oz Glass	4°C	14 Days to Extract 40 Days to Analyze
TAL Metals	Reworked Site Material	USEPA SW-846 Method 6010B with mercury analyzed by USEPA SW-846 Method 7471	8 oz. Glass	4°C	180 Days 28 Days for Mercury

13. ANALYTICAL METHODS SUMMARY

The reworked site material samples will be analyzed for USEPA Target Compound List (TCL) polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), and metals. An NJDEP-certified laboratory, TestAmerica, Inc, of Edison, New Jersey, (NJDEP Certification #12028) will be subcontracted by EcolSciences to complete the sample analyses. The analytical protocols followed by the laboratory for the soil sample analyses are provided in the table in Section 12.

14. PROJECT COMPOUNDS SUMMARY

As discussed in Section 1, PAHs, PCBs and metals were reported in samples collected for characterization of surplus reworked site material. The reworked site material samples will be analyzed for the USEPA Target Compound List (TCL) PAHs, PCBs, and metals.

14.1 Project Action Limits

The soil sampling results will be compared with current (i.e. 2012) NJDEP Residential Direct Contact Soil Remediation Standard (RDCSRS) and 2012 Non-Residential Direct Contact Soil Remediation Standards (NRDCSRS).

14.2 Practical Quantitation Limits

The current practical quantitation limits (PQL) or Reporting Limits (RL), and the Method Detection Limits (MDL) as provided by the contract laboratory for the project compound list are provided in QAPP Table 1.

15. MEASUREMENT PERFORMANCE CRITERIA

Performance criteria for QA/QC samples will be set by method-specific contract laboratory Standard Operating Procedures in accordance with the methodologies, the NJDEP Data of Known Quality Protocols Technical Guidance, and the NJDEP Data Quality Assessment and Data Usability Evaluation Technical Guidance.

16. QA/QC REQUIREMENTS FOR ANALYSIS

Quality control samples will be analyzed by the laboratory as prescribed in the analytical methods. Calibrations, blanks, blank spikes and/or laboratory control samples (LCS) will be implemented to demonstrate the effectiveness of the analytical methods on clean samples. Matrix spike/matrix spike duplicates (MS/MSD), and sample duplicates will be utilized to demonstrate the effectiveness of the method in the analysis of field samples. MS/MSDs will be designated by the laboratory as per the guidelines set by the USEPA Methodologies.

17. LABORATORY DATA DELIVERABLE FORMAT

Pursuant to N.J.A.C. 7:26E-2.1(a)15, laboratory data deliverables will be provided in a Reduced Laboratory Data Deliverables – Non-USEPA/CLP Methods (RLDDNCLP) format. All solid sample results will be reported in parts per million (mg/kg) on a dry weight basis.

18. DATA QA/QC REVIEW PROCEDURES

A Data Quality Assessment/Data Usability Evaluation (DQA/DUE) will be conducted upon all laboratory data generated during this investigation in accordance with the NJDEP Data of Known Quality Protocols Technical Guidance, and the NJDEP Data Quality Assessment and Data Usability Evaluation Technical Guidance. A summary table of the DQA/DUE will be provided in the report summarizing the data.

19. CORRECTIVE ACTION PROCEDURES

Any data determined to be not in line with project specific data quality objectives will be discussed with the contract laboratory. If resolution with the lab cannot be met, additional samples will be collected and analyzed to replace the non-compliant results. This Quality Assurance Project Plan follows accepted standard practices of the environmental industry. EcolSciences reserves the

right to substitute applicable investigatory methods upon the professional judgment of the Licensed Site Remediation Professional.

20. LABORATORY QA/QC PROCEDURES

A copy of the contract laboratory – Laboratory Quality Assurance Quality Control Procedures is provided in QAPP Attachment B.

21. DATA AND RECORDS MANAGEMENT/ARCHIVE PROCEDURES

All data and report documents will be archived electronically by the Licensed Site Remediation Professional for a period of at least seven years.

QAPP
FIGURE 1

Proposed Site Layout

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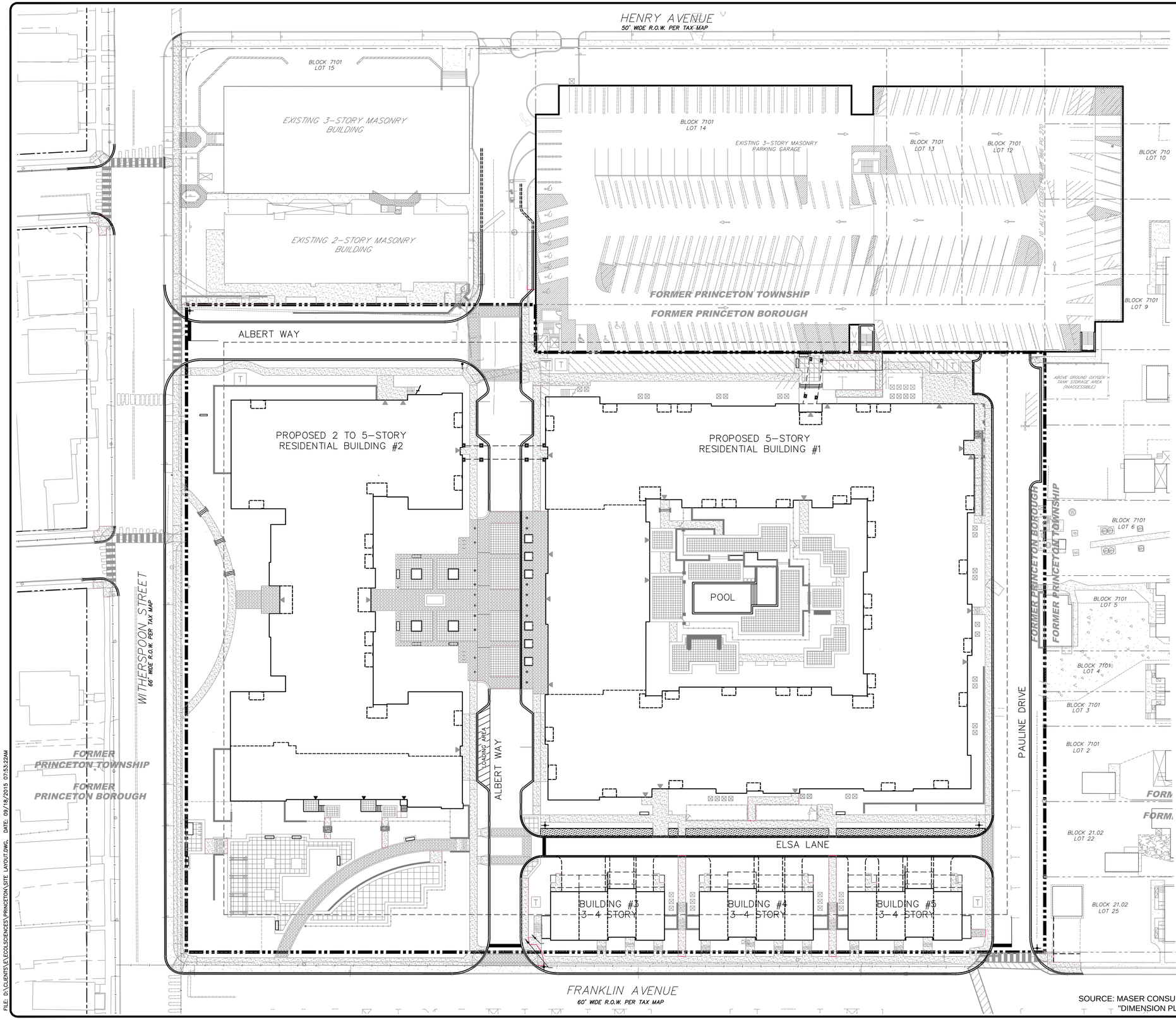

SOURCE: MASER CONSULTING, P.A., SHEET 5 OF 14, "DIMENSION PLAN", DATED 5/15/13.

TITLE:

QAPP FIGURE 1: PROPOSED SITE LAYOUT

FORMER UNIVERSITY MEDICAL CENTER @ PRINCETON
BLOCK 21.02, LOT 1
253 WITHERSPOON STREET
PRINCETON, MERCER COUNTY, NEW JERSEY
SRP PI# 011700

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

DRAWN BY:	DESIGNED BY:	APPROVED BY:	PLATE NUMBER:
AG	TR	TR	QAPP FIGURE 1
DATE: 9/10/15	SCALE: AS SHOWN	PROJECT NO.: XXXXX	

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QAPP
TABLE 1

TestAmerica-Edison 2015 RLs and MDLs

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000000QAPP TABLE 1
TestAmerica-Edison (NJDEP #12028) 2015 RLs and MDLs

Parameter	Analyte Description	CAS Number	Reporting Limit (RL) mg/kg	Method Detection Limit (MDL) mg/kg
Semivolatile Organic Compounds (GC/MS) USEPA 8270D_DKQP Automated Soxhlet Extraction 3541	1,2,4,5-Tetrachlorobenzene	95-94-3	0.330	0.0246
	2,2'-oxybis[1-chloropropane]	108-60-1	0.330	0.0136
	2,3,4,6-Tetrachlorophenol	58-90-2	0.330	0.0311
	2,4,5-Trichlorophenol	95-95-4	0.330	0.0329
	2,4,6-Trichlorophenol	88-06-2	0.133	0.00940
	2,4-Dichlorophenol	120-83-2	0.133	0.00780
	2,4-Dimethylphenol	105-67-9	0.330	0.0727
	2,4-Dinitrophenol	51-28-5	0.266	0.250
	2,4-Dinitrotoluene	121-14-2	0.0670	0.0131
	2,6-Dinitrotoluene	606-20-2	0.0670	0.0176
	2-Chloronaphthalene	91-58-7	0.330	0.00750
	2-Chlorophenol	95-57-8	0.330	0.00840
	2-Methylnaphthalene	91-57-6	0.330	0.00730
	2-Methylphenol	95-48-7	0.330	0.0144
	2-Nitroaniline	88-74-4	0.330	0.0109
	2-Nitrophenol	88-75-5	0.330	0.0111
	3,3'-Dichlorobenzidine	91-94-1	0.133	0.0369
	3-Nitroaniline	99-09-2	0.330	0.00980
	4,6-Dinitro-2-methylphenol	534-52-1	0.266	0.0882
	4-Bromophenyl phenyl ether	101-55-3	0.330	0.0104
	4-Chloro-3-methylphenol	59-50-7	0.330	0.0142
	4-Chloroaniline	106-47-8	0.330	0.00850
	4-Chlorophenyl phenyl ether	7005-72-3	0.330	0.00990
	4-Methylphenol	106-44-5	0.330	0.00900
	4-Nitroaniline	100-01-6	0.330	0.0125
	4-Nitrophenol	100-02-7	0.670	0.159
	Acenaphthene	83-32-9	0.330	0.00800
	Acenaphthylene	208-96-8	0.330	0.00850
	Acetophenone	98-86-2	0.330	0.00720
	Anthracene	120-12-7	0.330	0.0314
	Atrazine	1912-24-9	0.133	0.0147
	Benzaldehyde	100-52-7	0.330	0.0252
	Benzo[a]anthracene	56-55-3	0.0330	0.0276
	Benzo[a]pyrene	50-32-8	0.0330	0.0100
	Benzo[b]fluoranthene	205-99-2	0.0330	0.0129
	Benzo[g,h,i]perylene	191-24-2	0.330	0.0190
	Benzo[k]fluoranthene	207-08-9	0.0330	0.0144
	Bis(2-chloroethoxy)methane	111-91-1	0.330	0.0103
	Bis(2-chloroethyl)ether	111-44-4	0.0330	0.00780
	Bis(2-ethylhexyl) phthalate	117-81-7	0.330	0.0129
	Butyl benzyl phthalate	85-68-7	0.330	0.0102
	Caprolactam	105-60-2	0.330	0.0238
	Carbazole	86-74-8	0.330	0.00820
	Chrysene	218-01-9	0.330	0.00900
	Dibenz(a,h)anthracene	53-70-3	0.0330	0.0172
	Dibenzofuran	132-64-9	0.330	0.0100
	Diethyl phthalate	84-66-2	0.330	0.00940
	Dimethyl phthalate	131-11-3	0.330	0.00960
	Di-n-butyl phthalate	84-74-2	0.330	0.00990
	Di-n-octyl phthalate	117-84-0	0.330	0.0168
	Diphenyl	92-52-4	0.330	0.0282
	Fluoranthene	206-44-0	0.330	0.00980
	Fluorene	86-73-7	0.330	0.00720
	Hexachlorobenzene	118-74-1	0.0330	0.0134

000000QAPP TABLE 1
TestAmerica-Edison (NJDEP #12028) 2015 RLs and MDLs

Parameter	Analyte Description	CAS Number	Reporting Limit (RL) mg/kg	Method Detection Limit (MDL) mg/kg
Semivolatile Organic Compounds (GC/MS) USEPA 8270D_DKQP Automated Soxhlet Extraction 3541	Hexachlorobutadiene	87-68-3	0.0670	0.00930
	Hexachlorocyclopentadiene	77-47-4	0.330	0.0206
	Hexachloroethane	67-72-1	0.0330	0.0121
	Indeno[1,2,3-cd]pyrene	193-39-5	0.0330	0.0220
	Isophorone	78-59-1	0.133	0.00710
	Naphthalene	91-20-3	0.330	0.00840
	Nitrobenzene	98-95-3	0.0330	0.0104
	N-Nitrosodi-n-propylamine	621-64-7	0.0330	0.0111
	N-Nitrosodiphenylamine	86-30-6	0.330	0.0300
	Pentachlorophenol	87-86-5	0.266	0.0400
	Phenanthrene	85-01-8	0.330	0.00880
	Phenol	108-95-2	0.330	0.0108
	Pyrene	129-00-0	0.330	0.0150

Parameter	Analyte Description	CAS Number	Reporting Limit (RL) mg/kg	Method Detection Limit (MDL) mg/kg
Polychlorinated Biphenyls (PCBs) GC USEPA 8082A_DKQP Microwave Extraction 3546	Aroclor 1016	12674-11-2	0.0670	0.00890
	Aroclor 1221	11104-28-2	0.0670	0.00890
	Aroclor 1232	11141-16-5	0.0670	0.00890
	Aroclor 1242	53469-21-9	0.0670	0.00890
	Aroclor 1248	12672-29-6	0.0670	0.00890
	Aroclor 1254	11097-69-1	0.0670	0.00920
	Aroclor 1260	11096-82-5	0.0670	0.00920
	Aroclor 1262	37324-23-5	0.0670	0.00920
	Aroclor 1268	11100-14-4	0.0670	0.00920
	Polychlorinated biphenyls, Total	1336-36-3	0.0670	0.00920

Parameter	Analyte Description	CAS Number	Reporting Limit (RL) mg/kg	Method Detection Limit (MDL) mg/kg
Metals (ICP) USEPA 6010C_DKQP Preparation 3050B	Aluminum	7429-90-5	20.0	7.36
	Antimony	7440-36-0	1.00	0.411
	Arsenic	7440-38-2	1.00	0.446
	Barium	7440-39-3	2.00	0.660
	Beryllium	7440-41-7	0.400	0.126
	Cadmium	7440-43-9	1.00	0.312
	Calcium	7440-70-2	100	35.8
	Chromium	7440-47-3	2.00	0.776
	Cobalt	7440-48-4	2.00	0.768
	Copper	7440-50-8	2.00	0.674
	Iron	7439-89-6	60.0	25.9
	Lead	7439-92-1	0.600	0.221
	Magnesium	7439-95-4	100	35.9
	Manganese	7439-96-5	4.00	1.58
	Nickel	7440-02-0	2.00	0.782
	Potassium	9/7/40	100	34.0
	Selenium	7782-49-2	5.00	0.385
	Silver	7440-22-4	1.00	0.752
	Sodium	7440-23-5	100	38.4
	Thallium	7440-28-0	0.400	0.155
	Vanadium	7440-62-2	2.00	0.774
	Zinc	7440-66-6	8.00	2.44

Parameter	Analyte Description	CAS Number	Reporting Limit (RL) mg/kg	Method Detection Limit (MDL) mg/kg
Mercury (CVAA) USEPA 7471B_DKQP	Mercury	7439-97-6	0.0170	0.0120

QAPP
ATTACHMENT A

TestAmerica, Inc. Quality Assurance Manual (ED-QA-LQM Revision 13)
(Electronic Version Only, on Disk)

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Quality Assurance Manual

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Edison, NJ 08817
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www.testamericainc.com

Facility Distribution No. ELECTRONIC **Distributed To: FACILITY INTRANET**

Title Page:

Quality Assurance Manual
Approval Signatures

11/15/11

Laboratory Director – Ann Gladwell — Date

11/15/11

Quality Assurance Manager - Carl Armbruster — Date

11/15/11

Operations Manager – Mark Acierno — Date

SECTION 2. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

REFERENCED CORPORATE SOPs AND POLICIES

SOP / Policy Reference	Title
CA-Q-S-001	Solvent and Acid Lot Testing and Approval
CA-Q-S-002	Acceptable Manual Integration Practices
CA-Q-S-004	Method Compliance & Data Authenticity Audits
CA-Q-S-006	Detection Limits
CA-Q-S-008	Management Systems Review
CW-Q-S-001	Corporate Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CW-L-S-002	Internal Investigation of Potential Data Discrepancies and Determination for Data Recall
CA-L-S-002	Subcontracting Procedures
CW-L-P-004	Ethics Policy
CA-L-P-002	Contract Compliance Policy
CW-F-P-002	Authorization Matrix
CW-F-P-004	Procurement and Contracts Policy
CA-C-S-001	Work Sharing Process
CA-T-P-001	Qualified Products List
CW-F-S-007	Controlled Purchases Policy
CW-F-S-018	Vendor Selection
CA-Q-M-002	Corporate Quality Management Plan
CW-E-M-001	Corporate Environmental Health & Safety Manual

REFERENCED LABORATORY SOPs

SOP Reference	Title
ED-GEN-002	Document Control
ED-GEN-003	Control of Non-Conformances and Corrective Action
ED-GEN-022	Training
ED-GEN-024	Record Storage and Retention
ED-GEN-001	Data Management and Handling
ED-GEN-021	Data Review
ED-GEN-007	Subsampling
ED-SPM-001	Sample Receipt, Login, Identification, And Storage
ED-RP-001	Reports Production
ED-GEN-011	Calibration and Use of Pipettes
ED-FLD-008, -009	Groundwater Sampling and Flow Monitoring
ED-FLD-014	Wastewater Sampling
ED-FLD-001 thru -010	Field Analytical Parameters
ED-SPM-006	Acceptance and Handling of Regulated Domestic & Foreign Soils
ED-SPM-007	Disposal of Samples and Associated Laboratory Waste

SECTION 3. INTRODUCTION, SCOPE AND APPLICABILITY

3.1 Introduction and Compliance References

TestAmerica Edison's Quality Assurance Manual (QAM) is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving TestAmerica's data quality goals. The laboratory maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality.

The QAM has been prepared to assure compliance with The NELAC Institute (TNI) Standard, dated 2009, Volume 1 Modules 2 and 4, and ISO/IEC Guide 17025:2005(E). In addition, the policies and procedures outlined in this manual are compliant with TestAmerica's Corporate Quality Management Plan (CQMP) and the various accreditation and certification programs listed in Appendix 3. The CQMP provides a summary of TestAmerica's quality and data integrity system. It contains requirements and general guidelines under which all TestAmerica facilities shall conduct their operations.

The QAM has been prepared to be consistent with the requirements of the following documents:

- EPA 600/4-88/039, *Methods for the Determination of Organic Compounds in Drinking Water,* EPA, Revised July 1991.
- EPA 600/R-95/131, *Methods for the Determination of Organic Compounds in Drinking Water,* Supplement III, EPA, August 1995.
- EPA 600/4-79-019, *Handbook for Analytical Quality Control in Water and Wastewater Laboratories,* EPA, March 1979.
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008.*
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261.
- *Manual for the Certification of Laboratories Analyzing Drinking Water (EPA 815-R-05-004, January 2005) (DW labs only)*
- *Statement of Work for Inorganics & Organics Analysis, SOM and ISM, current versions, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- APHA, *Standard Methods for the Examination of Water and Wastewater,* 18th Edition, 19th, 20th, 21st and on-line Editions.
- Toxic Substances Control Act (TSCA).

3.2 Terms and Definitions

A Quality Assurance Program is a company-wide system designed to ensure that data produced by the laboratory conforms to the standards set by state and/or federal regulations. The program functions at the management level through company goals and management policies, and at the analytical level through Standard Operating Procedures (SOPs) and quality control. The TestAmerica program is designed to minimize systematic error, encourage

constructive, documented problem solving, and provide a framework for continuous improvement within the organization.

Refer to Appendix 2 for the Glossary/Acronyms.

3.3 Scope / Fields of Testing

The laboratory analyzes a broad range of environmental and industrial samples every month. Sample matrices vary among drinking water, effluent water, groundwater, hazardous waste, sludge and soils. The Quality Assurance Program contains specific procedures and methods to test samples of differing matrices for chemical, physical and biological parameters. The Program also contains guidelines on maintaining documentation of analytical processes, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all analytical requests are thoroughly evaluated before commitments are made to accept the work. Measurements are made using published reference methods or methods developed and validated by the laboratory.

The methods covered by this manual include the most frequently requested methodologies needed to provide analytical services in the United States and its territories. The specific list of test methods used by the laboratory can be found in TestAmerica Edison Work Instruction No. EDS-WI-009 (Analytical Capabilities). The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet these requirements. All methods performed by the laboratory shall meet these criteria as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require criteria other than those contained in this manual. In these cases, the laboratory will abide by the requested criteria following review and acceptance of the requirements by the Laboratory Director and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory Director and the QA Manager must determine if it is in the lab's best interest to follow the less stringent requirements.

3.4 Management of the Manual

3.4.1 Review Process

The template on which this manual is based is reviewed annually by Corporate Quality Management Personnel to assure that it remains in compliance with Section 3.1. This manual itself is reviewed every two years by senior laboratory management to assure that it reflects current practices and meets the requirements of the laboratory's clients and regulators as well as the CQMP. Occasionally, the manual may need changes in order to meet new or changing regulations and operations. The QA Manager will review the changes in the normal course of business and incorporate changes into revised sections of the document. All updates will be reviewed by the senior laboratory management staff. The laboratory updates and approves such changes according to our Document Control & Updating procedures (refer to SOP No. ED-GEN-002, Document Control).

SECTION 4. MANAGEMENT REQUIREMENTS

4.1 Overview

TestAmerica Edison is a local operating unit of TestAmerica Laboratories, Inc... The organizational structure, responsibilities and authorities of the corporate staff of TestAmerica Laboratories, Inc. are presented in the CQMP. The laboratory has day-to-day independent operational authority overseen by corporate officers (e.g., President, Chief Operating Officer, and Corporate Quality). The laboratory operational and support staff work under the direction of the Laboratory Director. The organizational structure for both Corporate & TestAmerica Edison is presented in Figure 4-1.

4.2 Roles and Responsibilities

In order for the Quality Assurance Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to the quality program. The following descriptions briefly define each role in its relationship to the Quality Assurance Program.

4.2.1 Additional Requirements for Laboratories

The responsibility for quality resides with every employee of the laboratory. All employees have access to the QAM, are trained to this manual, and are responsible for upholding the standards therein. Each person carries out his/her daily tasks in a manner consistent with the goals and in accordance with the procedures in this manual and the laboratory's SOPs. Role descriptions for Corporate personnel are defined in the CQMP. This manual is specific to the operations of TestAmerica's Edison laboratory.

4.2.2 Laboratory Director/Lead Technical Director

TestAmerica Edison's Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to the

General Manager (GM). The Laboratory Director provides the resources necessary to implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program.

Specific responsibilities include, but are not limited to:

- Serves as lead technical director for all fields of testing.
- Ensures that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented.
- Ensures that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work.
- Ensures TestAmerica's human resource policies are adhered to and maintained.
- Ensures that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.
- Ensures that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs may be temporarily suspended by the Laboratory Director.
- Monitors standards of performance in quality control and quality assurance.
- Monitors the validity of analyses performed and data generated in the lab to assure reliable data.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Interfaces with Project Management and Customer Service to forecast receipts, provide quality analytical data to clients and meet on-time delivery dates.
- Ensures that the facility has appropriate Information Technology resources and that they are used effectively to support operational requirements.
- Actively participates in the process of sharing and adopting best practices within TestAmerica. Provides technical assistance to other TestAmerica laboratories as needed to improve productivity and customer service.
- Ensures client specific reporting and quality control requirements are met.
- Captains the management team, consisting of the QA Manager, the Operations Manager, the Project Management Director, the Client Services Manager, the Service Center Manager, the Environmental, Health and Safety Manager and the Support Services Manager as direct reports.

4.2.3 Quality Assurance (QA) Manager

The QA Manager has responsibility and authority to ensure the continuous implementation of the quality system.

The QA Manager reports directly to the Laboratory Director and has access to Corporate QA for advice and resources. This position is able to evaluate data objectively and perform

assessments without outside (e.g., managerial) influence. Corporate QA may be used as a resource in dealing with regulatory requirements, certifications and other quality assurance related items. The QA Manager directs the activities of the QA officers to accomplish specific responsibilities, which include, but are not limited to:

- Serves as the focal point for QA/QC in the laboratory.
- Having functions independent from laboratory operations for which he/she has quality assurance oversight.
- Maintaining and updating the QAM.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Training and advising the laboratory staff on quality assurance/quality control procedures that are pertinent to their daily activities.
- Have documented training and/or experience in QA/QC procedures and the laboratory's Quality System.
- Having a general knowledge of the analytical test methods for which data audit/review is performed (and/or having the means of getting this information when needed).
- Arranging for or conducting internal audits on quality systems and the technical operation.
- The laboratory QA Manager will maintain records of all ethics-related training, including the type and proof of attendance.
- Maintain, improve, and evaluate the corrective action database and the corrective and preventive action systems.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs shall be investigated following procedures outlined in Section 12 and if deemed necessary may be temporarily suspended during the investigation.
- Objectively monitor standards of performance in quality control and quality assurance without outside (e.g., managerial) influence.
- Coordinating of document control of SOPs, MDLs, control limits, and miscellaneous forms and information.
- Review a percentage of all final data reports for internal consistency. Review of Chain of Custody (COC), correspondence with the analytical request, batch QC status, completeness of any corrective action statements, 5% of calculations, format, holding time, sensibility and completeness of the project file contents.
- Review of external audit reports and data validation requests.
- Follow-up with audits to ensure client QAPP requirements are met.

- Establishment of reporting schedule and preparation of various quality reports for the Laboratory Director, clients and/or Corporate QA.
- Development of suggestions and recommendations to improve quality systems.
- Research of current state and federal requirements and guidelines.
- Captains the QA team to enable communication and to distribute duties and responsibilities.

- Ensuring Communication & monitoring standards of performance to ensure that systems are in place to produce the level of quality as defined in this document.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs are temporarily suspended following the procedures outlined in Section 12.
- Evaluation of the thoroughness and effectiveness of training.

4.2.4 Quality Assurance (QA) Specialist

The Quality Assurance (QA) Specialist is responsible for performing data audits, special audits, assisting with external and systems audits, overseeing the maintenance of QC records, certifications, Standard Operating Procedures (SOPs), training records, DOCs, arranging and managing PT samples. Additional responsibilities may include assisting with systematic problems within the laboratory, assisting in reviewing and/or writing of Quality Assurance Project Plans, and technical and QC specifications in contracts and other functions in support of the QA Manager's responsibilities as assigned.

- Assist QA Manager in conducting QA training courses, including ethics training.
- Performs data audits.
- Assist in performing special audits as deemed necessary by data audits, client inquiries, etc.
- Assisting in, conducting and responding to external audits conducted by clients and regulatory agencies.
- Assisting in reviewing and/or writing of Quality Assurance Project Plans, and technical and QC specifications in contracts.
- Maintaining all necessary laboratory certifications.
- Arranging and managing PT samples.
- Reviewing laboratory SOPs. Writing SOPs as needed.
- Maintaining historical indices of all technical records including SOPs, QC records, laboratory data, etc.
- Ensuring maintenance of records archives.
- Assisting in and monitoring laboratory's method compliance.
- Ensuring maintenance of DOCs for all analysts.
- Ensuring maintenance of training records for all employees.

- Assisting in identification of systematic problems within laboratories.
- Recommends resolutions for ongoing or recurring nonconformance.
- Providing statistical feedback to Departments on error rates, and assisting in identifying systematic improvements to minimize errors.
- Assists in tracking of customer complaints, providing statistical feedback to the laboratory, and assisting in identifying improvements.
- Overseeing and reviewing MDL studies.
- Ensuring control charts are generated; oversees and approves setting of control limits.
- Assists in monitoring new regulations and communicating them to the laboratory.

4.2.5 LAN Analyst

The LAN Analyst reports directly to the Regional Desktop Support Supervisor. Responsibilities include:

- Works with Corporate IT to solve information systems problems and to standardize laboratory IT equipment and processes.
- Monitors and supports office automation so that LAN is operational for internal and external communications.
- Troubleshoots problems throughout laboratory relating to computers, software, telephones and other electronic equipment.
- Responsible for new user setup on network, LIMS, telephone and voice mail.
- Installs or upgrades computers and other equipment.
- Maintains tape backups for multiple computer servers including LIMS.
- Maintains historical files of software, software operating procedures (manuals), software changes/modifications (Change Log) and software version numbers.
- Maintains log of repairs and service performed on LIMS hardware.
- Maintains awareness of any environmental conditions of the facility housing the LIMS that may compromise LIMS raw data and informs management.

4.2.6 Operations Manager

The Operations Manager manages and directs the analytical and reports production sections of the laboratory. He/She reports directly to the Laboratory Director. Specific responsibilities include:

- Maintains awareness of any environmental conditions of the facility housing the LIMS that may compromise LIMS raw data and informs management.
- Continuously evaluates production capacity and improves capacity utilization.
- Continuously evaluates turnaround time and addresses any problems that may hinder meeting the required and committed turnaround time from the various Departments.

- Develops and improves the training of all analysts in cooperation with the Laboratory Director and QA Manager and in compliance with regulatory requirements.
- Works with the Department (Technical) Managers to ensure that scheduled instrument maintenance is completed.
- Is responsible for efficient utilization of supplies.
- Constantly monitors and modifies the processing of samples through the Departments.
- Fully supports the quality system and, if called upon in the absence of the QA Manager, serves as his substitute in the interim.

4.2.7 Environmental, Health and Safety Manager

The Environmental, Health and Safety Manager reports directly to the Laboratory Director. The duties of this position consist of:

- Supervises the Environmental, Health and Safety/Facilities Team.
- Conduct ongoing, necessary safety training and conduct new employee safety orientation.
- Assist in developing and maintaining the Chemical Hygiene/Safety Manual.
- Administer dispersal of all Material Safety Data Sheet (MSDS) information.
- Perform regular chemical hygiene and housekeeping instruction.
- Give instruction on proper labeling and practice.
- Serve as chairman of the laboratory safety committee.
- Provide and train personnel on protective equipment.
- Oversee the inspection and maintenance of general safety equipment – fire extinguishers, safety showers, eyewash fountains, etc. and ensure prompt repairs as needed.
- Supervise and schedule fire drills and emergency evacuation drills.
- Determine what initial and subsequent exposure monitoring, if necessary to determine potential employee exposure to chemicals used in the laboratory.
- When determined necessary, conduct exposure monitoring assessments.
- Determine when a complaint of possible over-exposure is “reasonable” and should be referred for medical consultation.
- Assist in the internal and external coordination of the medical consultation/monitoring program conducted by TestAmerica’s medical consultants.
- Staying current with the hazardous waste regulations.
- Continuing training on hazardous waste issues.
- Reviewing and updating annually the Hazardous Waste Contingency Plan in the Environmental Health & Safety Manual.
- Auditing the staff with regard to compliance with the Hazardous Waste Contingency Plan.

- Contacting the hazardous waste subcontractors for review of procedures and opportunities for minimization of waste.

4.2.8 EH&S/Facilities Coordinator

The EH&S/Facilities Coordinator reports directly to the Environmental, Health and Safety Manager. The duties of this position consist of:

- Monitors laboratory for unsafe conditions or acts to keep lab in compliance with the Chemical Hygiene Plan, EH&S Procedures, and company policies.
- Ensures the proper personal protective equipment is available and personnel are properly trained in its use.
- Assists the Environmental, Health and Safety Manager in the investigation of accidents, incidents, and near misses and identifies and eliminates root cause.
- Conducts monthly facility inspections for compliance with health, safety and environmental regulations and procedures. Completes and forwards monthly inspection report to safety committee and laboratory management for corrective actions.
- Conducts safety equipment checks to ensure proper working order and sufficient inventory.
- Plans and tracks completion of monthly general awareness training sessions and compliance training, including new employee EH&S orientation.
- Coordinates emergency response team to provide prompt medical attention and stabilize emergency situation. After emergency is over, assists in determining appropriate clean up procedures.
- Conducts the monthly EH&S committee meeting.
- Participates in monthly EH&S conference call.
- Reviews and maintains MSDS's for laboratory materials.
- Coordinates the management and disposal of laboratory wastes.
- Assists in the preparation and maintenance of the laboratory Integrated Contingency Plan.
- Monitors air quality in facility, including monitoring fumehoods for proper operation and ventilation.
- Maintains overall building facilities and equipment as well as administers prevention maintenance measures.
- Contacts outside contractors as necessary to repair/maintain items outside the realm of reasonable maintenance.
- Performs miscellaneous errands, buying parts for labs, janitorial supplies.
- Oversees storage facilities, files and outside storage.

4.2.9 Technical Managers (Department Managers)

The Technical Managers (Department Managers) report directly to the Operations Manager. They are accountable for all analyses and analysts under their experienced supervision. The scope of responsibility ranges from the new-hire process and existing technology through the ongoing training and development programs for existing analysts and new instrumentation. Specific responsibilities include, but are not limited to:

- Exercises day-to-day supervision of laboratory operations for the appropriate field of accreditation and reporting of results. Coordinating, writing, and reviewing preparation of all test methods, i. e., SOPs, with regard to quality, integrity, regulatory and optimum and efficient production techniques, and subsequent analyst training and interpretation of the SOPs for implementation and unusual project samples. He/she insures that the SOPs are properly managed and adhered to at the bench. He/she develops standard costing of SOPs to include supplies, labor, overhead, and capacity (design vs. demonstrated versus first-run yield) utilization.
- Reviewing and approving, with input from the QA Manager, proposals from marketing, in accordance with an established procedure for the review of requests and contracts. This procedure addresses the adequate definition of methods to be used for analysis and any limitations, the laboratory's capability and resources, the client's expectations. Differences are resolved before the contract is signed and work begins. A system documenting any significant changes is maintained, as well as pertinent discussions with the client regarding their requirements or the results of the analyses during the performance of the contract. All work subcontracted by the laboratory must be approved by the client. Any deviations from the contract must be disclosed to the client. Once the work has begun, any amendments to the contract must be discussed with the client and so documented.
- Monitoring the validity of the analyses performed and data generated in the laboratory. This activity begins with reviewing and supporting all new business contracts, insuring data quality, analyzing internal and external non-conformances to identify root cause issues and implementing the resulting corrective and preventive actions, facilitating the data review process (training, development, and accountability at the bench), and providing technical and troubleshooting expertise on routine and unusual or complex problems.
- Providing training and development programs to applicable laboratory staff as new hires and, subsequently, on a scheduled basis. Training includes instruction on calculations, instrumentation management to include troubleshooting and preventive maintenance.
- Enhancing efficiency and improving quality through technical advances and improved LIMS utilization. Capital forecasting and instrument life cycle planning for second generation methods and instruments as well as asset inventory management.
- Coordinating sample management from "cradle to grave," insuring that no time is lost in locating samples.
- Ensures that 100% of data review undergoes two documented levels of review. Likewise ensures that all non-conformance issues are properly documented.
- Scheduling all QA/QC-related requirements for compliance, e.g., MDLs, etc..

- Captains Department personnel to communicate quality, technical, personnel, and instrumental issues for a consistent team approach.
- Responsible for the timely and accurate completion of performance evaluation samples and MDLs, for the Department.
- Ensure all logbooks are maintained, current, and properly labeled or archived.
- Report all non-conformance conditions to the QA Manager, Operations Manager, and/or Laboratory Director.
- Ensure that preventive maintenance is performed on instrumentation as detailed in the QA Manual or SOPs. He is responsible for developing and implementing a system for preventive maintenance, troubleshooting, and repairing or arranging for repair of instruments.
- Maintain adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.
- Achieve optimum turnaround time on analyses and compliance with holding times.
- Provide written responses to external and internal audit issues and coordinates audit responses with the QA Manager.

4.2.10 Laboratory Analysts and Technicians

Laboratory analysts and technicians are responsible for conducting analysis and performing all tasks assigned to them by their Department manager or supervisor. The responsibilities of the analysts are listed below:

- Perform analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database by means of Non-Conformance Memos (NCMs).
- Report all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to their Department (Technical) Manager, the Laboratory Director, and/or the QA Manager or member of QA staff.
- Perform 100% review of the data generated and document the review in the raw data and on the review checklist prior to entering and submitting for secondary level review.
- Suggest method improvements to the Department (Technical) Manager, the Laboratory Director, and the QA Manager. These improvements, if approved, will be incorporated within the constraints of the consensus reference methods.
- Work cohesively as a team in their Department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.
- Adhere to all environmental, health and safety protocols and attend safety meetings as required.

- Attend and participate in all staff meetings.

4.2.11 Sample Control Manager

The Sample Control Manager reports to the Laboratory Director. The responsibilities are outlined below:

- Direct the logging of incoming samples into the LIMS.
- Ensure the verification of data entry from login.
- Manages the preparation and shipment of bottle kits to clients.
- Oversees the responsibilities of all Sample Control Technicians.
- Supervises the storage and disposal of all samples.

4.2.12 Client Services Manager

The Customer Service Manager reports to the Laboratory Director and serves as the primary interface between the laboratory and the Sales and Marketing staff. Responsibilities include:

- Laboratory's primary client representative.
- Ensures client complaints are handled professionally, and resolved in a timely manner.
- Compiles and interprets receipts forecast to show near term business trends.
- Manages a minimal list of projects/programs for key client accounts. (Note: sufficient time is needed to manage the PM group and the CSM must not be overwhelmed with project management.)
- Prepares proposals for new business opportunities.
- Compiles and interprets Bid Activity Report.
- Compiles and interprets receipts forecast to show near term business trends.
- Prepares proposals for new business opportunities.
- Provides general sales support to Account Executives for business development activities started in the field.
- Develops and maintains business materials and organized information resource files that include project descriptions, resumes, original proposals, boilerplates, and company qualifications materials.

4.2.13 Director of Project Management

The Director of Project Management reports to the Laboratory Director and serves as the interface between the laboratory's technical Departments and the laboratory's clients. The staff consists of the Project Management team. With the overall goal of total client satisfaction, the functions of this position are outlined below:

- Technical training and growth of the Project Management team.
- Technical liaison for the Project Management team.

- Human resource management of the Project Management team.
- Responsible for ensuring that clients receive the proper sampling supplies, as appropriate.
- Accountable for response to client inquiries concerning sample status.
- Responsible for assistance to clients regarding the resolution of problems concerning COC.
- Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory.
- Notifying the supervisors of incoming projects and sample delivery schedules.
- Accountable to clients for communicating sample progress in daily status meeting with agreed-upon due dates.
- Responsible for discussing with client any project-related problems, resolving service issues, and coordinating technical details with the laboratory staff.
- Responsible for staff familiarization with specific quotes, sample log-in review, and final report completeness.
- Monitor the status of all data package projects in-house to ensure timely and accurate delivery of reports.
- Inform clients of data package-related problems and resolve service issues.
- Coordinate requests for sample containers and other services (data packages).

4.2.14 Project Manager

The Project Managers report directly to the Director of Project Management and serve as liaisons between the laboratory and its clients. The Project Manager's responsibilities include:

- Ensure client specifications are met by communicating project and quality assurance requirements to the laboratory.
- Notify laboratory personnel of incoming projects and sample delivery schedules.
- Monitor the status of all projects in-house to ensure timely delivery of reports.
- Inform clients of project-related problems, resolving service issues and coordinating technical issues with the laboratory staff.
- Accountable for response to client inquiries concerning sample status.
- Responsible for assistance to clients regarding the resolution of problems concerning COC.
- Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory.
- Notifying the supervisors of incoming projects and sample delivery schedules.
- Coordinate client requests for sample containers and other services.
- Schedule sample pick-ups from client offices or project sites and notifying the laboratory staff of incoming samples.
- Coordinate subcontract work.

- Respond to client inquiries concerning sample status.
- Performs final completeness review of data packages prior to release to client.

4.2.15 Project Management Assistant

The Project Management Assistant coordinates and monitors scheduling, timely completion and maintenance of project documentation files and completion of project set up and final report review, invoicing, and EDD's. Assists the Project Manager in servicing the client's needs. Specific responsibilities include:

- Reviews login confirmation reports for accuracy and corrects as needed.
- Generates diskettes for electronic data deliverables (EDD's) for electronic delivery to clients.
- Enters data that was subcontracted to other laboratories.
- Monitors report due dates for timely delivery.
- Assists Project Manager in changing compound lists, TAT, deliverables and other client specific requirements in the LIMs project and/or job database.
- Invoices completed data packages and generates credit or debit invoices to ensure proper payment.

4.2.16 Service Center Manager

The Service Center Manager (SCM) manages the service center and acts as a liaison between the laboratory and the local client base. The SCM is in charge of maintaining the Service Center facility, managing service center couriers, samplers and other personnel, and working with sales to develop, maintain and grow the client base in the area.

- Local area primary client representative for service center location.
- May head project start up meetings to ensure project objectives are successfully met and hands off project detail to assigned Project Manager(s).
- Works with the Quality Assurance Manager and Account Executives (AE) to evaluate and establish project requirements for the service center area.
- Ensures client complaints are handled professionally, and resolved in a timely manner.
- Is in charge of scheduling service center couriers and samplers, preparing bottle orders for delivery, scheduling sample pick ups and shipping samples to the designated laboratory for analysis.
- May manage a minimal list of projects/programs for key client accounts.
- Maintains the facilities at the service center and is responsible for all EH&S policies of TestAmerica at the service center.
- Responsible for all company vehicles that operate out of the service center.
- Provides general sales support to AEs for business development activities started in the field.
- Prepares proposals for new business opportunities.

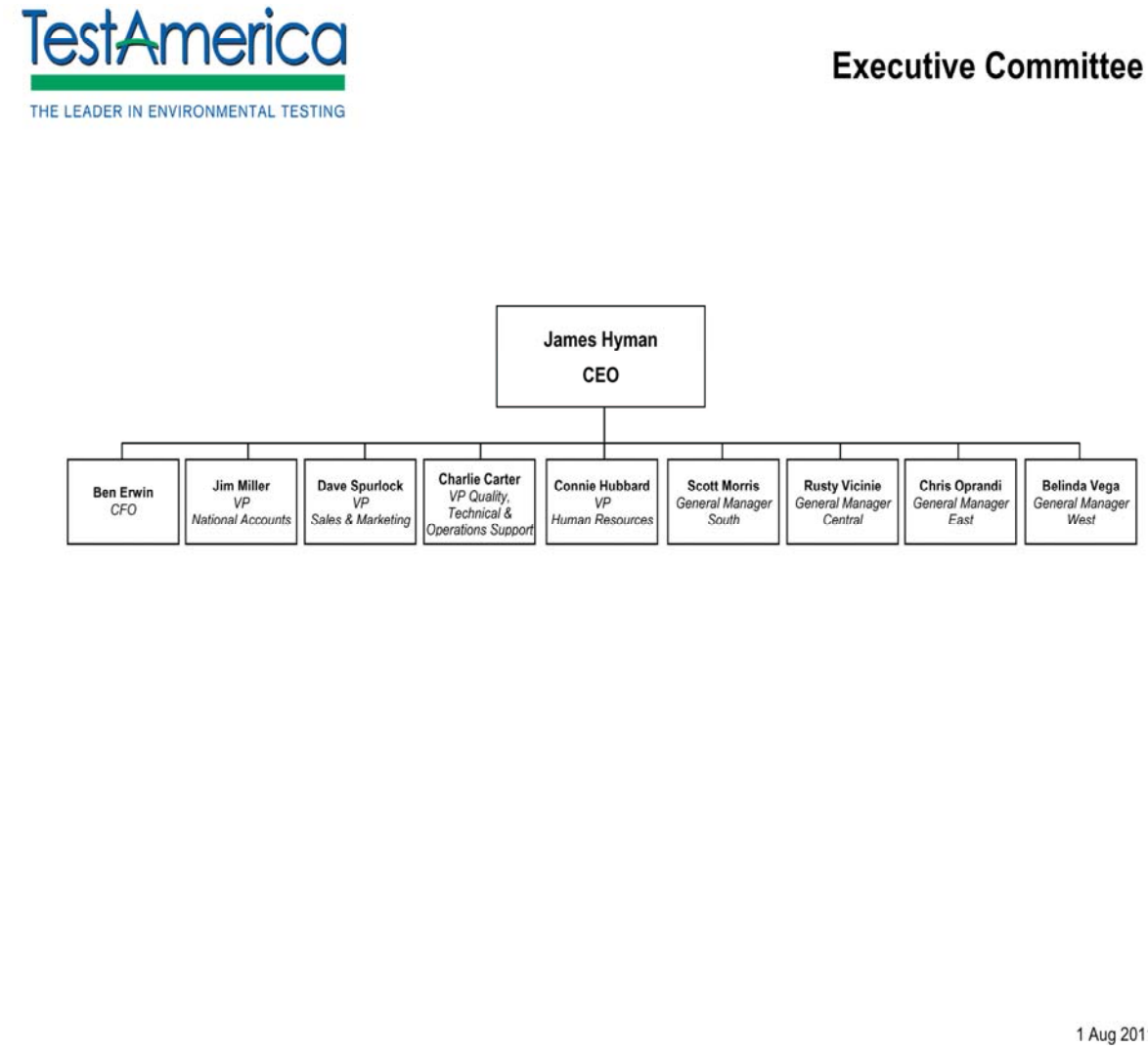
- Orders supplies (bottles, coolers, etc.) for the service center

4.3 Deputies

The following table defines who assumes the responsibilities of key personnel in their absence:

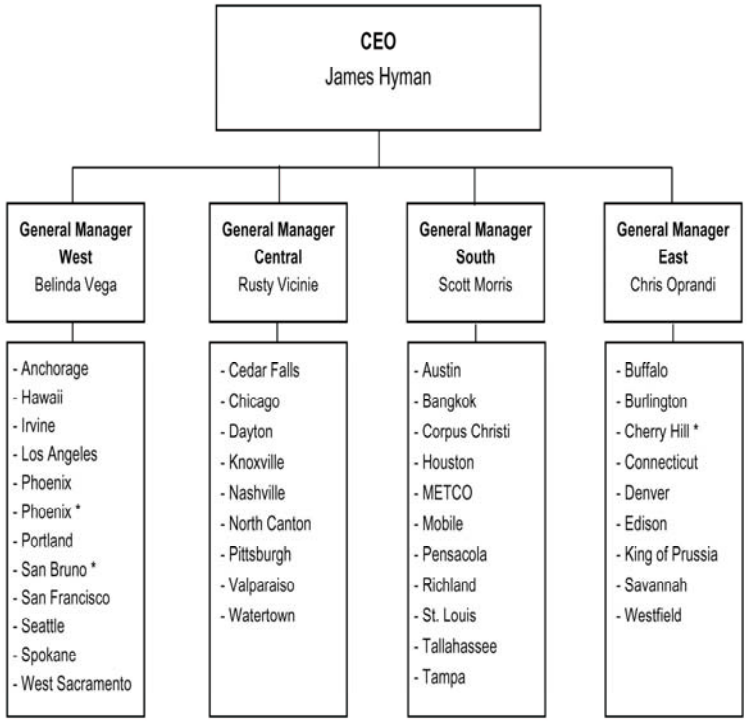
Key Personnel	Deputy
Ann Gladwell Laboratory Director	In the event of absence the Laboratory Director's responsibilities are shared by the Laboratory Operations Manager, the Quality Assurance Manager and the Client Services Manager, as appropriate
Carl Armbruster Quality Assurance Manager	Emmylou Digiacomo Quality Assurance Specialist Ann Gladwell Laboratory Director
Department (Technical) Managers	Mark Acierno Laboratory Operations Manager
David Lissy Client Services Manager	Ann Gladwell Laboratory Director
Kenwyn Williams Director of Project Management	Ann Gladwell Laboratory Director
Kene' Kasperek EH&S Manager	Edward Roche EH&S Coordinator
Kenwyn Williams Sample Control Manager	Mark McClain Sample Control Supervisor
Aidan Scott Kate Harrelson Service Center Managers	Field Services Supervisor

Figure 4-1. Corporate and Laboratory Organization Charts



TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Operations

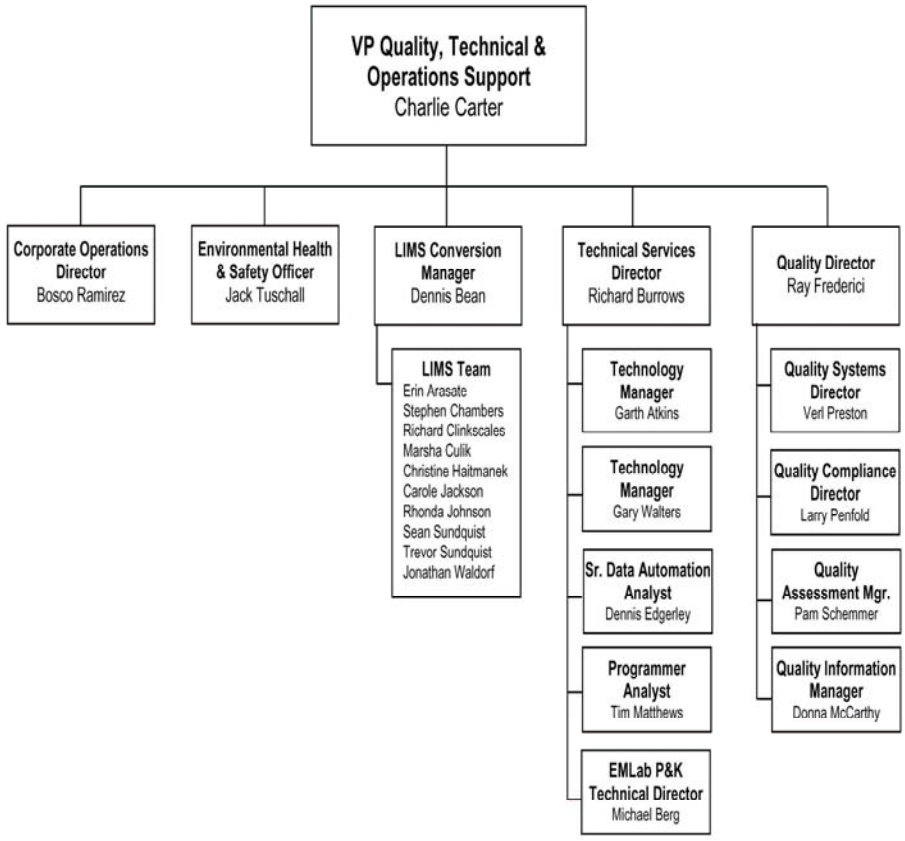


* Note: EMLab P&K microlabs report to these facilities.

1 Aug 2011

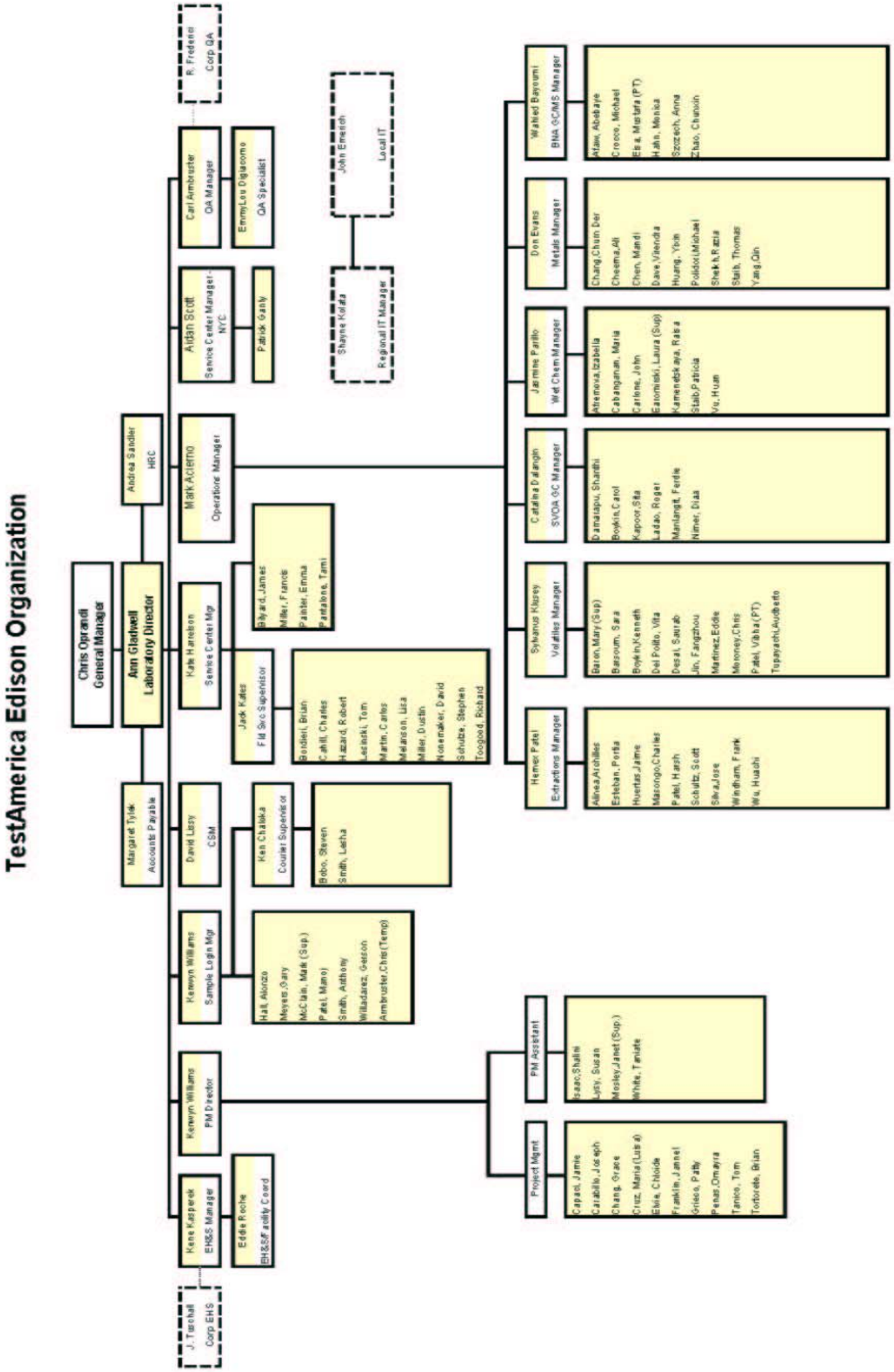
TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Quality, Technical & Operations Support



Note:
QA Managers and EH&S Managers have a direct reporting relationship to both operations leadership and corporate functional leadership.

4 Aug 2011


TestAmerica Edison Organization
Chris Oprandi
General Manager
Ann Gladwell
Laboratory Director
Andrea Sandler
HRC
Mark Acierno
Operations Manager
R. Frederer
Corp QA
Carl Armbruster
QA Manager
EmmyLou Digiacomo
QA Specialist
Aidan Scott
Service Center Manager-NYC
Patrick Gately
John Emerich
Local IT
Shayne Kolata
Regional IT Manager
Kathi Hamelton
Service Center Mgr
Margaret Tylek
Accounts Payable
David Lassy
CSM
Kenwyn Williams
Sample Login Mgr
Hall, Alonzo
Meyers,Gary
McClain, Maki (Sup.)
Patel, Mansi
Smith, Anthony
Willadarez, Geisson
Ambruster,Chris(Temp)
Ken Chaleka
Courier Supervisor
Bobo, Steven
Smith, Lasha
Jack Kates
Fld Svc Supervisor
Goldieri, Brian
Cahill, Charles
Hazard, Robert
Lesinski, Tom
Martin, Carlos
Melanson, Lisa
Miller, Dustin
Rosenmeier, David
Schultz, Stephen
Toogood, Richard
Bilyard,James
Miller, Francis
Painter, Emma
Pantalena, Tami
Kenwyn Williams
PM Director
PM Assistant
Project Mgmt
Kane Kasperek
EH&S Manager
Eddie Roche
EH&S Facility Coord
J. Turchall
Corp EHS
Hemen Patel
Extractions Manager
Sylvanus Klarey
Volatiles Manager
Catalina Dalangin
SVOA GC Manager
Jasmine Parillo
Wet Chem Manager
Don Evans
Metals Manager
Walied Bayomi
BNA GC/MS Manager
Alfonso,Archilles
Esteban, Portia
Huertas,Jaime
Masongo,Charles
Patel, Harsh
Schultz, Scott
Silva,Jose
Windham, Frank
Wu, Huashi
Baron,Mary (Sup)
Bassoum, Sara
Boykin,Kenneth
Del Potto, Vita
Desai, Sairab
Jin, Fangzhou
Martinez,Eddie
Mooney,Chris
Patel, Vibha(PT)
Tupyashi,Audibeto
Damaraju, Shanthi
Bopkha,Carol
Kapoor,Sita
Ladao, Roger
Manlangit, Ferdie
Nimer, Dlaa
Ateenova,Izabella
Cabanganan, Maria
Carlene, John
Kazmierski, Laura (Sup)
Kamenetskaya, Rasa
Stalb,Patricia
Vu, Huan
Chang,Chun Der
Cheema,Ali
Chen, Mandi
Dave,Virendra
Huang, Yibin
Polidori,Michael
Sheikh,Razia
Stark, Thomas
Yang,Qin
Afaw, Ababaye
Crocce, Michael
Elia, Marlaria (PT)
Hahn, Monica
Szczech, Anna
Zhao, Chanxin
Capasi, Jamie
Caraballo,Joseph
Chang, Grace
Cruz, Maria (Luisa)
Elvia, Chloda
Franklin, Jamel
Griego, Patty
Perez,Omayra
Tanico, Tom
Torborde, Brian
Isaac,Shalini
Lutty, Susan
Mosley,Janet (Sup.)
White, Tamatte

SECTION 5. QUALITY SYSTEM

5.1 Quality Policy Statement

It is TestAmerica's Policy to:

- ❖ Provide data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols.
- ❖ Effectively manage all aspects of the laboratory and business operations by the highest ethical standards.
- ❖ Continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. TestAmerica recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff.
- ❖ Provide clients with the highest level of professionalism and the best service practices in the industry.
- ❖ To comply with the ISO/IEC 17025:2005(E) International Standard, the 2009 TNI Standard and to continually improve the effectiveness of the management system

Every staff member at the laboratory plays an integral part in quality assurance and is held responsible and accountable for the quality of their work. It is, therefore, required that all laboratory personnel are trained and agree to comply with applicable procedures and requirements established by this document.

5.2 Ethics and Data Integrity

TestAmerica is committed to ensuring the integrity of its data and meeting the quality needs of its clients. The elements of TestAmerica's Ethics and Data Integrity Program include:

- An Ethics Policy (Corporate Policy No. CW-L-P-004) and Employee Ethics Statements.
- Ethics and Compliance Officers (ECOs).
- A Training Program.
- Self-governance through disciplinary action for violations.
- A Confidential mechanism for anonymously reporting alleged misconduct and a means for conducting internal investigations of all alleged misconduct. (Corporate SOP No. CW-L-S-002)
- Procedures and guidance for recalling data if necessary (Corporate SOP No. CW-L-S-002).
- Effective external and internal monitoring system that includes procedures for internal audits (Section 15).
- Produce results, which are accurate and include QA/QC information that meets client pre-defined Data Quality Objectives (DQOs).
- Present services in a confidential, honest and forthright manner.

- Provide employees with guidelines and an understanding of the Ethical and Quality Standards of our Industry.
- Operate our facilities in a manner that protects the environment and the health and safety of employees and the public.
- Obey all pertinent federal, state and local laws and regulations and encourage other members of our industry to do the same.
- Educate clients as to the extent and kinds of services available.
- Assert competency only for work for which adequate personnel and equipment are available and for which adequate preparation has been made.
- Promote the status of environmental laboratories, their employees, and the value of services rendered by them.

5.3 Quality System Documentation

The laboratory's Quality System is communicated through a variety of documents.

- Quality Assurance Manual – Each laboratory has a lab-specific quality assurance manual.
- Corporate SOPs and Policies – Corporate SOPs and Policies are developed for use by all relevant laboratories. They are incorporated into the laboratory's normal SOP distribution, training and tracking system. Corporate SOPs may be general or technical.
- Work Instructions – A subset of procedural steps, tasks or forms associated with an operation of a management system (e.g., checklists, preformatted bench sheets, forms).
- Laboratory SOPs – General and Technical
- Laboratory QA/QC Policy Memorandums

5.3.1 Order of Precedence

In the event of a conflict or discrepancy between policies, the order of precedence is as follows:

- Corporate Quality Management Plan (CQMP)
- Corporate SOPs and Policies
- Laboratory QA/QC Policy Memorandum
- Laboratory Quality Assurance Manual (QAM)
- Laboratory SOPs and Policies
- Other (Work Instructions (WI), memos, flow charts, etc.)

Note: The laboratory has the responsibility and authority to operate in compliance with regulatory requirements of the jurisdiction in which the work is performed. Where the CQMP conflicts with those regulatory requirements, the regulatory requirements of the jurisdiction shall hold primacy. The laboratory's QAM shall take precedence over the CQMP in those cases.

5.4 QA/QC Objectives for the Measurement of Data

Quality Assurance (QA) and Quality Control (QC) are activities undertaken to achieve the goal of producing data that accurately characterize the sites or materials that have been sampled. Quality Assurance is generally understood to be more comprehensive than Quality Control. Quality Assurance can be defined as the integrated system of activities that ensures that a product or service meets defined standards.

Quality Control is generally understood to be limited to the analyses of samples and to be synonymous with the term *"analytical quality control"*. QC refers to the routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements. The QC program includes procedures for estimating and controlling precision and bias and for determining reporting limits.

Request for Proposals (RFPs) and Quality Assurance Project Plans (QAPP) provide a mechanism for the client and the laboratory to discuss the data quality objectives in order to ensure that analytical services closely correspond to client needs. The client is responsible for developing the QAPP. In order to ensure the ability of the laboratory to meet the Data Quality Objectives (DQOs) specified in the QAPP, clients are advised to allow time for the laboratory to review the QAPP before being finalized. Additionally, the laboratory will provide support to the client for developing the sections of the QAPP that concern laboratory activities.

Historically, laboratories have described their QC objectives in terms of precision, accuracy, representativeness, comparability, completeness, selectivity and sensitivity (PARCCSS).

5.4.1 Precision

The laboratory objective for precision is to meet the performance for precision demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Precision is defined as the degree of reproducibility of measurements under a given set of analytical conditions (exclusive of field sampling variability). Precision is documented on the basis of replicate analysis, usually duplicate or matrix spike (MS) duplicate samples.

5.4.2 Accuracy

The laboratory objective for accuracy is to meet the performance for accuracy demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Accuracy is defined as the degree of bias in a measurement system. Accuracy may be documented through the use of laboratory control samples (LCS) and/or MS. A statement of accuracy is expressed as an interval of acceptance recovery about the mean recovery.

5.4.3 Representativeness

The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a population or set of samples and is a measurement of both analytical and field sampling precision. The representativeness of the analytical data is a function of the procedures used in procuring and processing the samples. The representativeness can be documented by the relative percent difference between separately procured, but otherwise identical samples or sample aliquots.

The representativeness of the data from the sampling sites depends on both the sampling procedures and the analytical procedures. The laboratory may provide guidance to the client regarding proper sampling and handling methods in order to assure the integrity of the samples.

5.4.4 Comparability

The comparability objective is to provide analytical data for which the accuracy, precision, representativeness and reporting limit statistics are similar to these quality indicators generated by other laboratories for similar samples, and data generated by the laboratory over time.

The comparability objective is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, by comparison of periodically generated statements of accuracy, precision and reporting limits with those of other laboratories.

5.4.5 Completeness

The completeness objective for data is 90% (or as specified by a particular project), expressed as the ratio of the valid data to the total data over the course of the project. Data will be considered valid if they are adequate for their intended use. Data usability will be defined in a QAPP, project scope or regulatory requirement. Data validation is the process for reviewing data to determine its usability and completeness. If the completeness objective is not met, actions will be taken internally and with the data user to improve performance. This may take the form of an audit to evaluate the methodology and procedures as possible sources for the difficulty or may result in a recommendation to use a different method.

5.4.6 Selectivity

Selectivity is defined as: The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. Target analytes are separated from non-target constituents and subsequently identified/detected through one or more of the following, depending on the analytical method: extractions (separation), digestions (separation), interelement corrections (separation), use of matrix modifiers (separation), specific retention times (separation and identification), confirmations with different columns or detectors (separation and identification), specific wavelengths (identification), specific mass spectra (identification), specific electrodes (separation and identification), etc..

5.4.7 Sensitivity

Sensitivity refers to the amount of analyte necessary to produce a detector response that can be reliably detected (Method Detection Limit) or quantified (Reporting Limit).

5.5 Criteria for Quality Indicators

The laboratory maintains Quality Control Limits within the Method Limit Group tables in TALS (the laboratory's LIMS) that contains that summarize the precision and accuracy acceptability limits for performed analyses. This summary includes an effective date, is updated each time new limits are generated and are managed by the laboratory's QA Department. Unless otherwise noted, limits within these tables are laboratory generated. Some acceptability limits are derived from US EPA methods when they are required. Where US EPA method limits are not required, the laboratory has developed limits from evaluation of data from similar matrices. Criteria for development of control limits is contained in Section 24.

5.6 Statistical Quality Control

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846) and certain regulatory programs such as the Ohio Voluntary Action Plan (VAP). The laboratory routinely utilizes statistically-derived limits to evaluate method performance and determine when corrective action is appropriate. The analysts are instructed to use the current limits in the laboratory (dated and approved by the Technical Manager and QA Manager) and entered into the Laboratory Information Management System (LIMS). The Quality Assurance Department maintains an archive of all limits used within the Method Limit Group tables in TALS (LIMS). If a method defines the QC limits, the method limits are used.

If a method requires the generation of historical limits, the lab develops such limits from recent data in the QC database of the LIMS following the guidelines described in Section 24. All calculations and limits are documented and dated when approved and effective. On occasion, a client requests contract-specified limits for a specific project.

Current QC limits are entered and maintained in the LIMS analyte database. As sample results and the related QC are entered into LIMS, the sample QC values are compared with the limits in LIMS to determine if they are within the acceptable range. The analyst then evaluates if the sample needs to be rerun or re-extracted/rerun or if a comment should be added to the report explaining the reason for the QC outlier.

5.6.1 QC Charts

The QA Manager generates QC charts using the TALS Control Chart program. In addition to their use in generating lab specific spike recovery limits and in the evaluation of MDL studies, these charts are used to determine if adjustments need to be made or for corrective actions to methods. All such findings are documented and kept on file in the QA Department.

5.7 Quality System Metrics

In addition to the QC parameters discussed above, the entire Quality System is evaluated on a monthly basis through the use of specific metrics (refer to Section 16). These metrics are used to drive continuous improvement in the laboratory's Quality System.

SECTION 6. DOCUMENT CONTROL

6.1 Overview

The QA Department is responsible for the control of documents used in the laboratory to ensure that approved, up-to-date documents are in circulation and out-of-date (obsolete) documents are archived or destroyed. The following documents, at a minimum, must be controlled:

- Laboratory Quality Assurance Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- Corporate Policies and Procedures distributed outside the intranet

Corporate Quality posts Corporate Manuals, SOPs, Policies, Work Instructions, White Papers and Training Materials on the company intranet site. These Corporate documents are only considered controlled when they are read on the intranet site. Printed copies are considered uncontrolled unless the laboratory physically distributes them as controlled documents. A detailed description of the procedure for issuing, authorizing, controlling, distributing, and archiving Corporate documents is found in Corporate SOP No. CW-Q-S-001, Corporate Document Control and Archiving. The laboratory's internal document control procedure is defined in SOP No. ED-GEN-002 (Document Control).

The laboratory QA Department also maintains access to various references and document sources integral to the operation of the laboratory. This includes reference methods and regulations. Instrument manuals (hard or electronic copies) are also maintained by the laboratory.

The laboratory maintains control of records for raw analytical data and supporting records such as audit reports and responses, logbooks, standard logs, training files, MDL studies, Proficiency Testing (PT) studies, certifications and related correspondence, and corrective action reports (CARs). Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data and final reports.

6.2 Document Approval and Issue

The pertinent elements of a document control system for each document include a unique document title and number, pagination, the total number of pages of the item or an 'end of document' page, the effective date, revision number and the laboratory's name. The QA personnel are responsible for the maintenance of this system.

Controlled documents are authorized by the QA Department. In order to develop a new document, a Department (Technical) Manager submits an electronic draft to the QA Department for suggestions and approval before use. Upon approval, QA personnel add the identifying version information to the document and retains that document as the official document on file. That document is then provided to all applicable operational units (may include electronic access). Controlled documents are identified as such and records of their distribution are kept by the QA Department. Document control may be achieved by either electronic or hardcopy distribution.

The QA Department maintains a list of the official versions of controlled documents.

Quality System Policies and Procedures will be reviewed at a minimum of every two years and revised as appropriate. Changes to documents occur when a procedural change warrants.

6.3 Procedures for Document Control Policy

For changes to the QA Manual, refer to SOP No. ED-GEN-002 (Document Control) Uncontrolled copies must not be used within the laboratory. Previous revisions and back-up data are stored by the QA Department. Electronic copies are stored on the Public server in the QA folder for the applicable revision.

For changes to SOPs, refer to SOP No. CW-Q-S-002, Writing a Standard Operating Procedure SOP. The SOP identified above also defines the process of changes to SOPs.

Forms, worksheets, work instructions and information are organized by department in the QA office. There is a table of contents. Electronic versions are kept on a hard drive in the QA Department; hard copies are kept in QA files. The procedure for the care of these documents is in SOP ED-GEN-002 (Document Control).

6.4 Obsolete Documents

All invalid or obsolete documents are removed, or otherwise prevented from unintended use. The laboratory has specific procedures as described above to accomplish this. In general, obsolete documents are collected from employees according to distribution lists and are marked obsolete on the cover or destroyed. At least one copy of the obsolete document is archived according to SOP No. ED-GEN-002 (Document Control).

SECTION 7. SERVICE TO THE CLIENT

7.1 Overview

The laboratory has established procedures for the review of work requests and contracts, oral or written. The procedures include evaluation of the laboratory's capability and resources to meet

the contract's requirements within the requested time period. All requirements, including the methods to be used, must be adequately defined, documented and understood. For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily "fit" into a standard laboratory service or product. It is the laboratory's intent to provide both standard and customized environmental laboratory services to our clients.

A thorough review of technical and QC requirements contained in contracts is performed to ensure project success. The appropriateness of requested methods, and the lab's capability to perform them must be established. Projects, proposals and contracts are reviewed for adequately defined requirements and the laboratory's capability to meet those requirements. Alternate test methods that are capable of meeting the clients' requirements may be proposed by the lab. A review of the lab's capability to analyze non-routine analytes is also part of this review process.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, sensitivity (detection and reporting levels), accuracy, and precision requirements (% Recovery and RPD). The reviewer ensures that the laboratory's test methods are suitable to achieve these requirements and that the laboratory holds the appropriate certifications and approvals to perform the work. The laboratory and any potential subcontract laboratories must be certified, as required, for all proposed tests.

The laboratory must determine if it has the necessary physical, personnel and information resources to meet the contract, and if the personnel have the expertise needed to perform the testing requested. Each proposal is checked for its impact on the capacity of the laboratory's equipment and personnel. As part of the review, the proposed turnaround time will be checked for feasibility.

Electronic or hard copy deliverable requirements are evaluated against the laboratory's capacity for production of the documentation.

If the laboratory cannot provide all services but intends to subcontract such services, whether to another TestAmerica facility or to an outside firm, this will be documented and discussed with the client prior to contract approval. (Refer to Section 8 for Subcontracting Procedures.)

The laboratory informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client's requirements and the laboratory's capability to meet those requirements is resolved in writing before acceptance of the contract. It is necessary that the contract be acceptable to both the laboratory and the client. Amendments initiated by the client and/or TestAmerica, are documented in writing.

All contracts, QAPPs, Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the project record.
The same contract review process used for the initial review is repeated when there are amendments to the original contract by the client, and the participating personnel are informed of the changes.

7.2 Review Sequence and Key Personnel

Appropriate personnel will review the work request at each stage of evaluation.

For routine projects and other simple tasks, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has any required certifications, that it can meet the clients' data quality and reporting requirements and that the lab has the capacity to meet the clients turn around needs. It is recommended that, where there is a sales person assigned to the account, an attempt should be made to contact that sales person to inform them of the incoming samples.

For new, complex or large projects, the proposed contract is given to the Sales Directors, who will decide which lab will receive the work based on the scope of work and other requirements, including certification, testing methodology, and available capacity to perform the work. The contract review process is outlined in TestAmerica's Corporate SOP No. CA-L-P-002**,** Contract Compliance Policy.

This review encompasses all facets of the operation. The scope of work is distributed to the appropriate personnel, as needed based on scope of contract, to evaluate all of the requirements shown above (not necessarily in the order below).

- Legal & Contracts Director
- General Manager
- The Laboratory Project Management Director
- The Laboratory Operations Manager
- Laboratory and/or Corporate Technical Managers / Directors
- Laboratory and/or Corporate Information Technology Managers/Directors
- Account Executives
- Laboratory and/or Corporate Quality
- Laboratory and/or Corporate Environmental Health and Safety Managers/Directors
- The Laboratory Director reviews the formal laboratory quote and makes final acceptance for their facility.

The Sales Director, Legal Contracts Director, Account Executive or Proposal *Coordinator* then submits the final proposal to the client.

In the event that one of the above personnel is not available to review the contract, his or her back-up will fulfill the review requirements.

The Legal & Contracts Director maintains copies of all signed contracts**.** The applicable Project Manager maintains local copies of signed contracts.

7.3 Documentation

Appropriate records are maintained for every contract or work request. All stages of the contract review process are documented and include records of any significant changes. These records are maintained in the project file by the Project Manager and/or Key Account Executive.

The contract will be distributed to and maintained by the appropriate sales/marketing personnel and the Account Executive. A copy of the contract and formal quote will be filed with the laboratory PM and the Laboratory Director.

Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract. The PM keeps a phone log of conversations with the client.

7.3.1 Project-Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, the laboratory assigns a PM to each client. It is the PM's responsibility to ensure that project-specific technical and QC requirements are effectively evaluated and communicated to the laboratory personnel before and during the project. QA Department involvement may be needed to assist in the evaluation of custom QC requirements.

PM's are the primary client contact and they ensure resources are available to meet project requirements. Although PM's do not have direct reports or staff in production, they coordinate opportunities and work with laboratory management and supervisory staff to ensure available resources are sufficient to perform work for the client's project. Project management is positioned between the client and laboratory resources.

Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. The PM introduces new projects to the laboratory staff through project kick-off meetings or to the supervisory staff during production meetings. These meetings provide direction to the laboratory staff in order to maximize production and client satisfaction, while maintaining quality. In addition, project notes may be associated with each sample batch as a reminder upon sample receipt and analytical processing.

During the project, any change that may occur within an active project is agreed upon between the client/regulatory agency and the PM/laboratory. These changes (e.g., use of a non-standard method or modification of a method) and approvals must be documented prior to implementation. Documentation pertains to any document, e.g., letter, e-mail, variance, contract addendum, which has been signed by both parties.

Such changes are also communicated to the laboratory during production meetings. Such changes are updated to the project notes and are introduced to the managers at these meetings. The laboratory staff is then introduced to the modified requirements via the PM or the individual laboratory Department (Technical) Manager. After the modification is implemented into the laboratory process, documentation of the modification is made in the case narrative of the data report(s).

The laboratory strongly encourages client visits to the laboratory and for formal/informal information sharing session with employees in order to effectively communicate ongoing client needs as well as project specific details for customized testing programs.

7.4 Special Services

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. It is the laboratory's goal to meet all client requirements in addition to statutory and regulatory requirements. The laboratory has procedures to ensure confidentiality to clients (Section 15 and 25).

The laboratory's standard procedures for reporting data are described in Section 25. Special services are also available and provided upon request. These services include:

- Reasonable access for our clients or their representatives to the relevant areas of the laboratory for the witnessing of tests performed for the client.
- Assist client-specified third party data validators as specified in the client's contract.
- Supplemental information pertaining to the analysis of their samples. Note: An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

7.5 Client Communication

Project managers are the primary communication link to the clients. They shall inform their clients of any delays in project completion as well as any non-conformances in either sample receipt or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

Technical Managers are available to discuss any technical questions or concerns that the client may have.

7.6 Reporting

The laboratory works with our clients to produce any special communication reports required by the contract.

7.7 Client Surveys

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service. TestAmerica's Sales and Marketing teams periodically develops lab and client specific surveys to assess client satisfaction.

SECTION 8. SUBCONTRACTING OF TESTS

8.1 Overview

For the purpose of this quality manual, the phrase subcontract laboratory refers to a laboratory external to the TestAmerica laboratories. The phrase "work sharing" refers to internal transfers of samples between the TestAmerica laboratories. The term outsourcing refers to the act of subcontracting tests.

When contracting with our clients, the laboratory makes commitments regarding the services to be performed and the data quality for the results to be generated. When the need arises to outsource testing for our clients because project scope, changes in laboratory capabilities, capacity or unforeseen circumstances, we must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments we have made to the client. Refer to TestAmerica's Corporate SOP's on Subcontracting Procedures (CA-L-S-002) and the Work Sharing Process (CA-C-S-001).

When outsourcing analytical services, the laboratory will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this document, the requirements specified in TNI/ISO 17025 and/or the client's Quality Assurance Project Plan (QAPP). All QC guidelines specific to the client's analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report, as will non-TNI accredited work where required.

Project Managers (PMs), Customer Service Managers (CSM), or Account Executives (AE) (or others as defined by the lab) for the Export Lab are responsible for obtaining client approval prior to outsourcing any samples. The laboratory will advise the client of a subcontract or work sharing arrangement in writing and when possible approval from the client shall be retained in the project folder.

Note: In addition to the client, some regulating agencies (e.g, USDA) or contracts (e.g, certain USACE projects) may require notification prior to placing such work**.**

8.2 Qualifying and Monitoring Subcontracators

Whenever a PM, Account Executive (AE) or Customer Service Manager becomes aware of a client requirement or laboratory need where samples must be outsourced to another laboratory, the other laboratory(s) shall be selected based on the following:

- The first priority is to attempt to place the work in a qualified TestAmerica laboratory; Firms specified by the client for the task (Documentation that a subcontractor was designated by the client must be maintained with the project file. This documentation can be as simple as placing a copy of an e-mail from the client in the project folder);
- Firms listed as pre-qualified and currently under a subcontract with TestAmerica: A listing of all approved subcontracting laboratories is available on the TestAmerica intranet site. Supporting documentation is maintained by corporate offices and by the TestAmerica laboratory originally requesting approval of the subcontract lab. Verify necessary accreditation, where applicable, (e.g., on the subcontractors TNI, A2LA accreditation or State Certification).
- Firms identified in accordance with the company's Small Business Subcontracting program as small, women-owned, veteran-owned and/or minority-owned businesses;
- TNI or A2LA accredited laboratories.
- In addition, the firm must hold the appropriate certification to perform the work required.

All TestAmerica laboratories are pre-qualified for work sharing provided they hold the appropriate accreditations, can adhere to the project/program requirements, and the client approved sending samples to that laboratory. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented). The originating laboratory is responsible for communicating all technical, quality, and deliverable requirements as well as other contract needs. (Corporate SOP No. CA-C-S-001, Work Sharing Process).

When the potential sub-contract laboratory has not been previously approved, Account Executives or PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Laboratory Director. The Laboratory Director requests that the QA Manager begin the process of approving the subcontract laboratory as outlined in Corporate SOP No. CA-L-S-002, Subcontracting Procedures. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented).

8.2.1 Once the appropriate accreditation and legal information is received by the laboratory, it is evaluated for acceptability (where applicable) and forwarded to Corporate Contracts for formal contracting with the laboratory. They will add the lab to the approved list on the intranet site and notify the finance group for JD Edwards.

8.2.2 The client will assume responsibility for the quality of the data generated from the use of a subcontractor they have requested the lab to use. The qualified subcontractors on the intranet site are known to meet minimal standards. TestAmerica does not certify laboratories. The subcontractor is on our approved list and can only be recommended to the extent that we would use them.

8.2.3 The status and performance of qualified subcontractors will be monitored periodically by the Corporate Contracts and/or Quality Departments. Any problems identified will be brought to the attention of TestAmerica's Corporate Finance or Corporate Quality personnel.

- Complaints shall be investigated. Documentation of the complaint, investigation and corrective action will be maintained in the subcontractor's file on the intranet site. Complaints are posted using the Vendor Performance Report.
- Information shall be updated on the intranet when new information is received from the subcontracted laboratories.
- Subcontractors in good standing will be retained on the intranet listing. The QA Manager will notify all TestAmerica laboratories, Corporate Quality and Corporate Contracts if any laboratory requires removal from the intranet site. This notification will be posted on the intranet site and e-mailed to all Laboratory Directors, QA Managers and Sales Personnel.

8.3 Oversight and Reporting

The PM must request that the selected subcontractor be presented with a subcontract, if one is not already executed between the laboratory and the subcontractor. The subcontract must include terms which flow down the requirements of our clients, either in the subcontract itself or

through the mechanism of work orders relating to individual projects. A standard subcontract and the Lab Subcontractor Vendor Package (posted on the intranet) can be used to accomplish this, and the Legal & Contracts Director can tailor the document or assist with negotiations, if needed. The PM responsible for the project must advise and obtain client consent to the subcontract as appropriate, and provide the scope of work to ensure that the proper requirements are made a part of the subcontract and are made known to the subcontractor.

Prior to sending samples to the subcontracted laboratory, the PM confirms their certification status to determine if it's current and scope-inclusive. The information is documented on a Subcontracted Sample Form (Figure 8-1) and the form is retained in the project folder. For TestAmerica laboratories, certifications can be viewed on the company's TotalAccess Database.

The Sample Control Department is responsible for ensuring compliance with QA requirements and applicable shipping regulations when shipping samples to a subcontracted laboratory.

All subcontracted samples must be accompanied by a TestAmerica Chain of Custody (COC). A copy of the original COC sent by the client must also be included with all samples workshared within TestAmerica. Client CoCs are only forwarded to external subcontractors when samples are shipped directly from the project site to the subcontractor lab. Under routine circumstances, client CoCs are not provided to external subcontractors.

Through communication with the subcontracted laboratory, the PM monitors the status of the subcontracted analyses, facilitates successful execution of the work, and ensures the timeliness and completeness of the analytical report.

Non-TNI accredited work must be identified in the subcontractor's report as appropriate. If TNI accreditation is not required, the report does not need to include this information.

Reports submitted from subcontractor laboratories are not altered and are included in their original form in the final project report. This clearly identifies the data as being produced by a subcontractor facility. If subcontract laboratory data is incorporated into the laboratories EDD (i.e., imported), the report must explicitly indicate which lab produced the data for which methods and samples.

Note: The results submitted by a TestAmerica work sharing laboratory may be transferred electronically and the results reported by the TestAmerica work sharing lab are identified on the final report. The report must explicitly indicate which lab produced the data for which methods and samples. The final report must include a copy of the completed COC for all work sharing reports.

8.4 Contingency Planning

The Laboratory Director may waive the full qualification of a subcontractor process temporarily to meet emergency needs; however, this decision & justification must be documented in the project files, and the 'Purchase Order Terms And Conditions For Subcontracted Laboratory Services' must be sent with the samples and Chain-of-Custody. In the event this provision is utilized, the laboratory (e.g., PM) will be required to verify and document the applicable accreditations of the subcontractor. All other quality and accreditation requirements will still be

applicable, but the subcontractor need not have signed a subcontract with TestAmerica at this time. The comprehensive approval process must then be initiated within 30 calendar days of subcontracting.

Figure 8-1.

Example - Subcontracted Sample Form

Date/Time: _____

Subcontracted Laboratory Information:

- Subcontractor's Name: _____
- Subcontractor Point of Contact: _____
- Subcontractor's Address: _____
- Subcontractor's Phone: _____
- Analyte/Method: _____
- Certified for State of Origin: _____
- TNI Certified: Yes_____No_____
- USDA Permit (__Domestic __ Foreign) Yes_____No_____
- A2LA (or ISO 17025) Certified: Yes_____No_____
- CLP-like Required: Yes_____No_____
  (Full doc required)
- Requested Sample Due Date: _____
  (Must be put on COC)

Project Manager: _____

Laboratory Sample # Range: _____
(Only of Subcontracted Samples)

Laboratory Project Number (Billing Control #): _____

All subcontracted samples are to be sent via bonded carrier and Priority Overnight. Please attach tracking number below and maintain these records in the project files.

PM Signature_____**Date**_____

SECTION 9. PURCHASING SERVICES AND SUPPLIES

9.1 Overview

Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, which may affect quality, all purchases from specific vendors are approved by a member of the supervisory or management staff. Capital expenditures are made in accordance with TestAmerica's Corporate Controlled Purchases Procedure, SOP No. CW-F-S-007.

Contracts will be signed in accordance with TestAmerica's Corporate Authorization Matrix Policy, Policy No. CW-F-P-002. Request for Proposals (RFP's) will be issued where more information is required from the potential vendors than just price. Process details are available in TestAmerica's Corporate Procurement and Contracts Policy (Policy No. CW-F-P-004). RFP's allow TestAmerica to determine if a vendor is capable of meeting requirements such as supplying all of the TestAmerica facilities, meeting required quality standards and adhering to necessary ethical and environmental standards. The RFP process also allows potential vendors to outline any additional capabilities they may offer.

9.2 Glassware

Glassware used for volumetric measurements must be Class A or verified for accuracy according to laboratory procedure. Pyrex (or equivalent) glass should be used where possible. For safety purposes, thick-wall glassware should be used where available.

9.3 Reagents, Standards & Supplies

Purchasing guidelines for equipment and reagents must meet the requirements of the specific method and testing procedures for which they are being purchased. Solvents and acids are pre-tested in accordance with TestAmerica's Corporate SOP on Solvent & Acid Lot Testing & Approval, SOP No. CA-Q-S-001.

9.3.1 Purchasing

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Materials used in the analytical process must be of a known quality. The wide variety of materials and reagents available makes it advisable to specify recommendations for the name, brand, and grade of materials to be used in any determination. This information is contained in the method SOP. The analyst may check the item out of the on-site consignment system that contains items approved for laboratory use.

If an item is not available from the on-site consignment, the analyst must provide the master item number (from the master item list that has been approved by the Technical Director), item description, package size, catalogue page number, and the quantity needed. If an item being

ordered is not the exact item requested, approval must be obtained from the Technical Director prior to placing the order. The Department (Technical) Manager or the Laboratory Operations Manager places the order.

9.3.2 Receiving

It is the responsibility of the Facilities Coordinator to receive the shipment. It is the responsibility of the analyst who ordered the materials to document the date materials where received. Once the ordered reagents or materials are received, the analyst compares the information on the label or packaging to the original order to ensure that the purchase meets the quality level specified. Material Safety Data Sheets (MSDSs) are available online through the Company's intranet website. Anyone may review these for relevant information on the safe handling and emergency precautions of on-site chemicals.

9.3.3 Specifications

Methods in use in the laboratory specify the grade of reagent that must be used in the procedure. If the quality of the reagent is not specified, analytical reagent grade will be used. It is the responsibility of the analyst to check the procedure carefully for the suitability of grade of reagent.

Chemicals must not be used past the manufacturer's expiration date and must not be used past the expiration time noted in a method SOP. If expiration dates are not provided, the laboratory may contact the manufacturer to determine an expiration date.

The laboratory assumes a five year expiration date on inorganic dry chemicals and solvents unless noted otherwise by the manufacturer or by the reference source method. Chemicals/solvents should not be used past the manufacturer's or SOPs expiration date unless 'verified' (refer to item 3 listed below).

- An expiration date cannot be extended if the dry chemical/solvent is discolored or appears otherwise physically degraded, the dry chemical/solvent must be discarded.
- Expiration dates can be extended if the dry chemical/solvent is found to be satisfactory based on acceptable performance of quality control samples (Continuing Calibration Verification (CCV), Blanks, Laboratory Control Sample (LCS), etc.).
- If the dry chemical/solvent is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical/solvent is compared to an unexpired independent source in performing the method and the performance of the dry chemical/solvent is found to be satisfactory. The comparison must show that the dry chemical/solvent meets CCV limits. The comparison studies are maintained in the analytical Department.

Wherever possible, standards must be traceable to national or international standards of measurement or to national or international reference materials. Records to that effect are available to the user.

Compressed gases in use are checked for pressure and secure positioning daily. The minimum total pressure must be 500 psig or the tank must be replaced. To prevent a tank from going to

dryness or introducing potential impurities, the pressure should be closely watched as it decreases to approximately 15% of the original reading, at which point it should be replaced. For example, a standard sized laboratory gas cylinder containing 3,000 psig of gas should be replaced when it drops to approximately 500 psig.. The quality of the gases must meet method or manufacturer specification or be of a grade that does not cause any analytical interference.

Water used in the preparation of standards or reagents must have a specific conductivity of less than 1- µmho/cm (or specific resistivity of greater than 1.0 megaohm-cm) at 25°C. The specific conductivity is checked and recorded daily. If the water's specific conductivity is greater than the specified limit, the Facility Manager and appropriate Technical Managers must be notified immediately in order to notify all Departments, decide on cessation (based on intended use) of activities, and make arrangements for correction.

The laboratory may purchase reagent grade (or other similar quality) water for use in the laboratory. This water must be certified "clean" by the supplier for all target analytes or otherwise verified by the laboratory prior to use. This verification is documented.

Standard lots are verified before first time use if the laboratory switches manufacturers or has historically had a problem with the type of standard.

Purchased bottleware used for sampling must be certified clean and the certificates must be maintained. If uncertified sampling bottleware is purchased, all lots must be verified clean prior to use. This verification must be maintained.

Records of manufacturer's certification and traceability statements are maintained in files or binders in each laboratory section. These records include date of receipt, lot number (when applicable), and expiration date (when applicable). Incorporation of the item into the record indicates that the analyst has compared the new certificate with the previous one for the same purpose and that no difference is noted, unless approved and so documented by the Technical Director or QA Manager.

9.3.4 Storage

Reagent and chemical storage is important from the aspects of both integrity and safety. Light-sensitive reagents may be stored in brown-glass containers. Storage conditions are per the Corporate Environmental Health & Safety Manual (Corp. Doc. No. CW-E-M-001) and method SOPs or manufacturer instructions.

9.4 Purchase of Equipment / Instruments / Software

When a new piece of equipment is needed, either for additional capacity or for replacing inoperable equipment, the analyst or supervisor makes a supply request to the Technical Manager/Laboratory Operations Manager and/or the Laboratory Director. If they agree with the request, the procedures outlined in TestAmerica's Corporate Policy No. CA-T-P-001, Qualified Products List, are followed. A decision is made as to which piece of equipment can best satisfy the requirements. The appropriate written requests are completed and purchasing places the order.

Upon receipt of a new or used piece of equipment, an unique identification name is assigned and provided to the QA Department for inclusion on the laboratory master equipment list. IT must also be notified so that they can synchronize the instrument for back-ups. Its capability is assessed to determine if it is adequate or not for the specific application. For instruments, a calibration curve is generated, followed by MDLs, Demonstration of Capabilities (DOCs), and other relevant criteria (refer to Section 19). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the IT Department or QA Department. Software certificates supplied by the vendors are filed with the LIMS Administrator. The manufacturer's operation manual is retained at the bench.

9.5 Services

Service to analytical instruments (except analytical balances) is performed on an as needed basis. Routine preventative maintenance is discussed in Section 20. The need for service is determined by analysts and/or Technical Managers. The service providers that perform the services are approved by the Technical Manager and/or the Laboratory Operations Manager.

9.6 Suppliers

TestAmerica selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts). This process is defined in the Corporate Finance documents on Vendor Selection (SOP No. CW-F-S-018) and Procurement & Contracts Policy (Policy No. CW-F-P-004). The level of control used in the selection process is dependent on the anticipated spending amount and the potential impact on TestAmerica business. Vendors that provide test and measuring equipment, solvents, standards, certified containers, instrument related service contracts or subcontract laboratory services shall be subject to more rigorous controls than vendors that provide off-the-shelf items of defined quality that meet the end use requirements. The JD Edwards purchasing system includes all suppliers/vendors that have been approved for use.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on packing slips or other supply receipt documents. The purchasing documents contain the data that adequately describe the services and supplies ordered.

Any issues of vendor performance are to be reported immediately by the laboratory staff to the Corporate Purchasing Group by completing a Vendor Performance Report.

The Corporate Purchasing Group will work through the appropriate channels to gather the information required to clearly identify the problem and will contact the vendor to report the problem and to make any necessary arrangements for exchange, return authorization, credit, etc.
As deemed appropriate, the Vendor Performance Reports will be summarized and reviewed to determine corrective action necessary, or service improvements required by vendors

The laboratory has access to a listing of all approved suppliers of critical consumables, supplies and services. This information is provided through the JD Edwards purchasing system.

9.6.1 New Vendor Procedure

TestAmerica employees who wish to request the addition of a new vendor must complete a J.D. Edwards Vendor Add Request Form.

New vendors are evaluated based upon criteria appropriate to the products or services provided as well as their ability to provide those products and services at a competitive cost. Vendors are also evaluated to determine if there are ethical reasons or potential conflicts of interest with TestAmerica employees that would make it prohibitive to do business with them as well as their financial stability. The QA Department and/or the Technology Director are consulted with vendor and product selection that have an impact on quality.

SECTION 10. COMPLAINTS

10.1 Overview

The laboratory considers an effective client complaint handling processes to be of significant business and strategic value. Listening to and documenting client concerns captures 'client knowledge' that enables our operations to continually improve processes and client satisfaction. An effective client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

A client complaint is any expression of dissatisfaction with any aspect of our business services (e.g., communications, responsiveness, data, reports, invoicing and other functions) expressed by any party, whether received verbally or in written form. Client inquiries, complaints or noted discrepancies are documented, communicated to management, and addressed promptly and thoroughly.

The laboratory has procedures for addressing both external and internal complaints with the goal of providing satisfactory resolution to complaints in a timely and professional manner.

The nature of the complaint is identified, documented and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA Department must evaluate whether a special audit must be conducted to assist in resolving the issue. A written confirmation or letter to the client, outlining the issue and response taken is recommended as part of the overall action taken.

The process of complaint resolution and documentation utilizes the procedures outlined in Section 12 (Corrective Actions) and is documented following the procedures in TestAmerica Edison SOP No. ED-GEN-003 (Control of Non-Conformances and Corrective Action).

10.2 External Complaints

An employee that receives a complaint initiates the complaint resolution process by first documenting the complaint according to TestAmerica Edison SOP No. ED-GEN-003 (Control of Non-Conformances and Corrective Action.

Complaints fall into two categories: correctable and non-correctable. An example of a correctable complaint would be one where a report re-issue would resolve the complaint. An example of a non-correctable complaint would be one where a client complains that their data was repeatedly late. Non-correctable complaints should be reviewed for preventive action measures to reduce the likelihood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving and Documenting Complaints
- Complaint Investigation and Service Recovery
- Process Improvement

The laboratory shall inform the initiator of the complaint of the results of the investigation and the corrective action taken, if any.

10.3 Internal Complaints

Internal complaints include, but are not limited to: errors and non-conformances, training issues, internal audit findings, and deviations from methods. Corrective actions may be initiated by any staff member who observes a nonconformance and shall follow the procedures outlined in Section 12. In addition, Corporate Management, Sales and Marketing and IT may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 12.

10.4 Management Review

The number and nature of client complaints is reported by the QA Manager to the laboratory and QA Director in the QA Monthly report. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Annual Management Review (Section 16).

SECTION 11. CONTROL OF NON-CONFORMING WORK

11.1 Overview

When data discrepancies are discovered or deviations and departures from laboratory SOPs, policies and/or client requests have occurred, corrective action is taken immediately. First, the laboratory evaluates the significance of the nonconforming work. Then, a corrective action plan is initiated based on the outcome of the evaluation. If it is determined that the nonconforming work is an isolated incident, the plan could be as simple as adding a qualifier to the final results and/or making a notation in the case narrative. If it is determined that the nonconforming work is a systematic or improper practices issue, the corrective action plan could include a more in depth

investigation and a possible suspension of an analytical method. In all cases, the actions taken are documented using the laboratory's corrective action system (refer to Section 12).

Due to the frequently unique nature of environmental samples, sometimes departures from documented policies and procedures are needed. When an analyst encounters such a situation, the problem is presented to the Department (Technical) Manager for resolution. The manager may elect to discuss it with the Lab Director and/or QA Manager or have a representative contact the client to decide on a logical course of action. Once an approach is agreed upon, the analyst documents it using the laboratories corrective action system described in Section 12. This information can then be supplied to the client in the form of a footnote or a case narrative with the report.

Project Management may encounter situations where a client may request that a special procedure be applied to a sample that is not standard lab practice. Based on a technical evaluation, the lab may accept or opt to reject the request based on technical or ethical merit. An example might be the need to report a compound that the lab does not normally report. The lab would not have validated the method for this compound following the procedures in Section 19. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Laboratory Director and QA Manager, documented and included in the project folder. Deviations **must** also be noted on the final report with a statement that the compound is not reported in compliance with TNI (or the analytical method) requirements and the reason. Data being reported to a non-TNI state would need to note the change made to how the method is normally run.

11.2 Responsibilities and Authorities

TestAmerica's Corporate SOP entitled *Internal Investigation of Potential Data Discrepancies and Determination for Data Recall* (SOP No. CW-L-S-002, outlines the general procedures for the reporting and investigation of data discrepancies and alleged incidents of misconduct or violations of TestAmerica's data integrity policies as well as the policies and procedures related to the determination of the potential need to recall data.

Under certain circumstances, the Laboratory Director, the Lab Operations Manager, a Department (Technical) Manager, or a member of the QA team may authorize departures from documented procedures or policies. The departures may be a result of procedural changes due to the nature of the sample; a one-time procedure for a client; QC failures with insufficient sample to reanalyze, etc.. In most cases, the client will be informed of the departure prior to the reporting of the data. Any departures must be well documented using the laboratory's corrective action procedures. This information may also be documented in logbooks and/or data review checklists as appropriate. Any impacted data must be referenced in a case narrative and/or flagged with an appropriate data qualifier.

Any misrepresentation or possible misrepresentation of analytical data discovered by any laboratory staff member must be reported to facility Senior Management within 24-hours. The Senior Management staff is comprised of the Laboratory Director, Laboratory Operations Manager, the QA Manager, and the Department (Technical) Managers The reporting of issues involving alleged violations of the company's Data Integrity or Manual Integration procedures must be conveyed to an Ethics and Compliance Officer (ECO), Director of Quality & Client Advocacy and the laboratory's Quality Director within 24 hours of discovery.

Whether an inaccurate result was reported due to calculation or quantitation errors, data entry errors, improper practices, or failure to follow SOPs, the data must be evaluated to determine the possible effect.

The Laboratory Director, QA Manager, ECOs, Corporate Quality, General Managers and the Quality Directors have the authority and responsibility to halt work, withhold final reports, or suspend an analysis for due cause as well as authorize the resumption of work.

11.3 Evaluation of Significance and Actions Taken

For each nonconforming issue reported, an evaluation of its significance and the level of management involvement needed is made. This includes reviewing its impact on the final data, whether or not it is an isolated or systematic issue, and how it relates to any special client requirements.

TestAmerica's Corporate Data Investigation & Recall Procedure (SOP No. CW-L-S-002) distinguishes between situations when it would be appropriate for laboratory management to make the decision on the need for client notification (written or verbal) and data recall (report revision) and when the decision must be made with the assistance of the ECO's and Corporate Management. Laboratory level decisions are documented and approved using the laboratory's standard nonconformance/corrective action reporting in lieu of the data recall determination form contained in TestAmerica's Corporate SOP No. CW-L-S-002.

11.4 Prevention of NonConforming Work

If it is determined that the nonconforming work could recur, further corrective actions must be made following the laboratory's corrective action system. On a monthly basis, the QA Department evaluates non-conformances to determine if any nonconforming work has been repeated multiple times. If so, the laboratory's corrective action process may be followed.

11.5 Method Suspension / Restriction (Stop Work Procedures)

In some cases, it may be necessary to suspend/restrict the use of a method or target compound which constitutes significant risk and/or liability to the laboratory. Suspension/restriction procedures can be initiated by any of the persons noted in Section 11.2, Paragraph 5.

Prior to suspension/restriction, confidentiality will be respected, and the problem with the required corrective and preventive action will be stated in writing and presented to the Laboratory Director.

The Laboratory Director shall arrange for the appropriate personnel to meet with the QA Manager as needed. This meeting shall be held to confirm that there is a problem, that suspension/restriction of the method is required and will be concluded with a discussion of the steps necessary to bring the method/target or test fully back on line. In some cases, that may not be necessary if all appropriate personnel have already agreed there is a problem and there is agreement on the steps needed to bring the method, target or test fully back on line.

The QA Manager will also initiate a corrective action report as described in Section 12 if one has not already been started. A copy of any meeting notes and agreed upon steps should be faxed or e-mailed by the laboratory to the appropriate General Manager and member of Corporate QA. This fax/e-mail acts as notification of the incident.

After suspension/restriction, the lab will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. The report must not be posted for viewing on the internet. It is the responsibility of the Laboratory Director to hold all reporting and to notify all relevant laboratory personnel regarding the suspension/restriction (e.g., Project Management, Log-in, etc…). Clients will NOT generally be notified at this time. Analysis may proceed in some instances depending on the non-conformance issue.

Within 72 hours, the QA Manager will determine if compliance is now met and reports can be released, OR determine the plan of action to bring work into compliance, and release work. A team, with all principals involved (Laboratory Director, Laboratory Operations Manager, QA Manager, Department Technical Manager) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. Project Management, and the Directors of Client Services and Sales and Marketing must be notified if clients must be notified or if the suspension/restriction affects the laboratory's ability to accept work. The QA Manager must approve start-up or elimination of any restrictions after all corrective action is complete. This approval is given by final signature on the completed corrective action report.

SECTION 12. CORRECTIVE ACTION

12.1 Overview

A major component of TestAmerica's Quality Assurance (QA) Program is the problem investigation and feedback mechanism designed to keep the laboratory staff informed on quality related issues and to provide insight to problem resolution. When nonconforming work or departures from policies and procedures in the quality system or technical operations are identified, the corrective action procedure provides a systematic approach to assess the issues, restore the laboratory's system integrity, and prevent reoccurrence. Corrective actions are documented using Data Inquiry, Client Complaint and Corrective Action Report Form (CAR) (TestAmerica Edison Work Instruction No. EDS-WI-012) (refer to Figure 12-1).

12.2 General

Problems within the quality system or within analytical operations may be discovered in a variety of ways, such as QC sample failures, internal or external audits, proficiency testing (PT) performance, client complaints, staff observation, etc..

The purpose of a corrective action system is to:

- Identify non-conformance events and assign responsibility(s) for investigating.
- Resolve non-conformance events and assign responsibility for any required corrective action.
- Identify systematic problems before they become serious.
- Identify and track client complaints and provide resolution.

12.2.1 Non-Conformance Report (NCR) – The CAR form is used to document the following types of corrective actions:

- Deviations from an established procedure or SOP
- QC outside of limits (non-matrix related)
- Isolated reporting / calculation errors
- Client complaints
- Discrepancies in materials / goods received vs. manufacturer packing slips.

12.2.2 Corrective Action Report (CAR) – The CAR form is also used to document the following types of corrective actions:

- Questionable trends that are found in the review of NCRs.
- Issues found while reviewing NCRs that warrant further investigation.
- Internal and external audit findings
- Failed or unacceptable PT results.
- Corrective actions that cross multiple Departments in the laboratory.
- Systematic reporting / calculation errors
- Client complaints
- Data recall investigations
- Identified poor process or method performance trends
- Excessive revised reports

This will provide background documentation to enable root cause analysis and preventive action.

12.3 Closed Loop Corrective Action Process

Any employee in the company can initiate a corrective action. There are four main components to a closed-loop corrective action process once an issue has been identified: Cause Analysis, Selection and Implementation of Corrective Actions (both short and long term), Monitoring of the Corrective Actions, and Follow-up.

12.3.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. An CAR must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Table 12-1 provides some general guidelines on determining responsibility for assessment.
- The cause analysis step is the key to the process as a long term corrective action cannot be determined until the cause is determined.
- If the cause is not readily obvious, the Department (Technical) Manager, Laboratory Director, Laboratory Operations Manager, or QA Manager (or QA designee) is consulted.

12.3.2 Selection and Implementation of Corrective Actions

- Where corrective action is needed, the laboratory shall identify potential corrective actions. The action(s) most likely to eliminate the problem and prevent recurrence are selected and implemented. Responsibility for implementation is assigned.
- Corrective actions shall be to a degree appropriate to the magnitude of the problem identified through the cause analysis.
- Whatever corrective action is determined to be appropriate, the laboratory shall document and implement the changes. The CAR is used for this documentation.

12.3.3 Root Cause Analysis

Root Cause Analysis is a class of problem solving (investigative) methods aimed at identifying the basic or causal factor(s) that underlie variation in performance or the occurrence of a significant failure. The root cause may be buried under seemingly innocuous events, many steps preceding the perceived failure. At first glance, the immediate response is typically directed at a symptom and not the cause. Typically, root cause analysis would be best with three or more incidents to triangulate a weakness.

Systematically analyze and document the Root Causes of the more significant problems that are reported. Identify, track, and implement the corrective actions required to reduce the likelihood of recurrence of significant incidents. Trend the Root Cause data from these incidents to identify Root Causes that, when corrected, can lead to dramatic improvements in performance by eliminating entire classes of problems.

Identify the one event associated with problem and ask why this event occurred. Brainstorm the root causes of failures; for example, by asking why events occurred or conditions existed; and then why the cause occurred 5 consecutive times until you get to the root cause. For each of these sub events or causes, ask why it occurred. Repeat the process for the other events associated with the incident.

Root cause analysis does not mean the investigation is over. Look at technique, or other systems outside the normal indicators. Often creative thinking will find root causes that ordinarily would be missed, and continue to plague the laboratory or operation.

12.3.4 Monitoring of the Corrective Actions

- The Department (Technical) Manager/Supervisor and QA Manager are responsible to ensure that the corrective action taken was effective.
- Ineffective actions are documented and re-evaluated until acceptable resolution is achieved. Department (Technical) Managers are accountable to the Laboratory Director to ensure final acceptable resolution is achieved and documented appropriately.
- Each CAR is entered into an Excel spreadsheet for tracking purposes and a monthly summary of all corrective actions is printed out for review to aid in ensuring that the corrective actions have taken effect.
- The QA Manager reviews monthly CARs for trends. Highlights are included in the QA monthly report (refer to Section 16). If a significant trend develops that adversely affects quality, an audit of the area is performed and corrective action implemented.

- Any out-of-control situations that are not addressed acceptably at the laboratory level may be reported to the Corporate Quality Director by the QA Manager, indicating the nature of the out-of-control situation and problems encountered in solving the situation.

12.3.5 Follow-up Audits

- Follow-up audits may be initiated by the QA Manager and shall be performed as soon as possible when the identification of a nonconformance casts doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with state or federal requirements.
- These audits often follow the implementation of the corrective actions to verify effectiveness. An additional audit would only be necessary when a critical issue or risk to business is discovered.

(Also refer to Section 15.1.4, Special Audits.)

12.4 Technical Corrective Actions

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs, the laboratory has general procedures to be followed to determine when departures from the documented policies and procedures and quality control have occurred (refer to Section 11). The documentation of these procedures is through the use of an CAR.

Table 12-1 includes examples of general technical corrective actions. For specific criteria and corrective actions, refer to the analytical methods or specific method SOPs. The laboratory may also maintain Work Instructions on these items that are available upon request.

Table 12-1 provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The table also provides general guidance on how a data set should be treated if associated QC measurements are unacceptable. Specific procedures are included in Method SOPs, Work Instructions, QAM Sections 19 and 20. All corrective actions are reviewed monthly, at a minimum, by the QA Manager and highlights are included in the QA monthly report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If the deficiency does not impair the usability of the results, data will be reported with an appropriate data qualifier and/or the deficiency will be noted in the case narrative. Where sample results may be impaired, the Project Manager is notified and appropriate corrective action (e.g., reanalysis) is taken and documented.

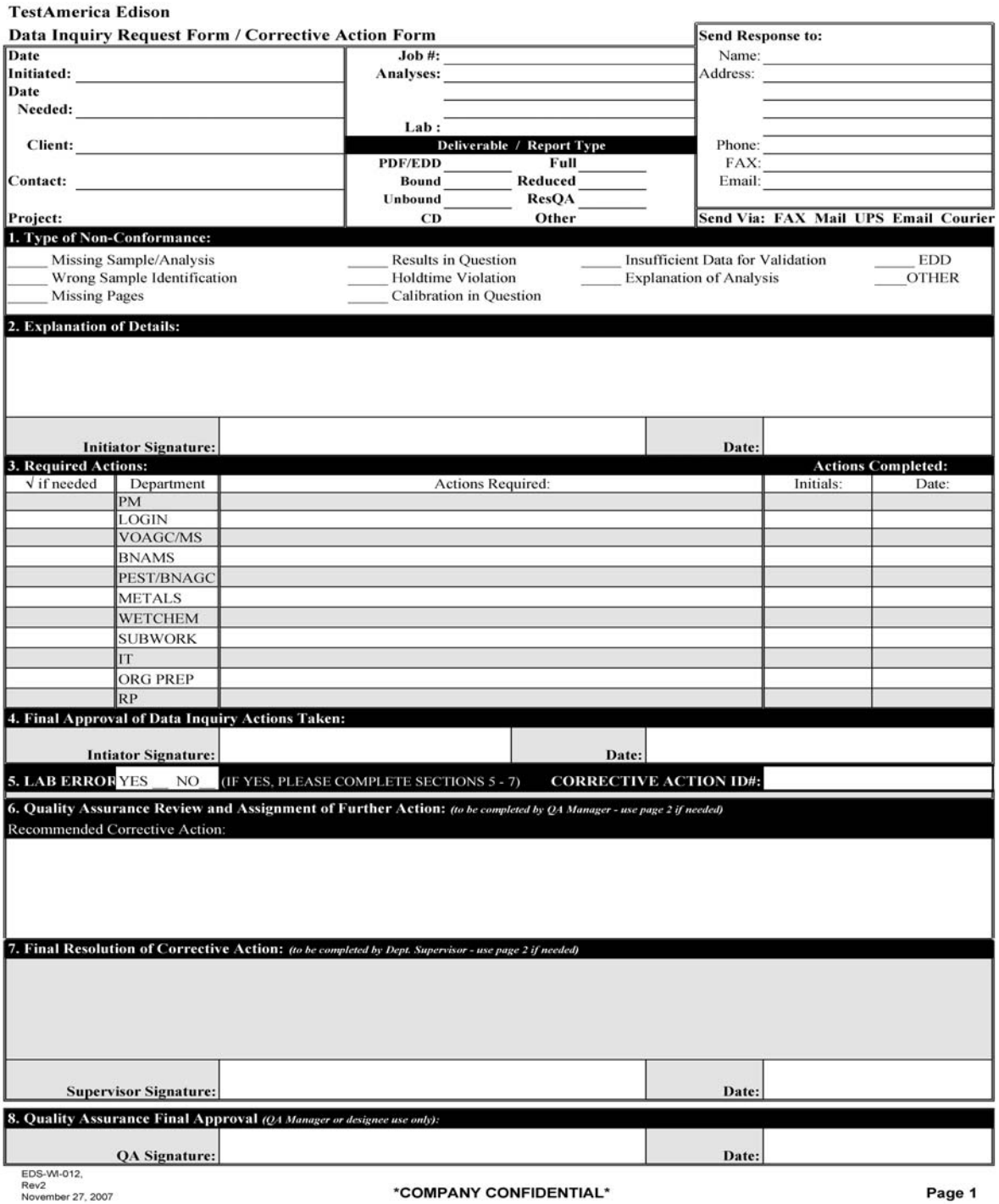
12.5 Basic Corrections

When mistakes occur in records, each mistake shall be crossed-out, [not obliterated (e.g. no white-out)], and the correct value entered alongside. All such corrections shall be initialed (or signed) and dated by the person making the correction. In the case of records stored electronically, the original "uncorrected" file must be maintained intact and a second "corrected" file is created.

This same process applies to adding additional information to a record. All additions made later than the initial must also be initialed (or signed) and dated.

When corrections are due to reasons other than obvious transcription errors, the reason for the corrections (or additions) shall also be documented.

Figure 12-1.
Example - Corrective Action Report



TestAmerica Edison

Data Inquiry Request Form / Corrective Action Form

Date Initiated:	**Job #:**	**Send Response to:** Name:
Date Needed:	**Analyses:**	Address:
Client:	**Lab :**	
Contact:	**Deliverable / Report Type**	Phone:
Project:	**PDF/EDD** ____ **Full** ____	FAX:
	Bound ____ **Reduced** ____	Email:
	Unbound ____ **ResQA** ____	
	CD ____ **Other** ____	**Send Via: FAX Mail UPS Email Courier**

1. Type of Non-Conformance:

_____ Missing Sample/Analysis	_____ Results in Question	_____ Insufficient Data for Validation	_____ EDD
_____ Wrong Sample Identification	_____ Holdtime Violation	_____ Explanation of Analysis	____OTHER
_____ Missing Pages	_____ Calibration in Question		

2. Explanation of Details:

Initiator Signature:		**Date:**	

3. Required Actions: **Actions Completed:**

√ if needed	Department	Actions Required:	Initials:	Date:
	PM			
	LOGIN			
	VOAGC/MS			
	BNAMS			
	PEST/BNAGC			
	METALS			
	WETCHEM			
	SUBWORK			
	IT			
	ORG PREP			
	RP			

4. Final Approval of Data Inquiry Actions Taken:

Intiator Signature:		**Date:**	

5. LAB ERROR YES ___ NO ___ (IF YES, PLEASE COMPLETE SECTIONS 5 - 7) **CORRECTIVE ACTION ID#:**

6. Quality Assurance Review and Assignment of Further Action: *(to be completed by QA Manager - use page 2 if needed)*

Recommended Corrective Action:

7. Final Resolution of Corrective Action: *(to be completed by Dept. Supervisor - use page 2 if needed)*

Supervisor Signature:		**Date:**	

8. Quality Assurance Final Approval *(QA Manager or designee use only):*

QA Signature:		**Date:**	

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Table 12-1. Example – General Corrective Action Procedures

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
Initial Instrument Blank *(Analyst)*	- Instrument response < MDL.	- Prepare another blank. - If same response, determine cause of contamination: reagents, environment, instrument equipment failure, etc..
Initial Calibration Standards *(Analyst, Department Technical Manager)*	- Correlation coefficient > 0.99 or standard concentration value. - % Recovery within acceptance range. - See details in Method SOP.	- Reanalyze standards. - If still unacceptable, remake standards and recalibrate instrument.
Independent Calibration Verification (Second Source) *(Analyst, Department Technical Manager))*	- % Recovery within control limits.	- Remake and reanalyze standard. - If still unacceptable, then remake calibration standards or use new primary standards and recalibrate instrument.
Continuing Calibration Standards *(Analyst, Data Reviewer)*	% Recovery within control limits.	- Reanalyze standard. - If still unacceptable, then recalibrate and rerun affected samples.
Matrix Spike / Matrix Spike Duplicate (MS/MSD) *(Analyst, Data Reviewer)*	- % Recovery within limits documented in TALS and/or Work Instructions	- If the acceptance criteria for duplicates or matrix spikes are not met because of matrix interferences, the acceptance of the analytical batch is determined by the validity of the LCS. - If the LCS is within acceptable limits the batch is acceptable. - The results of the duplicates, matrix spikes and the LCS are reported with the data set. - For matrix spike or duplicate results outside criteria the data for that sample shall be reported with qualifiers.

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
Laboratory Control Sample (LCS) *(Analyst, Data Reviewer)*	- % Recovery within limits specified in TALS and/or Work Instructions	- Batch must be re-prepared and re-analyzed. This includes any allowable marginal exceedance. When not using marginal exceedances, the following exceptions apply: 1) when the acceptance criteria for the positive control are exceeded high (i.e., high bias) and there are associated samples that are non-detects, then those non-detects may be reported with data qualifying codes; 2) when the acceptance criteria for the positive control are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum regulatory limit/decision level with data qualifying codes. **Note:** If there is insufficient sample or the holding time cannot be met, contact client and report with flags.
Surrogates *(Analyst, Data Reviewer)*	- % Recovery within limits of method or within three standard deviations of the historical mean.	- Individual sample must be repeated. Place comment in LIMS. - Surrogate results outside criteria shall be reported with qualifiers.
Method Blank (MB) *(Analyst, Data Reviewer)*	< Reporting Limit [1]	- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e. digest or extract) entire sample batch. Report blank results. - Qualify the result(s) if the concentration of a targeted analyte in the MB is at or above the reporting limit AND is > 1/10 of the amount measured in the sample.
Proficiency Testing (PT) Samples *(QA Manager, Department Technical Manager)*	- Criteria supplied by PT Supplier.	- Any failures or warnings must be investigated for cause. Failures may result in the need to repeat a PT sample to show the problem is corrected.
Internal / External Audits *(QA Manager, Department Technical Manager)*	- Defined in Quality System documentation such as SOPs, QAM, etc..	- Non-conformances must be investigated through CAR system and necessary corrections must be made.

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
Reporting / Calculation Errors (Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Department Technical Manager, QA Manager, Corporate QA, Corporate Management)	- SOP CW-L-S-002, Internal Investigation of Potential Data Discrepancies and Determination for Data Recall.	- Corrective action is determined by type of error. Follow the procedures in SOP CW-L-S-002 or the Corrective Action SOP (ED-GEN-003).
Client Complaints *(Project Managers, Lab Director Operations Manager, Sales and Marketing)*	-	- Corrective action is determined by the type of complaint. For example, a complaint regarding an incorrect address on a report will result in the report being corrected and then follow-up must be performed on the reasons the address was incorrect (e.g., database needs to be updated).
QA Monthly Report (Refer to Section 16 for an example) (QA Manager, Lab Director, Operations Manager, Department Technical Managers)	- QAM, SOPs.	- Corrective action is determined by the type of issue. For example, CARs for the month are reviewed and possible trends are investigated.
Health and Safety Violation (Safety Officer, Lab Director, Operations Manager, Department Technical Manager)	- Environmental Health and Safety (EHS) Manual.	- Non-conformance is investigated and corrected through CAR system.

Note:
1. Except as noted below for certain compounds, the method blank should be below the detection limit Concentrations up to five times the reporting limit will be allowed for the ubiquitous laboratory and reagent contaminants: methylene chloride, toluene, acetone, 2-butanone and phthalates **provided** they appear in similar levels in the reagent blank and samples. This allowance presumes that the detection limit is significantly below any regulatory limit to which the data are to be compared and that blank subtraction will not occur. For benzene and ethylene dibromide (EDB) and other analytes for which regulatory limits are extremely close to the detection limit, the method blank must be below the method detection limit

SECTION 13. PREVENTIVE ACTION / IMPROVEMENT

13.1 Overview

The laboratory's preventive action programs improve, or eliminate potential causes of nonconforming product and/or nonconformance to the quality system. This preventive action process is a proactive and continuous process of improvement activities that can be initiated through feedback from clients, employees, business providers, and affiliates. The QA Department has the overall responsibility to ensure that the preventive action process is in place, and that relevant information on actions is submitted for management review.

Dedicating resources to an effective preventive action system emphasizes the laboratory's commitment to its Quality Program. It is beneficial to identify and address negative trends before they develop into complaints, problems and corrective actions. Additionally, customer service and client satisfaction can be improved through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered during management reviews, the monthly QA Metrics Report, evaluation of internal or external audits, results & evaluation of proficiency testing (PT) performance, data analysis & review processing operations, client complaints, staff observation, etc..

The monthly Management Systems Metrics Report shows performance indicators in all areas of the laboratory and quality system. These areas include revised reports, corrective actions, audit findings, internal auditing and data authenticity audits, client complaints, PT samples, holding time violations, SOPs, ethics training, etc.. These metrics are used in evaluating the management and quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

The laboratory's corrective action process is integral to implementation of preventive actions. A critical piece of the corrective action process is the implementation of actions to prevent further occurrence of a non-compliance event. Historical review of corrective action provides a valuable mechanism for identifying preventive action opportunities.

13.1.1 The following elements are part of a preventive action system:

- Identification of an opportunity for preventive action.
- Process for the preventive action.
- Define the measurements of the effectiveness of the process once undertaken.
- Execution of the preventive action.
- Evaluation of the plan using the defined measurements.
- Verification of the effectiveness of the preventive action.

- Close-Out by documenting any permanent changes to the Quality System as a result of the Preventive Action. Documentation of Preventive Action is incorporated into the monthly QA reports, corrective action process and management review.

13.1.2 Any Preventive Actions undertaken or attempted shall be taken into account during the annual Management Systems Review (Section 16). A highly detailed report is not required; however, a summary of successes and failures within the preventive action program is sufficient to provide management with a measurement for evaluation.

13.2 Management of Change

The Management of Change process is designed to manage significant events and changes that occur within the laboratory. Through these various tracking indicators, the potential risks inherent with a new event or change are identified and evaluated. The risks are minimized or eliminated through pre-planning and the development of preventive measures. The types of indicators monitored under this collective system include:

- SOP Tracking
  Current Revisions w/ Effective Dates
  Required Biennial Revisions w/ Due Date

- Proficiency Testing (PT) Sample Tracking
  Pass / Fail – most current 2 out of 3 studies.

- Instrument / Equipment List
  Current / Location

- Accreditations
  New / Expiring

- Method Capabilities
  Current Listing by program (e.g., Potable Water, Soils, etc.)

- Key Personnel
  Technical Managers, Department Supervisors, etc..

These items are maintained on TestAmerica's Intranet (Proposal Library) or on our internal database (TotalAccess) which uploads to our company internet site.

SECTION 14. CONTROL OF RECORDS

The laboratory maintains a records management system appropriate to its needs and that complies with applicable standards or regulations as required. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the analytical report for a minimum of five years after it has been issued.

14.1 Overview

The laboratory has established procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. A record index is listed in Table 14-1. Quality records are maintained by the QA Department in a database, which is backed up as part of the regular laboratory backup. Records are of two types; either electronic or hard copy paper formats depending on whether the record is computer or hand generated (some records may be in both formats). Technical records are maintained by Laboratory Operations under the direction of the Laboratory Operations Manager.

Table 14-1. Record Index[1]

	Record Types [1]:	Retention Time:
Technical Records	- Raw Data - Logbooks[2] - Standards - Certificates - Analytical Records - MDLs/IDLs/DOCs - Lab Reports	5 Years from analytical report issue*
Official Documents	- Quality Assurance Manual (QAM) - Work Instructions - Policies - SOPs - Policy Memorandums - Manuals	5 Years from document retirement date*
QA Records	- Internal & External Audits/Responses - Certifications - Corrective/Preventive Actions - Management Reviews - Method & Software Validation / Verification Data - Data Investigation	5 Years from archival* **Data Investigation:** 5 years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)
Project Records	- Sample Receipt & COC Documentation - Contracts and Amendments - Correspondence - QAPP - SAP - Telephone Logbooks - Lab Reports	5 Years from analytical report issue*
Administrative Records	Finance and Accounting	10 years
	EH&S Manual, Permits,	7 years
	Disposal Records	Indefinitely
	Employee Handbook	Indefinitely
	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)	7 Years (HR Personnel Files must be maintained indefinitely)
	Administrative Policies Technical Training Records	7 years

[1] Record Types encompass hardcopy and electronic records.
[2] Examples of Logbook types: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature (hardcopy or electronic records).
* Exceptions listed in Table 14-2.

14.1.1 All records are stored and retained in such a way that they are secure and readily retrievable at the laboratory facility or an offsite location that provides a suitable environment to prevent damage or deterioration and to prevent loss**.** All records shall be protected against fire, theft, loss, environmental deterioration, and vermin. In the case of electronic records, electronic or magnetic sources, storage media are protected from deterioration caused by magnetic fields and/or electronic deterioration.

Access to the data is limited to laboratory and company employees. Records archived off-site are stored in a secure location where a record is maintained of any entry into the storage facility. Whether on-site or off-site storage is used, logs are maintained in each storage box to note removal and return of records. Records are maintained for a minimum of five years unless otherwise specified by a client or regulatory requirement.

For raw data and project records, record retention shall be calculated from the date the project report is issued. For other records, such as Controlled Documents, QA, or Administrative Records, the retention time is calculated from the date the record is formally retired. Records related to the programs listed in Table 14-2 have lengthier retention requirements and are subject to the requirements in Section 14.1.3.

14.1.2 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 14-2 with their retention requirements. In these cases, the longer retention requirement is enacted. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data.

Table 14-2. Example: Special Record Retention Requirements

Program	[1]Retention Requirement
Drinking Water – All States	5 years (project records) 10 years - Radiochemistry (project records)
Drinking Water Lead and Copper Rule	12 years (project records)
NY Potable Water NYCRR Part 55-2	10 years

[1]Note: Extended retention requirements must be noted with the archive documents or addressed in facility-specific records retention procedures.

14.1.3 The laboratory has procedures to protect and back-up records stored electronically and to prevent unauthorized access to or amendment of these records. All analytical data is maintained as hard copy or in a secure readable electronic format. For analytical reports that are maintained as copies in PDF format, refer to Section 19.14.1 for more information. For additional details please refer to refer to TestAmerica Edison SOP No. ED-GEN-024 (Record Storage and Retention).

14.1.4 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data, as well as rapid recovery of historical data The history of the sample from when the laboratory took possession of the samples must be readily understood through the documentation. This shall include inter-laboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, sample receipt, preparation, or testing. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the chain of custody is stored in the laboratory's hard copy project file (in addition to the scanned copy included in the analytical report PDF). The chain of custody would indicate the name of the sampler. If any sampling notes are provided with a work order, they are kept in the project file as well. For additional details please refer to refer to TestAmerica Edison SOP No. ED-GEN-024 (Record Storage and Retention).

- All information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification are documented.

- The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes (e.g., set format for naming electronic files, set format for what is included with a given analytical data set. Reference TestAmerica Edison SOP No. ED-GEN-024 (Record Storage and Retention).

- Instrument data is stored sequentially by instrument. A given day's analyses are maintained in the order of the analysis. Run logs are maintained for each instrument or method; a copy of each day's run long or instrument sequence is stored with the data to aid in re-constructing an analytical sequence. Where an analysis is performed without an instrument, bound logbooks or bench sheets are used to record and file data. Standard and reagent information is recorded in logbooks or entered into the LIMS for each method as required.

- Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

- The reason for a signature or initials on a document is clearly indicated in the records such as "sampled by," "prepared by," "reviewed by", or "analyzed by".

- All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent dark ink.

- Hard copy data may be scanned into PDF format for record storage as long as the scanning process can be verified in order to ensure that no data is lost and the data files and storage media must be tested to verify the laboratory's ability to retrieve the information prior to the destruction of the hard copy that was scanned.

- Also refer to Section 19.14.1 'Computer and Electronic Data Related Requirements'.

14.2 Technical and Analytical Records

14.2.1 The laboratory retains records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each analytical report issued, for a minimum of five years unless otherwise specified by a client or regulatory requirement. The records for each analysis shall contain sufficient information to enable the analysis to be repeated under conditions as close as possible to the original. The records shall include the identity of laboratory personnel responsible for the sampling, performance of each analysis and reviewing results.

14.2.2 Observations, data and calculations are recorded real-time and are identifiable to the specific task.

14.2.3 Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include:

- laboratory sample ID code**;**
- Date of analysis; Time of Analysis is also required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., drying times, incubations, etc.); instrumental analyses have the date and time of analysis recorded as part of their general operations. Where a time critical step exists in an analysis, location for such a time is included as part of the documentation in a specific logbook or on a benchsheet.
- Instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically recorded in instrument maintenance logs where available.
- analysis type**;**
- all manual calculations and manual integrations**;**
- analyst's or operator's initials/signature**;**
- sample preparation including cleanup, separation protocols, incubation periods or subculture, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents**;**
- test results**;**
- standard and reagent origin, receipt, preparation, and use**;**
- calibration criteria, frequency and acceptance criteria**;**
- data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions**;**
- quality control protocols and assessment**;**
- electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and
- Method performance criteria including expected quality control requirements. These are indicated both in the LIMS and on specific analytical report formats**.**

14.3 Laboratory Support Activities

In addition to documenting all the above-mentioned activities, the following are retained QA records and project records (previous discussions in this section relate where and how these data are stored):

- all original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' work sheets and data output records (chromatograms, strip charts, and other instrument response readout records)**;**
- a written description or reference to the specific test method used which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value**;**
- copies of final reports**;**

- archived SOPs**;**
- correspondence relating to laboratory activities for a specific project**;**
- all corrective action reports, audits and audit responses**;**
- proficiency test results and raw data; and
- results of data review, verification, and crosschecking procedures

14.3.1 Sample Handling Records

Records of all procedures to which a sample is subjected while in the possession of the laboratory are maintained. These include but are not limited to records pertaining to:

- sample preservation including appropriateness of sample container and compliance with holding time requirement;
- sample identification, receipt, acceptance or rejection and login;
- sample storage and tracking including shipping receipts, sample transmittal / COC forms; and
- procedures for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

14.4 Administrative Records

The laboratory also maintains the administrative records in either electronic or hard copy form. Refer to Table 14-1.

14.5 Records Management, Storage and Disposal

All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. Certification related records are available upon request.

All information necessary for the historical reconstruction of data is maintained by the laboratory. Records that are stored only on electronic media must be supported by the hardware and software necessary for their retrieval.

Records that are stored or generated by computers or personal computers have hard copy, write-protected backup copies, or an electronic audit trail controlling access**.**

The laboratory has a record management system (a.k.a., document control) for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting. Laboratory notebooks are issued on a per analysis basis, and are numbered sequentially. All data are recorded sequentially within a series of sequential notebooks. Bench sheets are filed sequentially. Standards are primarily maintained in the LIMS (this electronic record may be augmented by a logbook record. Records are considered archived when noted as such in the records management system (a.k.a., document control.)

14.5.1 Transfer of Ownership

In the event that the laboratory transfers ownership or goes out of business, the laboratory shall ensure that the records are maintained or transferred according to client's instructions. Upon ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed. In the event of the closure of the laboratory, all records will revert to the control of the corporate headquarters. Should the entire company cease to exist, as much notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

14.5.2 Records Disposal

Records are removed from the archive and destroyed after 5 years unless otherwise specified by a client or regulatory requirement. On a project specific or program basis, clients may need to be notified prior to record destruction. Records are destroyed in a manner that ensures their confidentiality such as shredding, mutilation or incineration. (Refer to Tables 14-1 and 14-2).

Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

If a third party records management company is hired to dispose of records, a "Certificate of Destruction" is required.

SECTION 15. AUDITS

15.1 Internal Audits

Internal audits are performed to verify that laboratory operations comply with the requirements of the lab's quality system and with the external quality programs under which the laboratory operates. Audits are planned and organized by the QA staff. Personnel conducting the audits should be independent of the area being evaluated. Auditors will have sufficient authority, access to work areas, and organizational freedom necessary to observe all activities affecting quality and to report the assessments to laboratory management and, when requested, to corporate management.

Audits are conducted and documented as described in the TestAmerica Corporate SOP on performing Internal Auditing, SOP No. CA-Q-S-004. The types and frequency of routine internal audits are described in Table 15-1. Special or ad hoc assessments may be conducted as needed under the direction of the QA staff.

Table 15-1. Types of Internal Audits and Frequency

Description	Performed by	Frequency
Quality Systems Audits	QA Department , QA approved designee, or Corporate QA	All areas of the laboratory annually
Method Audits	Joint responsibility: a) QA Manager or designee b) Technical Manager or Designee (Refer to CA-Q-S-004)	Methods Audits Frequency: 50% of methods annually
Special	QA Department or Designee	Surveillance or spot checks performed as needed, e.g., to confirm corrective actions from other audits.
Performance Testing	Analysts with QA oversight	Two successful per year for each TNI field of testing or as dictated by regulatory requirements

15.1.1 Annual Quality Systems Audit

An annual quality systems audit is required to ensure compliance to analytical methods and SOPs, TestAmerica's Data Integrity and Ethics Policies, TNI quality systems, client and state requirements, and the effectiveness of the internal controls of the analytical process, including but not limited to data review, quality controls, preventive action and corrective action. The completeness of earlier corrective actions is assessed for effectiveness & sustainability. The audit is divided into sections for each operating or support area of the lab, and each section is comprehensive for a given area. The area audits may be performed on a rotating schedule throughout the year to ensure adequate coverage of all areas. This schedule may change as situations in the laboratory warrant.

15.1.2 QA Technical Audits

QA technical audits are based on client projects, associated sample delivery groups, and the methods performed. Reported results are compared to raw data to verify the authenticity of results. The validity of calibrations and QC results are compared to data qualifiers, footnotes, and case narratives. Documentation is assessed by examining run logs and records of manual integrations. Manual calculations are checked. Where possible, electronic audit miner programs (e.g., MintMiner and Chrom AuditMiner) are used to identify unusual manipulations of the data deserving closer scrutiny. QA technical audits will include all methods within a two-year period.

15.1.3 SOP Method Compliance

Compliance of all SOPs with the source methods and compliance of the operational groups with the SOPs will be assessed by the Department Manager (i.e., Technical Manager) or qualified designee at least every two years. It is also recommended that the work of each newly hired analyst is assessed within 3 months of working independently, (e.g., completion of method

IDOC). In addition, as analysts add methods to their capabilities, (new IDOC) reviews of the analyst work products will be performed within 3 months of completing the documented training.

15.1.4 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, PT results, data audits, system audits, validation comments, regulatory audits or suspected ethical improprieties. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

15.1.5 Performance Testing

The laboratory participates semi-annually in performance audits conducted through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: Drinking Water, Non-potable Water, Soil and Hazardous Waste.

It is TestAmerica's policy that PT samples be treated as typical samples in the production process. Furthermore, where PT samples present special or unique problems, in the regular production process they may need to be treated differently, as would any special or unique request submitted by any client. The QA Manager must be consulted and in agreement with any decisions made to treat a PT sample differently due to some special circumstance.

Written responses to unacceptable PT results are required. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

15.2 External Audits

External audits are performed when certifying agencies or clients conduct on-site inspections or submit performance testing samples for analysis. It is TestAmerica's policy to cooperate fully with regulatory authorities and clients. The laboratory makes every effort to provide the auditors with access to personnel, documentation, and assistance. Laboratory supervisors are responsible for providing corrective actions to the QA Manager who coordinates the response for any deficiencies discovered during an external audit. Audit responses are due in the time allotted by the client or agency performing the audit. When requested, a copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. The client may only view data and systems related directly to the client's work. All efforts are made to keep other client information confidential.

15.2.1 Confidential Business Information (CBI) Considerations

During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment." When information is claimed as business confidential, the laboratory must place on (or attach to) the

information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend or other suitable form of notice, employing language such as “trade secret”, “proprietary” or “company confidential”. Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may not be obscured from the information. Additional information regarding CBI can be found in within the 2009 TNI standards.

15.3 Audit Findings

Audit findings are documented using the corrective action process and database. The laboratory’s corrective action responses for both types of audits may include action plans that could not be completed within a predefined timeframe. In these instances, a completion date must be set and agreed to by operations management and the QA Manager.

Developing and implementing corrective actions to findings is the responsibility of the Department (i.e., Technical) Manager where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report. When requested, a copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory’s test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

Clients must be notified promptly in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any test report or amendment to a test report. The investigation must begin within 24-hours of discovery of the problem and all efforts are made to notify the client within two weeks after the completion of the investigation.

SECTION 16. MANAGEMENT REVIEWS

16.1 Quality Assurance Report

A comprehensive QA Report shall be prepared each month by the laboratory’s QA Department and forwarded to the Laboratory Director, their Quality Director as well as the General Manager. All aspects of the QA system are reviewed to evaluate the suitability of policies and procedures. During the course of the year, the Laboratory Director, General Manager or Corporate QA may request that additional information be added to the report.

On a monthly basis, Corporate QA compiles information from all the monthly laboratory reports. The Corporate Quality Directors prepare a report that includes a compilation of all metrics and notable information and concerns regarding the QA programs within the laboratories. The report

also includes a listing of new regulations that may potentially impact the laboratories. This report is presented to the Senior Management Team and General Managers.

16.2 Annual Management Review

The senior lab management team (Laboratory Director, QA Manager) conducts a review annually of its quality systems and LIMS to ensure its continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. It will also provide a platform for defining goals, objectives and action items that feed into the laboratory planning system. Corporate Operations and Corporate QA personnel may be included in this meeting at the discretion of the Laboratory Director. The LIMS review consists of examining any audits, complaints or concerns that have been raised through the year that are related to the LIMS. The laboratory will summarize any critical findings that can not be solved by the lab and report them to Corporate IT.

This management systems review (Corporate SOP No. CA-Q-S-008 & Work Instruction No. CA-Q-WI-020) uses information generated during the preceding year to assess the “big picture” by ensuring that routine actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review should keep the quality systems current and effective, therefore, the annual review is a formal senior management process to review specific existing documentation. Significant issues from the following documentation are compiled or summarized by the QA Manager prior to the review meeting:

- Matters arising from the previous annual review.
- Prior Monthly QA Reports issues.
- Laboratory QA Metrics.
- Review of report reissue requests.
- Review of client feedback and complaints.
- Issues arising from any prior management or staff meetings.
- Minutes from prior senior lab management meetings. Issues that may be raised from these meetings include:
    - Adequacy of staff, equipment and facility resources.
    - Adequacy of policies and procedures.
    - Future plans for resources and testing capability and capacity.
- The annual internal double blind PT program sample performance (if performed),
- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data Integrity.

A report is generated by the QA Manager and management. The report is distributed to the appropriate General Manager and the Quality Director. The report includes, but is not limited to:

- The date of the review and the names and titles of participants.
- A reference to the existing data quality related documents and topics that were reviewed.
- Quality system or operational changes or improvements that will be made as a result of the review [e.g., an implementation schedule including assigned responsibilities for the changes (Action Table)].

Changes to the quality systems requiring update to the laboratory QA Manual shall be included in the next revision of the QA Manual.

16.3 Potential Integrity Related Managerial Reviews

Potential integrity issues (data or business related) must be handled and reviewed in a confidential manner until such time as a follow-up evaluation, full investigation, or other appropriate actions have been completed and issues clarified. TestAmerica's Corporate Data Investigation/Recall SOP shall be followed (SOP No. CW-L-S-002) . All investigations that result in finding of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

TestAmerica's CEO, VP of Quality, Technical & Operations, General Managers and Quality Directors receive a monthly report from the Corporate Quality Director summarizing any current data integrity or data recall investigations. The General Manager's are also made aware of progress on these issues for their specific labs.

SECTION 17. PERSONNEL

17.1 Overview

The laboratory's management believes that its highly qualified and professional staff is the single most important aspect in assuring a high level of data quality and service. The staff consists of professionals and support personnel as outlined in the organization chart in Figure 4-1.

All personnel must demonstrate competence in the areas where they have responsibility. Any staff that is undergoing training shall have appropriate supervision until they have demonstrated their ability to perform their job function on their own. Staff shall be qualified for their tasks based on appropriate education, training, experience and/or demonstrated skills as required.

The laboratory employs sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned responsibilities.

All personnel are responsible for complying with all QA/QC requirements that pertain to the laboratory and their area of responsibility. Each staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular area of responsibility. Technical staff must also have a general knowledge of lab operations, test methods, QA/QC procedures and records management.

Laboratory management is responsible for formulating goals for lab staff with respect to education, training and skills and ensuring that the laboratory has a policy and procedures for identifying training needs and providing training of personnel. The training shall be relevant to the present and anticipated responsibilities of the lab staff.

The laboratory only uses personnel that are employed by or under contract to, the laboratory. Contracted personnel, when used, must meet competency standards of the laboratory and work in accordance to the laboratory's quality system.

17.2 Education and Experience Requirements for Technical Personnel

The laboratory makes every effort to hire analytical staffs that possess a college degree (AA, BA, BS) in an applied science with some chemistry in the curriculum. Exceptions can be made based upon the individual's experience and ability to learn. Selection of qualified candidates for laboratory employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Minimum education and training requirements for TestAmerica employees are outlined in job descriptions and are generally summarized for analytical staff in the table below.

The laboratory maintains job descriptions for all personnel who manage, perform or verify work affecting the quality of the environmental testing the laboratory performs. Job Descriptions are located on the TestAmerica intranet site's Human Resources web-page (Also see Section 4 for position descriptions/responsibilities).

Experience and specialized training are occasionally accepted in lieu of a college degree (basic lab skills such as using a balance, colony counting, aseptic or quantitation techniques, etc., are also considered).

As a general rule for analytical staff:

Specialty	Education	Experience
Extractions, Digestions, some electrode methods (pH, DO, Redox, etc.), or Titrimetric and Gravimetric Analyses	H.S. Diploma	On the job training (OJT)
GFAA, CVAA, FLAA, Single component or short list Chromatography (e.g., Fuels, BTEX-GC, IC	A college degree in an applied science or 2 years of college and at least 1 year of college chemistry	Or 2 years prior analytical experience is required
ICP, ICPMS, Long List or complex chromatography (e.g., Pesticides, PCB, Herbicides, HPLC, etc.), GCMS	A college degree in an applied science or 2 years of college chemistry	or 5 years of prior analytical experience
Spectra Interpretation	A college degree in an applied science or 2 years of college chemistry	And 2 years relevant experience Or 5 years of prior analytical experience

Specialty	Education	Experience
Department Managers (i.e,Technical Managers) - **General**	Bachelors Degree in an applied science or engineering with 24 semester hours in chemistry An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years experience in environmental analysis of representative analytes for which they will oversee
Department Managers (i.e,Technical Managers)– **Wet Chem** only (no advanced instrumentation)	Associates degree in an applied science or engineering or 2 years of college with 16 semester hours in chemistry	And 2 years relevant experience

When an analyst does not meet these requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Department (i.e., Technical) Manager, and are considered an analyst in training. The person supervising an analyst in training is accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

17.3 Training

The laboratory is committed to furthering the professional and technical development of employees at all levels.

Orientation to the laboratory's policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. Below are examples of various areas of required employee training:

Required Training	Time Frame	Employee Type
Environmental Health & Safety	Prior to lab work	All
Ethics – New Hires	1 week of hire	All
Ethics – Comprehensive	90 days of hire	All
Data Integrity	30 days of hire	Technical and PMs
Quality Assurance	90 days of hire	All
Ethics – Comprehensive Refresher	Annually	All
Initial Demonstration of Capability (DOC)	Prior to unsupervised method performance	Technical

The laboratory maintains records of relevant authorization/competence, education, professional qualifications, training, skills and experience of technical personnel (including contracted personnel) as well as the date that approval/authorization was given. These records are kept on file at the laboratory. Also refer to "Demonstration of Capability" in Section 19.

The training of technical staff is kept up to date by:

- Each employee must have documentation in their training file that they have read, understood and agreed to follow the most recent version of the laboratory QA Manual and SOPs in their area of responsibility. This documentation is updated as SOPs are updated.
- Documentation from any training courses or workshops on specific equipment, analytical techniques or other relevant topics are maintained in their training file.
- Documentation of proficiency (refer to Section 19).
- An Ethics Agreement signed by each staff member (renewed each year) and evidence of annual ethics training.
- A Confidentiality Agreement signed by each staff member signed at the time of employment.
- Human Resources maintains documentation and attestation forms on employment status & records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics). This information is maintained in the employee's secured personnel file.

Further details of the laboratory's training program are described in the Laboratory Training SOP (TestAmerica Edison SOP No. ED-GEN-022).

17.4 Data Integrity and Ethics Training Program

Establishing and maintaining a high ethical standard is an important element of a Quality System. Ethics and data integrity training is integral to the success of TestAmerica and is provided for each employee at TestAmerica. It is a formal part of the initial employee orientation within 1 week of hire followed by technical data integrity training within 30 days, comprehensive training within 90 days, and an annual refresher for all employees. Senior management at each facility performs the ethics training for their staff.

In order to ensure that all personnel understand the importance TestAmerica places on maintaining high ethical standards at all times; TestAmerica has established a Corporate Ethics Policy (Policy No. CW-L-P-004) and an Ethics Statement. All initial and annual training is documented by signature on the signed Ethics Statement demonstrating that the employee has participated in the training and understands their obligations related to ethical behavior and data integrity.

Violations of this Ethics Policy will not be tolerated. Employees who violate this policy will be subject to disciplinary actions up to and including termination. Criminal violations may also be referred to the Government for prosecution. In addition, such actions could jeopardize TestAmerica's ability to do work on Government contracts, and for that reason, TestAmerica has a Zero Tolerance approach to such violations.
Employees are trained as to the legal and environmental repercussions that result from data misrepresentation. Key topics covered in the presentation include:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting.
- Ethics Policy
- How and when to report ethical/data integrity issues. Confidential reporting.
- Record keeping.
- Discussion regarding data integrity procedures.
- Specific examples of breaches of ethical behavior (e.g. peak shaving, altering data or computer clocks, improper macros, etc., accepting/offering kickbacks, illegal accounting practices, unfair competition/collusion)
- Internal monitoring. Investigations and data recalls.
- Consequences for infractions including potential for immediate termination, debarment, or criminal prosecution.
- Importance of proper written narration / data qualification by the analyst and project manager with respect to those cases where the data may still be usable but are in one sense or another partially deficient.

Additionally, a data integrity hotline (1-800-736-9407) is maintained by TestAmerica and administered by the Corporate Quality Department.

SECTION 18. ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS

18.1 Overview

The laboratory is a 42,000 ft^2 secure laboratory facility with controlled access and designed to accommodate an efficient workflow and to provide a safe and comfortable work environment for employees. All visitors sign in and are escorted by laboratory personnel. Access is controlled by various measures.

The laboratory is equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. The laboratory provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, etc., OSHA and other regulatory agency guidelines regarding required amounts of bench and fume hood space, lighting, ventilation (temperature and humidity controlled), access, and safety equipment are met or exceeded.

Traffic flow through sample preparation and analysis areas is minimized to reduce the likelihood of contamination. Adequate floor space and bench top area is provided to allow unencumbered sample preparation and analysis space. Sufficient space is also provided for storage of reagents and media, glassware, and portable equipment. Ample space is also provided for refrigerated sample storage before analysis and archival storage of samples after analysis. Laboratory HVAC and deionized water systems are designed to minimize potential trace contaminants.

The laboratory is separated into specific areas for sample receiving, sample preparation, volatile organic sample analysis, non-volatile organic sample analysis, inorganic sample analysis, and administrative functions.

18.2 Environment

Laboratory accommodation, test areas, energy sources, lighting are adequate to facilitate proper performance of tests. The facility is equipped with heating, ventilation, and air conditioning (HVAC) systems appropriate to the needs of environmental testing performed at this laboratory.

The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of any measurements.

The laboratory provides for the effective monitoring, control and recording of environmental conditions that may affect the results of environmental tests as required by the relevant specifications, methods, and procedures. Such environmental conditions include humidity and temperature levels in the laboratory (when appropriate).

When any of the method or regulatory required environmental conditions change to a point where they may adversely affect test results, analytical testing will be discontinued until the environmental conditions are returned to the required levels.

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

18.3 Work Areas

There is effective separation between neighboring areas when the activities therein are incompatible with each other. Examples include:

- Volatile organic chemical handling areas, including sample preparation and waste disposal, and volatile organic chemical analysis areas.

Access to and use of all areas affecting the quality of analytical testing is defined and controlled by secure access to the laboratory building as described below in the Building Security section.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality. These measures include regular cleaning to control dirt and dust within the laboratory. Work areas are available to ensure an unencumbered work area. Work areas include:

- Access and entryways to the laboratory.
- Sample receipt areas.
- Sample storage areas.
- Chemical and waste storage areas.
- Data handling and storage areas.
- Sample processing areas.
- Sample analysis areas.

18.4 Floor Plan

A floor plan can be found in Appendix 1.

18.5 Building Security

Building keys are distributed to employees as necessary.

Visitors to the laboratory sign in and out in a visitor's logbook. A visitor is defined as any person who visits the laboratory who is not an employee of the laboratory. In addition to signing into the laboratory, the Environmental, Health and Safety Manual contains requirements for visitors and vendors. There are specific safety forms that must be reviewed and signed. Visitors (with the exception of company employees) are escorted by laboratory personnel at all times, or the location of the visitor is noted in the visitor's logbook.

SECTION 19. TEST METHODS AND METHOD VALIDATION

19.1 Overview

The laboratory uses methods that are appropriate to meet our clients' requirements and that are within the scope of the laboratory's capabilities. These include sampling, handling, transport,

storage and preparation of samples, and, where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of environmental data.

Instructions are available in the laboratory for the operation of equipment as well as for the handling and preparation of samples. All instructions, Standard Operating Procedures (SOPs), reference methods and manuals relevant to the working of the laboratory are readily available to all staff. Deviations from published methods are documented (with justification) in the laboratory's approved SOPs. SOPs are submitted to clients for review at their request. Significant deviations from published methods require client approval and regulatory approval where applicable.

19.2 Standard Operating Procedures (SOPS)

The laboratory maintains SOPs that accurately reflect all phases of the laboratory such as assessing data integrity, corrective actions, handling customer complaints as well as all analytical methods and sampling procedures. The method SOPs are derived from the most recently promulgated/approved, published methods and are specifically adapted to the laboratory facility. Modifications or clarifications to published methods are clearly noted in the SOPs. All SOPs are controlled in the laboratory.

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for writing an SOP are incorporated by reference to TestAmerica's Corporate SOP entitled 'Writing a Standard Operating Procedure', No. CW-Q-S-002.
- SOPs are reviewed at a minimum of every 2 years (annually for Drinking Water and DoD SOPs), and where necessary, revised to ensure continuing suitability and compliance with applicable requirements.

19.3 Laboratory Methods Manual

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP.

Note: If more stringent standards or requirements are included in a mandated test method or regulation than those specified in this manual, the laboratory shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed. Any exceptions or deviations from the referenced methods or regulations are noted in the specific analytical SOP.

The laboratory maintains an SOP Index for both technical and non-technical SOPs. Technical SOPs are maintained to describe a specific test method. Non-technical SOPs are maintained to describe functions and processes not related to a specific test method.

19.4 Selection of Methods

Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized. Once client methodology requirements are established, this and other pertinent information is summarized by the Project Manager. These mechanisms ensure that the proper analytical methods are applied when the samples arrive for log-in. For non-routine analytical services (e.g., special matrices, non-routine compound lists), the method of choice is selected based on client needs and available technology. The methods selected should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required precision and accuracy.

19.4.1 Sources of Methods

Routine analytical services are performed using standard EPA-approved methodology. In some cases, modification of standard approved methods may be necessary to provide accurate analyses of particularly complex matrices. When the use of specific methods for sample analysis is mandated through project or regulatory requirements, only those methods shall be used.

When clients do not specify the method to be used or methods are not required, the methods used will be clearly validated and documented in an SOP and available to clients and/or the end user of the data.

The analytical methods used by the laboratory are those currently accepted and approved by the U. S. EPA and the state or territory from which the samples were collected. Reference methods include:

- *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, and Appendix A-C; 40 CFR Part 136, USEPA Office of Water. Revised as of July 1, 1995, Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA 600 Series)*
- *Methods for Chemical Analysis of Water and Wastes, EPA 600 (4-79-020), 1983.*

- *Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100, August 1993.*
- *Methods for the Determination of Metals in Environmental Samples, EPA/600/4-91/010, June 1991. Supplement I: EPA-600/R-94/111, May 1994.*
- *Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised, July 1991, Supplement I, EPA-600-4-90-020, July 1990, Supplement II, EPA-600/R-92-129, August 1992. Supplement III EPA/600/R-95/131 - August 1995 (EPA 500 Series) (EPA 500 Series methods)*
- *Technical Notes on Drinking Water Methods, EPA-600/R94-173, October 1994*
- *Statement of Work for Inorganics & Organics Analysis, SOM and ISM, current versions, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- *Standard Methods for the Examination of Water and Wastewater, 18th/19th /20th/ on-line edition; Eaton, A.D. Clesceri, L.S. Greenberg, A.E. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C.*
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008.*
- *Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.*
- *National Status and Trends Program, National Oceanographic and Atmospheric Administration, Volume I-IV, 1985-1994.*
- *Manual for the Certification of Laboratories Analyzing Drinking Water (EPA 815-R-05-004, January 2005)*
- *Code of Federal Regulations (CFR) 40, Parts 136, 141, 172, 173, 178, 179 and 261*

The laboratory reviews updated versions to all the aforementioned references for adaptation based upon capabilities, instrumentation, etc., and implements them as appropriate. As such, the laboratory strives to perform only the latest versions of each approved method as regulations allow or require.

Other reference procedures for non-routine analyses may include methods established by specific states (e.g., Underground Storage Tank methods), ASTM or equipment manufacturers. Sample type, source, and the governing regulatory agency requiring the analysis will determine the method utilized.

The laboratory shall inform the client when a method proposed by the client may be inappropriate or out of date. After the client has been informed, and they wish to proceed contrary to the laboratory's recommendation, it will be documented.

19.4.2 Demonstration of Capability

Before the laboratory may institute a new method and begin reporting results, the laboratory shall confirm that it can properly operate the method. In general, this demonstration does not test the performance of the method in real world samples, but in an applicable and available clean matrix sample. If the method is for the testing of analytes that are not conducive to spiking, demonstration of capability may be performed on quality control samples.

A demonstration of capability (reference TestAmerica Edison Training SOP No. ED-GEN-022) is performed whenever there is a change in instrument type (e.g., new instrumentation), method or personnel (e.g., analyst hasn't performed the test within the last 12 months).

The initial demonstration of capability must be thoroughly documented and approved by the Department Manager (i.e., Technical Manager) and QA Manager prior to independently analyzing client samples. All associated documentation must be retained in accordance with the laboratories archiving procedures.

The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct an MDL study (when applicable). There may be other requirements as stated within the published method or regulations (i.e., retention time window study).

Note: In some instances, a situation may arise where a client requests that an unusual analyte be reported using a method where this analyte is not normally reported. If the analyte is being reported for regulatory purposes, the method must meet all procedures outlined within this QA Manual (SOP, MDL, and Demonstration of Capability). If the client states that the information is not for regulatory purposes, the result may be reported as long as the following criteria are met:

- The instrument is calibrated for the analyte to be reported using the criteria for the method and ICV/CCV criteria are met (unless an ICV/CCV is not required by the method or criteria are per project DQOs).
- The laboratory's nominal or default reporting limit (RL) is equal to the quantitation limit (QL), must be at or above the lowest non-zero standard in the calibration curve and must be reliably determined. Project RLs are client specified reporting levels which may be higher than the QL. Results reported below the QL must be qualified as estimated values. Also see Section 19.6.1.3, Relationship of Limit of Detection (LOD) to Quantitation Limit (QL).
- The client request is documented and the lab informs the client of its procedure for working with unusual compounds. The final report must be footnoted: *Reporting Limit based on the low standard of the calibration curve.*

19.4.3 Initial Demonstration of Capability (IDOC) Procedures

19.4.3.1 The spiking standard used must be prepared independently from those used in instrument calibration.

19.4.3.2 The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified by a method or the laboratory SOP.

19.4.3.3 At least four aliquots shall be prepared (including any applicable clean-up procedures) and analyzed according to the test method (either concurrently or over a period of days).

19.4.3.4 Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations for each parameter of interest.

19.4.3.5 When it is not possible to determine the mean and standard deviations, such as for presence, absence and logarithmic values, the laboratory will assess performance against criteria described in the Method SOP.

19.4.3.6 Compare the information obtained above to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory generated acceptance criteria (LCS or interim criteria) if there is no mandatory criteria established. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

19.4.3.7 When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to either option listed below:

- Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with 19.4.3.3 above.
- Beginning with 19.4.3.3 above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with 19.4.3.1 above.

Note: Results of successive LCS analyses can be used to fulfill the DOC requirement.

A certification statement (refer to Figure 19-1 as an example) shall be used to document the completion of each initial demonstration of capability. A copy of the certification is archived in the analyst's training folder.

Methods on line prior to the effective date of this Section shall be updated to the procedures outlined above as new analysts perform their demonstration of capability. A copy of the new record will replace that which was used for documentation in the past. At a minimum, the precision and accuracy of four mid-level laboratory control samples must have been compared to the laboratory's quality control acceptance limits.

19.5 Laboratory Developed Methods and Non-Standard Methods

Any new method developed by the laboratory must be fully defined in an SOP and validated by qualified personnel with adequate resources to perform the method. Method specifications and the relation to client requirements must be clearly conveyed to the client if the method is a non-standard method (not a published or routinely accepted method). The client must also be in agreement to the use of the non-standard method.

19.6 Validation of Methods

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
All non-standard methods, laboratory designed/developed methods, standard methods used outside of their scope, and major modifications to published methods must be validated to confirm they are fit for their intended use. The validation will be as extensive as necessary to meet the needs of the given application. The results are documented with the validation procedure used and contain a statement as to the fitness for use.

19.6.1 Method Validation and Verification Activities for All New Methods

While method validation can take various courses, the following activities can be required as part of method validation. Method validation records are designated QC records and are archived accordingly.

19.6.1.1 Determination of Method Selectivity

Method selectivity is the demonstrated ability to discriminate the analyte(s) of interest from other compounds in the specific matrix or matrices from other analytes or interference. In some cases to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

19.6.1.2 Determination of Method Sensitivity

Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set of samples. Where estimations and/or demonstrations of sensitivity are required by regulation or client agreement, such as the procedure in 40 CFR Part 136 Appendix B, under the Clean Water Act, these shall be followed.

19.6.1.3 Relationship of Limit of Detection (LOD) to the Quantitation Limit (QL)

An important characteristic of expression of sensitivity is the difference in the LOD and the QL. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The QL is the minimum concentration of analyte that can be quantitatively determined with acceptable precision and bias. For most instrumental measurement systems, there is a region where semi-quantitative data is generated around the LOD (both above and below the estimated MDL or LOD) and below the QL. In this region, detection of an analyte may be confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the QL, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be estimated. If data is to be reported in this region, it must be done so with a qualification that denotes the semi-quantitative nature of the result.

19.6.1.4 Determination of Interferences

A determination that the method is free from interferences in a blank matrix is performed.

19.6.1.5 Determination of Range

Where appropriate to the method, the quantitation range is determined by comparison of the response of an analyte in a curve to established or targeted criteria. Generally the upper quantitation limit is defined by highest acceptable calibration concentration. The lower quantitation limit or QL cannot be lower than the lowest non-zero calibration level, and can be constrained by required levels of bias and precision.

19.6.1.6 Determination of Accuracy and Precision

Accuracy and precision studies are generally performed using replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

19.6.1.7 Documentation of Method

The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, an SOP Attachment describing the specific differences in the new method is acceptable in place of a separate SOP.

19.6.1.8 Continued Demonstration of Method Performance

Continued demonstration of Method Performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as LCS, method blanks or PT samples.

19.7 Method Detection Limits (MDL) / Limits of Detection (LOD)

Method detection limits (MDL) are initially determined in accordance with 40 CFR Part 136, Appendix B or alternatively by other technically acceptable practices that have been accepted by regulators. MDL is also sometimes referred to as Limit of Detection (LOD). The MDL theoretically represents the concentration level for each analyte within a method at which the Analyst is 99% confident that the true value is not zero. The MDL is determined for each analyte initially during the method validation process and updated as required in the analytical methods, whenever there is a significant change in the procedure or equipment, or based on project specific requirements. Generally, the analyst prepares at least seven replicates of solution spiked at one to five times the estimated method detection limit (most often at the lowest standard in the calibration curve) into the applicable matrix with all the analytes of interest. Each of these aliquots is extracted (including any applicable clean-up procedures) and analyzed in the same manner as the samples. Where possible, the seven replicates should be analyzed over 2-4 days to provide a more realistic MDL. [To allow for some flexibility, this low level standard may be analyzed every batch or every week or some other frequency rather than doing the study all at once. In addition, a larger number of data points may be used if the appropriate t-value multiplier is used]

Refer to the Corporate SOP No. CA-Q-S-006 for details on the laboratory's MDL process.

19.8 Instrument Detection Limits (IDL)

The IDL is sometimes used to assess the reasonableness of the MDLs or in some cases required by the analytical method or program requirements. IDLs are most used in metals analyses but may be useful in demonstration of instrument performance in other areas.

IDLs are calculated to determine an instrument's sensitivity independent of any preparation method. IDLs are calculated either using 7 replicate spike analyses, like MDL but without sample preparation, or by the analysis of 10 instrument blanks and calculating 3 x the absolute value of the standard deviation.

If IDL is > than the MDL, it may be used as the reported MDL.

19.9 Verification of Detection and Reporting Limits

Once an MDL is established, it must be verified, on each instrument, by analyzing a quality control sample (prepared as a sample) at no more than 3 times the calculated MDL for single analyte analyses (e.g. most wet chemistry methods, Atomic Absorption, etc.) and no more than 4 times the calculated MDL for multiple analyte methods (e.g. GC, GCMS, ICP, etc.). The analytes must be qualitatively identified. This verification does not apply to methods that are not readily spiked (e.g. pH, turbidity, etc.) or where the lab does not report to the MDL. If the MDL does not verify, then the lab will not report to the MDL, or redevelop their MDL or use the level where qualitative identification is established. MDLs must be verified at least annually.

When the laboratory establishes a quantitation limit, it must be initially verified by the analysis of a low level standard or QC sample at 1-2 times the reporting limit and annually thereafter. The annual requirement is waved for methods that have an annually verified MDL. The laboratory will comply with any regulatory requirements.

19.10 Retention Time Windows

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis or as specific in the reference method, each analyte will have a specific time of elution from the column to the detector. This is known as the analyte's retention time. The variance in the expected time of elution is defined as the retention time window. As the key to analyte identification in chromatography, retention time windows must be established on every column for every analyte used for that method. These records are kept with the files associated with an instrument for later quantitation of the analytes. Complete details are available in the laboratory SOPs.

19.11 Evaluation of Selectivity

The laboratory evaluates selectivity by following the checks within the applicable analytical methods, which include mass spectral tuning, second column confirmation, ICP interelement interference checks, chromatography retention time windows, sample blanks, spectrochemical, atomic absorption or fluorescence profiles, co-precipitation evaluations and specific electrode response factors.

19.12 Estimation of Uncertainty of Measurement

19.12.1 Uncertainty is "a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand" (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1). Knowledge of the uncertainty of a measurement provides additional confidence in a result's validity. Its value accounts for all the factors which could possibly affect the result, such as adequacy of analyte definition, sampling, matrix effects and interferences, climatic conditions, variances in weights, volumes, and standards, analytical procedure, and random variation. Some national accreditation organizations require the use of an "expanded uncertainty": the range within which the value of the measurand is believed to lie within at least a 95% confidence level with the coverage factor k=2.

19.12.2 Uncertainty is not error. Error is a single value, the difference between the true result and the measured result. On environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error. Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to be Gaussian in distribution, and reducible by increasing the number of measurements.

19.12.3 The minimum uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte. The LCS limits are used to assess the performance of the measurement system since they take into consideration all of the laboratory variables associated with a given test over time (except for variability associated with the sampling and the variability due to matrix effects). The percent recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

19.12.4 To calculate the uncertainty for the specific result reported, multiply the result by the decimal of the lower end of the LCS range percent value for the lower end of the uncertainty range, and multiply the result by the decimal of the upper end of the LCS range percent value for the upper end of the uncertainty range. These calculated values represent a 99%-certain range for the reported result. As an example, suppose that the result reported is 1.0 mg/l, and the LCS percent recovery range is 50 to 150%. The uncertainty range would be 0.5 to 1.5 mg/l, which could also be written as 1.0 +/- 0.5 mg/l.

19.12.5 In the case where a well recognized test method specifies limits to the values of major sources of uncertainty of measurement (e.g., 524.2, 525, etc.) and specifies the form of presentation of calculated results, no further discussion of uncertainty is required.

19.13 Sample Reanalysis Guidelines

Because there is a certain level of uncertainty with any analytical measurement, a sample re-preparation (where appropriate) and subsequent analysis (hereafter referred to as 'reanalysis') may result in either a higher or lower value from an initial sample analysis. There are also variables that may be present (e.g., sample homogeneity, analyte precipitation over time, etc.) that may affect the results of a reanalysis. Based on the above comments, the laboratory will reanalyze samples at a client's request with the following caveats. Note: Client specific Contractual Terms & Conditions for reanalysis protocols may supersede the following items.

- Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within $\pm$ 1 reporting limit for samples $\leq$ 5x the reporting limit, the original analysis will be reported. At the client's request, both results may be reported on the same report but not on two separate reports.

- If the reanalysis does not agree (as defined above) with the original result, then the laboratory will investigate the discrepancy and reanalyze the sample a third time for confirmation if sufficient sample is available.

- Any potential charges related to reanalysis are discussed in the contract terms and conditions or discussed at the time of the request. The client will typically be charged for reanalysis unless it is determined that the lab was in error.

- Due to the potential for increased variability, reanalysis may not be applicable to Non-homogenous, Encore, and Sodium Bisulfate preserved samples. See the Laboratory Director if unsure.

19.14 Control of Data

The laboratory has policies and procedures in place to ensure the authenticity, integrity, and accuracy of the analytical data generated by the laboratory.

19.14.1 Computer and Electronic Data Related Requirements

The three basic objectives of our computer security procedures and policies are shown below. More detail is outlined in the TestAmerica Corporate IT SOPs and in TestAmerica Edison SOPs No. ED-GEN-001 (Data Management and Handling Procedures) and ED-GEN-002 (Document Control). The laboratory is currently running the TALS LIMS which is a, custom in-house developed LIMS system that has been highly customized to meet the needs of the laboratory. It is referred to as LIMS for the remainder of this section. The LIMS utilizes Microsoft SQL Server which is an industry standard relational database platform. It is referred to as Database for the remainder of this section.

19.14.1.1 Maintain the Database Integrity: Assurance that data is reliable and accurate through data verification (review) procedures, password-protecting access, anti-virus protection, data change requirements, as well as an internal LIMS permissions procedure.

- LIMS Database Integrity is achieved through data input validation, internal user controls, and data change requirements.
- Spreadsheets and other software developed in-house must be verified with documentation through hand calculations prior to use. Cells containing calculations must be lock-protected and controlled.
- Instrument hardware and software adjustments are safeguarded through maintenance logs, audit trails and controlled access.

19.14.1.2 Ensure Information Availability: Protection against loss of information or service is ensured through scheduled back-ups, stable file server network architecture, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented.

19.14.1.3 Maintain Confidentiality: Ensure data confidentiality through physical access controls such as password protection or website access approval when electronically transmitting data.

19.14.2 Data Reduction

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The

analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., Wet Chemistry, the data is reduced by the analyst and then verified by the Department (Technical) Manager or alternate analyst prior to updating the data in LIMS. The spreadsheets, or any other type of applicable documents, are signed by both the analyst and alternate reviewer to confirm the accuracy of the manual entry(s).

Manual integration of peaks will be documented and reviewed and the raw data will be flagged in accordance with the TestAmerica Corporate SOP No. CA-Q-S-002, *Acceptable Manual Integration Practices*.

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method or per manufacturer's indication; otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

19.14.2.1 All raw data must be retained in the worklist folder, computer file (if appropriate), and/or runlog. All criteria pertinent to the method must be recorded. The documentation is recorded at the time observations or calculations are made and must be signed or initialed/dated (month/day/year). It must be easily identifiable who performed which tasks if multiple people were involved.

19.14.2.2 In general, concentration results are reported in milligrams per liter (mg/l) or micrograms per liter (µg/l) for liquids and milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg) for solids. For values greater than 10,000 mg/l, results can be reported in percent, i.e., 10,000 mg/l = 1**%.** Units are defined in each lab SOP.

19.14.2.3 In reporting, the analyst or the instrument output records the raw data result using values of known certainty plus one uncertain digit. If final calculations are performed external to LIMS, the results should be entered in LIMS with at least three significant figures. In general, results are reported to 2 significant figures on the final report.

19.14.2.4 For those methods that do not have an instrument printout or an instrumental output compatible with the LIMS System, the raw results and dilution factors are entered directly into LIMS by the analyst, and the software calculates the final result for the analytical report. LIMS has a defined significant figure criterion for each analyte.

19.14.2.5 The laboratory strives to import data directly from instruments or calculation spreadsheets to ensure that the reported data are free from transcription and calculation errors. For those analyses with an instrumental output compatible with the LIMS, the raw results and dilution factors are transferred into LIMS electronically after reviewing the quantitation report, and removing unrequested or poor spectrally-matched compounds. The analyst prints a copy of what has been entered to check for errors. This printout and the instrument's printout of calibrations, concentrations, retention times, chromatograms, and mass spectra, if applicable, are retained with

the data file. The data file is stored in a monthly folder on the instrument computer; periodically, this file is transferred to the server and, eventually, to a tape file.

19.14.3 Logbook / Worksheet Use Guidelines

Logbooks and worksheets are filled out 'real time' and have enough information on them to trace the events of the applicable analysis/task. (e.g. calibrations, standards, analyst, sample ID, date, time on short holding time tests, temperatures when applicable, calculations are traceable, etc.)

- Corrections are made following the procedures outlined in Section 12.
- Logbooks are controlled by the QA Department. A record is maintained of all logbooks in the lab.
- Unused portions of pages must be "Z"'d out, signed and dated.
- Worksheets are created with the approval of the Department Managers/QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

19.14.4 Review / Verification Procedures

Review procedures are out lined in several SOPs (including but not limited to, TestAmerica Edison SOP Nos. ED-GEN-021: Data Review, ED-SPM-001:Login, and ED-RP-001:Reports Production) to ensure that reported data are free from calculation and transcription errors, that QC parameters have been reviewed and evaluated before data is reported. The general review concepts are discussed below, more specific information can be found in the SOPs.

19.14.4.1 The data review process at the laboratory starts at the Sample Control level. Sample Control personnel review chain-of-custody forms and input the sample information and required analyses into a computer LIMS. The Sample Control Supervisor reviews the transaction of the chain-of-custody forms and the inputted information. The Project Managers perform final review of the chain-of-custody forms and inputted information.

19.14.4.2 The next level of data review occurs with the Analysts. As results are generated, analysts review their work to ensure that the results generated meet QC requirements and relevant EPA methodologies. The Analysts transfer the data into the LIMS and add data qualifiers if applicable. To ensure data compliance, a different analyst or Department (Technical) Manager/Supervisor performs a second level of review. Second level review is accomplished by checking reported results against raw data and evaluating the results for accuracy. During the second level review, blank runs, QA/QC check results, initial and continuing calibration results, laboratory control samples, sample data, qualifiers and spike information are evaluated. Where calibration is not required on a daily basis, secondary review of the initial calibration results may be conducted at the time of calibration. Approximately 15% of all sample data from manual methods and from automated methods, all GC/MS spectra and all manual integrations are reviewed. Manual integrations are also electronically reviewed utilizing auditing software to help ensure compliance to ethics and manual integration policies. Issues that deem further review include the following:

- QC data are outside the specified control limits for accuracy and precision
- Reviewed sample data does not match with reported results
- Unusual detection limit changes are observed
- Samples having unusually high results
- Samples exceeding a known regulatory limit
- Raw data indicating some type of contamination or poor technique
- Inconsistent peak integration
- Transcription errors
- Results outside of calibration range

19.14.4.3 Unacceptable analytical results may require reanalysis of the samples. Any problems are brought to the attention of the Laboratory Director, Project Manager, Quality Assurance Manager, Technical Manager, or Supervisor for further investigation. Corrective action is initiated whenever necessary.

19.14.4.4 The results are then entered or directly transferred into the computer database and a hard copy (or .pdf) is printed for the client.

19.14.4.5 As a final review prior to the release of the report, the Project Manager reviews the results for appropriateness and completeness. This review and approval ensures that client requirements have been met and that the final report has been properly completed. The process includes, but is not limited to, verifying that chemical relationships are evaluated, COC is followed, cover letters/ narratives are present, flags are appropriate, and project specific requirements are met.

19.14.4.6 Any project that requires a data package is subject to a tertiary data review for transcription errors and acceptable quality control requirements. The Project Manager then signs the final report. The accounting personnel also check the report for any clerical or invoicing errors. When complete, the report is sent out to the client.

19.14.5 Manual Integrations

Computerized data systems provide the analyst with the ability to re-integrate raw instrument data in order to optimize the interpretation of the data. Though manual integration of data is an invaluable tool for resolving variations in instrument performance and some sample matrix problems, when used improperly, this technique would make unacceptable data appear to meet quality control acceptance limits. Improper re-integrations lead to legally indefensible data, a poor reputation, or possible laboratory decertification. Because guidelines for re-integration of data are not provided in the methods and most methods were written prior to widespread implementation of computerized data systems, the laboratory trains all analytical staff on proper manual integration techniques using TestAmerica's Corporate SOP (CA-Q-S-002).

19.14.5.1 The analyst must adjust baseline or the area of a peak in some situations, for example when two compounds are not adequately resolved or when a peak shoulder needs to be separated from the peak of interest. The analyst must use professional judgment and common sense to determine when manual integrating is required. Analysts are encouraged to ask for assistance from a senior analyst or manager when in doubt.

19.14.5.2 Analysts shall not increase or decrease peak areas for the sole purpose of achieving acceptable QC recoveries that would have otherwise been unacceptable. The intentional recording or reporting of incorrect information (or the intentional omission of correct information) is against company principals and policy and is grounds for immediate termination.

19.14.5.3 Client samples, performance evaluation samples, and quality control samples are all treated equally when determining whether or not a peak area or baseline should be manually adjusted.

19.14.5.4 All manual integrations receive a second level review. Manual integrations must be indicated on an expanded scale "after" chromatograms such that the integration performed can be easily evaluated during data review. Expanded scale "before" chromatograms are also required for all manual integrations on QC parameters (calibrations, calibration verifications, laboratory control samples, internal standards, surrogates, etc.) unless the laboratory has another documented corporate approved procedure in place that can demonstrate an active process for detection and deterrence of improper integration practices.

Figure 19-1. Example - Demonstration of Capability Documentation

DEMONSTRATION OF CAPABILITIY (DOC)

Laboratory Name:_____
Laboratory Address:_____
Method:_____ Matrix:_____
Date:_____ Analyst(s):_____
Source of Analyte(s):_____

Analytical Results

Analyst	Conc. (Units)	Rep 1	Rep 2	Rep 3	Rep 4	Avg. % Recovery	% RSD

% RSD = Percent relative standard deviation = standard deviation divided by average % Recovery

Raw data reference: _____

Certification Statement:

We, the undersigned, certify that:
1. The cited test method has met Demonstration of Capability requirements.
2. The test method was performed by the analyst(s) identified on this certification.
3. A copy of the test method and the laboratory-specific SOPs are available for all personnel on site.
4. The data associated with the method demonstration of capability are true, accurate, complete, and self-explanatory.
5. All raw data necessary to reconstruct and validate these analyses have been retained at the facility, and the associated information is well organized and available for review.
6.

_____ _____
Analyst Signature Date

_____ _____
Technical Director Signature Date

_____ _____
Quality Assurance Coordinator Signature Date

SECTION 20. EQUIPMENT and CALIBRATIONS

20.1 Overview

The laboratory purchases the most technically advanced analytical instrumentation for sample analyses. Instrumentation is purchased on the basis of accuracy, dependability, efficiency and sensitivity. Each laboratory is furnished with all items of sampling, preparation, analytical testing and measurement equipment necessary to correctly perform the tests for which the laboratory has capabilities. Each piece of equipment is capable of achieving the required accuracy and complies with specifications relevant to the method being performed. Before being placed into use, the equipment (including sampling equipment) is calibrated and checked to establish that it meets its intended specification. The calibration routines for analytical instruments establish the range of quantitation. Calibration procedures are specified in laboratory SOPs. A list of laboratory instrumentation is presented in Table 20-1. The most current list of laboratory instrumentation can be found in TestAmerica Edison Work Instruction No. ED-WI-002 (Equipment Inventory).

Equipment is only operated by authorized and trained personnel. Manufacturers instructions for equipment use are readily accessible to all appropriate laboratory personnel.

20.2 Preventive Maintenance

The laboratory follows a well-defined maintenance program to ensure proper equipment operation and to prevent the failure of laboratory equipment or instrumentation during use. This program of preventive maintenance helps to avoid delays due to instrument failure.

Routine preventive maintenance procedures and frequency, such as cleaning and replacements, should be performed according to the procedures outlined in the manufacturer's manual. Qualified personnel must also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to continually meet one of the quality control criteria.

Table 20-2 lists examples of scheduled routine maintenance. It is the responsibility of each Technical Manager to ensure that instrument maintenance logs are kept for all equipment in his/her Department. Preventative maintenance procedures may also be outlined in analytical SOPs or instrument manuals. (Note: for some equipment, the log used to monitor performance is also the maintenance log. Multiple pieces of equipment may share the same log as long as it is clear as to which instrument is associated with an entry.)

Instrument maintenance logs are controlled and are used to document instrument problems, instrument repair and maintenance activities. Maintenance logs shall be kept for all major pieces of equipment. Instrument maintenance logs may also be used to specify instrument parameters.

- Documentation must include all major maintenance activities such as contracted preventive maintenance and service and in-house activities such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning and adjustments.
- Each entry in the instrument log includes the Analyst's initials, the date, a detailed description of the problem (or maintenance needed/scheduled), a detailed explanation of the solution or maintenance performed, and a verification that the equipment is functioning properly (state

what was used to determine a return to control. e.g. CCV run on *'date'* was acceptable, or instrument recalibrated on 'date' with acceptable verification, etc.) must also be documented in the instrument records.

- When maintenance or repair is performed by an outside agency, service receipts detailing the service performed can be affixed into the logbooks adjacent to pages describing the maintenance performed. This stapled in page must be signed across the page entered and the logbook so that it is clear that a page is missing if only half a signature is found in the logbook.

If an instrument requires repair (subjected to overloading or mishandling, gives suspect results, or otherwise has shown to be defective or outside of specified limits) it shall be taken out of operation and tagged as out-of-service or otherwise isolated until such a time as the repairs have been made and the instrument can be demonstrated as operational by calibration and/or verification or other test to demonstrate acceptable performance. The laboratory shall examine the effect of this defect on previous analyses.

In the event of equipment malfunction that cannot be resolved, service shall be obtained from the instrument vendor manufacturer, or qualified service technician, if such a service can be tendered. If on-site service is unavailable, arrangements shall be made to have the instrument shipped back to the manufacturer for repair. Back up instruments, which have been approved, for the analysis shall perform the analysis normally carried out by the malfunctioning instrument. If the back up is not available and the analysis cannot be carried out within the needed timeframe, the samples shall be subcontracted.

If an instrument is sent out for service or transferred to another facility, it must be recalibrated and verified (including new initial MDL study) prior to return to lab operations.

20.3 Support Equipment

This section applies to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, field sampling devices, temperature measuring devices, thermal/pressure sample preparation devices and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All raw data records associated with the support equipment are retained to document instrument performance.

20.3.1 Weights and Balances

The accuracy of the balances used in the laboratory is checked every working day, before use. All balances are placed on stable counter tops.

Each balance is checked prior to initial serviceable use with at least two certified ASTM type 1 weights spanning its range of use (weights that have been calibrated to ASTM type 1 weights may also be used for daily verification). ASTM type 1 weights used only for calibration of other weights (and no other purpose) are inspected for corrosion, damage or nicks at least annually and if no damage is observed, they are calibrated at least every 5 years by an outside calibration laboratory. Any weights (including ASTM Type 1) used for daily balance checks or

other purposes are recalibrated/recertified annually to NIST standards (this may be done internally if laboratory maintains "calibration only" ASTM type 1 weights).
All balances are serviced annually by a qualified service representative, who supplies the laboratory with a certificate that identifies traceability of the calibration to the NIST standards.

All of this information is recorded in logs, and the recalibration/recertification certificates are kept on file.

20.3.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to ± 0.1 pH units, and have a scale readability of at least 0.05 pH units. The meters automatically compensate for the temperature, and are calibrated with at least two working range buffer solutions before each use.

Conductivity meters are also calibrated before each use with a known standard to demonstrate the meters do not exceed an error of 1% or one umhos/cm.

Turbidity meters are also calibrated before each use. All of this information is documented in logs.

Consult pH and Conductivity, and Turbidity SOPs for further information.

20.3.3 Thermometers

All thermometers are calibrated on an annual basis with a NIST-traceable thermometer. IR thermometers, digital probes and thermocouples are calibrated quarterly.

The mercury NIST thermometer is recalibrated every five years (unless thermometer has been exposed to temperature extremes or apparent separation of internal liquid) by an approved outside service and the provided certificate of traceability is kept on file. The NIST thermometer(s) have increments of 1 degree (0.5 degree or less increments are required for drinking water microbiological laboratories), and have ranges applicable to method and certification requirements. The NIST traceable thermometer is used for no other purpose than to calibrate other thermometers.

All of this information is documented in logbooks. Monitoring method-specific temperatures, including incubators, heating blocks, water baths, and ovens, is documented in method-specific logbooks. More information on this subject can be found in the laboratory SOP No. ED-GEN-014 (Thermometer Calibration).

20.3.4 Refrigerators/Freezer Units, Waterbaths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample and standard storage are monitored each working day.

Ovens, waterbaths and incubators are monitored on days of use.

All of this equipment has a unique identification number, and is assigned a unique thermometer for monitoring.

Sample storage refrigerator temperatures are kept between > 0ºC and ≤ 6 ºC.

Specific temperature settings/ranges for other refrigerators, ovens waterbaths, and incubators can be found in method specific SOPs.

All of this information is documented in Daily Temperature Logbooks and method-specific logbooks.

20.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware) are given unique identification numbers and the delivery volumes are verified gravimetrically, at a minimum, on a quarterly basis.

For those dispensers that are not used for analytical measurements, a label is / can be applied to the device stating that it is not calibrated. Any device not regularly verified can not be used for any quantitative measurements. Refer to TestAmerica Edison SOP No. ED-GEN-011 (Calibration and Use of Lab Pipettes).

Micro-syringes are purchased from Hamilton Company. Each syringe is traceable to NIST. The laboratory keeps on file an "Accuracy and Precision Statement of Conformance" from Hamilton attesting established accuracy.

20.3.6 Autoclaves

The laboratory utilizes autoclaves in the sample preparation step for certain mercury analysis procedures. These autoclaves have direct reading temperature and pressure gauges. These gauges are checked for accuracy on an annual basis.

20.3.7 Field Sampling Devices (Isco Auto Samplers)

Each Auto Sampler (ISCO) is assigned a unique identification number in order to keep track of the calibration. This number is also recorded on the sampling documentation.

The Auto Sampler is calibrated as needed based on manufacturers recommendations.

20.4 Instrument Calibrations

Calibration of analytical instrumentation is essential to the production of quality data. Strict calibration procedures are followed for each method. These procedures are designed to determine and document the method detection limits, the working range of the analytical instrumentation and any fluctuations that may occur from day to day.

Sufficient raw data records are retained to allow an outside party to reconstruct all facets of the initial calibration. Records contain, but are not limited to, the following: calibration date, method, instrument, analyst(s) initials or signatures, analysis date, analytes, concentration, response, type of calibration (Avg RF, curve, or other calculations that may be used to reduce instrument responses to concentration.)

Sample results must be quantitated from the initial calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method or program.

If the initial calibration results are outside of the acceptance criteria, corrective action is performed and any affected samples are reanalyzed if possible. If the reanalysis is not possible, any data associated with an unacceptable initial calibration will be reported with appropriate data qualifiers (refer to Section 12).

Note: Instruments are calibrated initially and as needed after that and at least annually.

20.4.1 Calibration Standards

Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP. If a reference method does not specify the number of calibration standards, a minimum of 3 calibration points (exception being ICP and ICP/MS methods) will be used.

Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to national or international standards of measurement, or to national or international standard reference materials.

The lowest concentration calibration standard that is analyzed during an initial calibration must be at or below the stated reporting limit for the method based on the final volume of extract (or sample).

The other concentrations define the working range of the instrument/method or correspond to the expected range of concentrations found in actual samples that are also within the working range of the instrument/method. Results of samples not bracketed by initial instrument calibration standards (within calibration range to at least the same number of significant figures used to report the data) must be reported as having less certainty, e.g., defined qualifiers or flags (additional information may be included in the case narrative). The exception to these rules is ICP methods or other methods where the referenced method does not specify two or more standards.

All initial calibrations are verified with a standard obtained from a second source and traceable to a national standard, when available (or vendor certified different lot if a second source is not

available). For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst at a different time or a different preparation would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

20.4.1.1 Calibration Verification

The calibration relationship established during the initial calibration must be verified initially and at least daily as specified in the laboratory method SOPs in accordance with the referenced analytical methods and in the 2009 TNI Standard. The process of calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. Initial calibration verification is with a standard source secondary (second source standard) to the calibration standards, but continuing calibration verifications may use the same source standards as the calibration curve.

Note: The process of calibration verification referred to here is fundamentally different from the approach called "calibration" in some methods. As described in those methods, the calibration factors or response factors calculated during calibration are used to update the calibration factors or response factors used for sample quantitation. This approach, while employed in other EPA programs, amounts to a daily single-point calibration.

All target analytes and surrogates, including those reported as non-detects, must be included in periodic calibration verifications for purposes of retention time confirmation and to demonstrate that calibration verification criteria are being met, i.e., RPD, per 2009 TNI Std. EL-V1M4 Sec. 1.7.2.

All samples must be bracketed by periodic analyses of standards that meet the QC acceptance criteria (e.g., calibration and retention time). The frequency is found in the determinative methods or SOPs.

Note: If an internal standard calibration is being used (basically GCMS) then bracketing standards are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

Generally, the initial calibrations must be verified at the beginning of each 12-hour analytical shift during which samples are analyzed. (Some methods may specify more or less frequent verifications). The 12-hour analytical shift begins with the injection of the calibration verification standard (or the MS tuning standard in MS methods). The shift ends after the completion of the analysis of the last sample, QC, or standard that can be injected within 12 hours of the beginning of the shift.

A continuing instrument calibration verification (CCV) must be repeated at the beginning and, for methods that have quantitation by external calibration models, at the end of each analytical batch. Some methods have more frequent CCV requirements see specific SOPs. Most Inorganic methods require the CCV to be analyzed after ever 10 samples or injections, including matrix or batch QC samples.

Note: If an internal standard calibration is being used (basically GCMS) then bracketing standards are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

If the results of a CCV are outside the established acceptance criteria and analysis of a second consecutive (and immediate) CCV fails to produce results within acceptance criteria, corrective action shall be performed. Once corrective actions have been completed & documented, the laboratory shall demonstrate acceptable instrument / method performance by analyzing two consecutive CCVs, or a new initial instrument calibration shall be performed.

Sample analyses and reporting of data may not occur or continue until the analytical system is calibrated or calibration verified. However, data associated with an unacceptable calibration verification may be fully useable under the following special conditions:

a). when the acceptance criteria for the CCV are exceeded high (i.e., high bias) and the associated samples within the batch are non-detects, then those non-detects may be reported with a footnote or case narrative explaining the high bias. Otherwise the samples affected by the unacceptable CCV shall be re-analyzed after a new calibration curve has been established, evaluated and accepted; or

b). when the acceptance criteria for the CCV are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise the samples affected by the unacceptable CCV shall be re-analyzed after a new calibration curve has been established, evaluated and accepted.

Samples reported by the 2 conditions identified above will be appropriately flagged.

20.4.1.2 Verification of Linear and Non-Linear Calibrations

Calibration verification for calibrations involves the calculation of the percent drift or the percent difference of the instrument response between the initial calibration and each subsequent analysis of the verification standard. (These calculations are available in the laboratory method SOPs. Verification standards are evaluated based on the % Difference from the average CF or RF of the initial calibration or based on % Drift or % Recovery if a linear or quadratic curve is used.

Regardless of whether a linear or non-linear calibration model is used, if initial verification criterion is not met, then no sample analyses may take place until the calibration has been verified or a new initial calibration is performed that meets the specifications listed in the method SOPs. If the calibration cannot be verified after the analysis of a single verification standard, then adjust the instrument operating conditions and/or perform instrument maintenance, and analyze another aliquot of the verification standard. If the calibration cannot be verified with the second standard, then a new initial calibration is performed.

- When the acceptance criteria for the calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and acepted.

- When the acceptance criteria for the calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise, the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. Alternatively, a reporting limit standard may be analyzed to demonstrate that the laboratory can still support non-detects at their reporting limit.

20.5 Tentatively Identified Compounds (TICs) – GC/MS Analysis

For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

Note: If the TIC compound is not part of the client target analyte list but is calibrated by the laboratory and is both qualitatively and/or quantitatively identifiable, it should not be reported as a TIC. If the compound is reported on the same form as true TICs, it should be qualified and/or narrated that the reported compound is qualitatively and quantitatively (if verification in control) reported compared to a known standard that is in control (where applicable).

For example, the RCRA permit or waste delisting requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification.

20.6 GC/MS Tuning

Prior to any GCMS analytical sequence, including calibration, the instrument parameters for the tune and subsequent sample analyses within that sequence must be set.

Prior to tuning/auto-tuning the mass spec, the parameters may be adjusted within the specifications set by the manufacturer or the analytical method. These generally don't need any adjustment but it may be required based on the current instrument performance. If the tune verification does not pass it may be necessary to clean the source or perform additional maintenance. Any maintenance is documented in the maintenance log.

Table 20-1. Example: Instrumentation List

Example: Edison Laboratory Instrumentation List						
Instrument Type	**Manufacturer**	**Model**	**Purchase Date**	**Install Date**	**Autosampler**	**Method Performed**
METALS ICP	Thermo Jarrell Ash (2) S/N 356490	61E Trace	1998	Feb98	Yes	6010B, 200.7, CLP
	Thermo Jarrell Ash (3) S/N 493890	61E Trace	2000	Sep00	Yes	6010B, 200.7, CLP
	Thermo Jarrell Ash (4) S/N: ICP-20073407	ICAP 6500 Duo View	2007	Feb 09	Yes	6010B, 200.7, CLP
ICP-MS ICPMS1 Heat Exchanger Autosampler	Agilent Technologies 7500ce S/N JP51201560 PolyScience Agilent TechnologiesG1879B S/N G57335 Cetac S/N 120536A520	 G3272A 3370 ASX520	2006	May06	Yes	6020, 200.8
ICP-MS ICPMS2 Heat Exchanger Autosampler	 Agilent Technologies 7500ce S/N JP82802644 Agilent Technologies G1879B S/N 108500855 Cetac ASX-500 S/N US0808108A520	 G3272B 3370 G3286A	2010	June 2010	Yes	6020, 200.8
Mercury Analyzer	Leeman Labs (3) S/N HA-3010	Hydra AA	2003	Jan04	Yes	7471A, 7470, 245.1 CLP
	Leeman Labs (4) S/N HA-4008	Hydra AA	2004	Jun04	Yes	7471A, 7470, 245.1 CLP
Hotblock 1	Environmental Express Limited S/N 2772CEC1378	SC154	2003	2003	No	3050B, CLP
Hotblock 2	Environmental Express Limited S/N 2391CEC1273	SC154	2004	2004	No	3050B, CLP
Autoclave (Out of Service)	Steril-Matic S/N 95-2678	MEA 109-85-E	1996	1996	No	7471A
Hot Plate 1 (Out of Service)	Fischer Scientific S/N 1000132		Jan04	Jan04	No	200.7, 3010A, 3020A, CLP
Hot Plate 2 (Out of Service)	Fischer Scientific S/N 1000153		Oct04	Oct04	No	200.7, 3010A, 3020A, CLP
Hot Plate 3 (Out of Service)	Fischer Scientific S/N 1000168		Jul03	Jul03	No	200.7, 3010A, 3020A, CLP
Hot Plate 4 (Out of Service)	Fischer Scientific S/N 1000169		May05	May05	No	200.7, 3010A, 3020A, CLP
Hot Plate 5 (Out of Service)	Fischer Scientific S/N 1000170		Apr05	Apr05	No	200.7, 3010A, 3020A, CLP
Hot Plate 6 (Out of Service)	Fischer Scientific S/N 1000203		Dec04	Dec04	No	200.7, 3010A, 3020A, CLP
Hot Plate 7 (Out of Service)	Fischer Scientific S/N 1000210		Apr05	Apr05	No	200.7, 3010A, 3020A, CLP

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Hot Plate 8 (Out of Service)	Fischer Scientific S/N 1000220		Jun05	Jun05	No	200.7, 3010A, 3020A, CLP
Hotblock 3	Environmental Express Limited S/N 4298CEC2048	SC150	2004	2004	No	200.7, 3010A, 200.8, CLP
Hotblock 4	Environmental Express Limited S/N 4507CEC2115	SC150	2006	2006	No	200.7, 3010A, 200.8, CLP
Hotblock 5	Environmental Express Limited S/N 4667CEC2183	SC150	2006	2006	No	200.7, 3010A, 200.8, CLP
Hotblock 6	Environmental Express Limited S/N 4667CEC2183	SC150	2006	2006	No	200.7, 3010A, 200.8, CLP
Hotblock 7	Environmental Express Limited S/N 2772CDC1378	SC150	2006	2006	No	200.7, 3010A, 200.8, CLP
Balance # 35	Acculab 18255989		2005	2005	No	3050B, CLP
Balance # 33	Ohaus F0461200521139		2001	2001	No	7471A
Autoclave	Steril-Matic S/N 201188	STME	2002	2002	No	7471A
GC/MS Semivolatiles (BNAMS1/GC) GC MS Tower Tray Controller	Hewlett-Packard S/N 3223A43511 S/N 3118A02442 S/N 3013A21967 S/N 3249A30680 S/N 3249A30674	 5971 7673	1986	1986	Yes	**Out of Service**
(BNAMS2/GC) GC MS Tower Tray Controller	Hewlett-Packard S/N 2618A07933 S/N 3234A04110 S/N 2704A08901 S/N 2718A08680 S/N 2607A02892	 5971 7673A	1986	1986	Yes	8270C, 625, CLP
(BNAMS3/GC) GC MS Tower Tray Controller	Hewlett-Packard S/N 3140A38366 S/N 3188A02926 S/N 3266A31274 S/N 3021A21499 S/N 3138A27180	 5971 7673	1986	1986	Yes	8270C, 625, CLP
(BNAMS4/GC) GC MS Tower Tray Controller	Hewlett-Packard S/N 3108A34490 S/N 3114A02077 S/N 2546A02861 S/N 2942A20598 S/N 2803A11211	 5971A 7673A	1986	1986	Yes	8270C, 625, CLP

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
(BNAMS5/GC)	Agilent Technologies		2007	2007	Yes	8270C, 625, CLP
GC	S/N CN10726100					
MS	S/N US35120328	5975C				
Tower	S/N CN72441261	7890A				
Tray	S/N CN40427800					
Controller	S/N CN40427800					
(BNAMS6/GC)	Hewlett-Packard		1990	1990	Yes	8270C, 625, CLP
GC	S/N 3336A54722					
MS	S/N 3234A04274	5971				
Tower	S/N 2843A13155	7673				
Tray	S/N 2933A11253					
Controller	S/N 3018A21811					
(BNAMS7/GC)	Hewlett-Packard		1990	1990	Yes	**Out of Service**
GC	S/N 3235A45833					
MS	S/N 3307A00368	5972				
Tower	S/N 2546602130	7673A				
Tray	S/N 2633A02968					
Controller	S/N 2511A01985					
(BNAMS8/GC)	Hewlett-Packard		1990	1990	Yes	**Out of Service**
GC	S/N 336A56444					
MS	S/N 3435A01857	5972				
Tower	S/N C11144007149	A0C-20i				
Tray	S/N C11154103496					
Controller	S/N 626059SA					
(BNAMS9/GC)	Agilent Technologies		2004	2004	Yes	8270C, 625, CLP
GC	S/N CN10349071					
MS	S/N US35120328	5973				
Tower	S/N CN35134357	7683				
Tray	S/N CN40427800					
Controller	S/N CN40427800					
(BNAMS10/GC)	Agilent Technologies		2004	2004	Yes	8270C, 625, CLP
GC	S/N CN10403063					
MS	S/N US35120373	5973				
Tower	S/N CN40334758	7683				
Tray	S/N CN40327770					
Controller	S/N CN40327770					
(BNAMS11/GC)	Agilent Technologies		2007	2007	Yes	8270C, 625, CLP
GC	S/N CN10727109					
MS	S/N US71236621	5975C				
Tower	S/N CN35134357	7890A				
Tray	S/N CN72441255					
Controller						

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
BNAGC2	Hewlett-Packard		1986	1986	Yes	**Out of Service**
GC	S/N 3336A55994	5890 II				
Tower 1	S/N 3004A20530	7673				
Tower 2	S/N 3613A21129					
Tray	S/N 3021A21938					
Controller	S/N 3244A30371					
BNAGC8	Hewlett-Packard		1986	1986	Yes	Screen
GC	S/N 3121A35833	5890				
Tower 1	S/N 2704805765	7673A				
Tray	S/N 3131A25914					
Controller	S/N 2921A03449					
Manifold			10/29/04	11/1/04	No	
Gases	Western Enterprise 28452	Innovator HBAC2-5-4				
GC/MS Volatiles					Yes	8260, 624, CLP, 524.2
	Agilent	5975	Feb06	Jul06		
VOAMS1	S/N US60532504					
	Agilent	6890N	Feb06	Jul06		
GC	S/N CN10606023					
	OI	4551A	Feb06	Jul06		
Autosampler	S/N D60345B194					
	OI	4660	Feb06	Jul06		
Concentrator	S/N D608466853					
	OI	SAM	Feb06	Jul06		
Spiker	S/N E610475713					
VOAMS2	Hewlett-Packard	5975C	2008	2008	Yes	8260, 624, CLP,
	S/N US80838709					
GC	Hewlett-Packard	7890A	2008	2008		
	S/N CN10813013					
Autosampler	EST	Archon 51	2008	2008		
	S/N 15264					
Concentrator	EST	Encon Evolution	2008	2008		
	S/N 104041408					
VOAMS3	Agilent	5973inert	Feb04	Aug04	Yes	8260B, 624, CLP, 524.2
	S/N US35120382					
GC	Agilent	6890N	Feb04	Aug04		
	S/N CN10406105					
Autosampler	EST	Centurion	Jun04	Aug04		
	S/N CENT140051304					
Concentrator A	EST	Encon	May04	Aug04		
	S/N 367060704					
Concentrator B	EST	Encon	May04	Aug04		
	S/N 368060704					

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
VOAMS4	Hewlett-Packard S/N US80838712	5975C	2008	2008	Yes	8260, 624, CLP,
GC	Hewlett-Packard S/N CN10813014	7890A	2008	2008		
Autosampler 1	OI S/N 15266	4552	2008	2008		
Concentrator	OI S/N D809466076	2008	2008	2008		
VOAMS5	Hewlett-Packard S/N 3234A04198	5971	1996	1996	Yes	8260B, 624, CLP, 524.2
GC	Hewlett-Packard S/N 3033A33368	5890 II	1996	1996		
Autosampler	Archon S/N 11957-696A	5100A	1996	1996		
Concentrator	OI S/N D310219	4560	1996	1996		
VOAMS6	Agilent VOAMS6 S/N US35120322	5973inert	Feb04	Apr04	Yes	624, 524.2, CLP
GC	Agilent S/N CN10406076	6890N	Feb04	Apr04		
Autosampler	OI S/N D54645B461	4551A	Nov05	Dec05		
Concentrator	OI S/N D548466579	4660	Nov05	Dec05		
Spiker	OI S/N C425475656	SAM	Jun04	Jul04		
VOAMS7	Agilent S/N US43110514	5973inert	Oct 04	Nov 04	Yes	624, 524.2,8260 CLP
GC	Agilent S/N CN10437064	6890N	Oct 04	May 06		
Autosampler	Teledyne Tekmar S/N US08121007	Solatek	Tekmar swap	May 08		
Concentrator	Teledyne Tekmar S/N US08007007	Stratum	Tekmar swap	May 08		
VOAMS8	Hewlett-Packard S/N 3118A02630	5971	1998	1998	Yes	8260B, 624, CLP, 524.2
GC	Hewlett-Packard S/N 3126A36935	5890 II	1998	1998		
Autosampler	EST Archon S/N 12206	5100A	1998	1998		
Concentrator	OI S/N I418460464	4560	1998	1998		

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
VOAMS9	Hewlett-Packard	5971	1998	1998	Yes	8260B, 624, CLP, 524.2
	S/N 3118A03332					
GC	Hewlett-Packard	5890 II	1998	1998		
	S/N 3203A40292					
Autosampler	EST Archon	5100A	1998	1998		
	S/N 12207					
Concentrator	OI	4560	1998	1998		
	S/N C302089					
VOAMS10	Hewlett-Packard	5972	1997 (Whippany acquisition)	July /2000 (In Edison)	Yes	8260, 624, CLP, 524.2
	S/N 3307A00392					
GC	Hewlett-Packard	5890	Unknown	1997 (In Whippany)		
	S/N 2728414257					
Autosampler	Teledyne Tekmar	Aquatek 70	Mar06			
	S/N 94312017			May 2008		
Concentrator	Tekmar	3000	1997			
	S/N 94087010					
VOAMS11	Agilent	5973N	Jun03	Jul03	Yes	8260B, 624, CLP, 524.2
	S/N US30965664					
GC	Agilent	6890N	Jun03	Jul03		
	S/N CN10324011					
Autosampler	EST Archon	5100A	Jun03	Jul03		
	S/N 13970					
Concentrator	EST	Encon	Jun03	Jul03		
	S/N 279061703					

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
VOAMS12	Agilent S/N US43110519	5973inert	Oct04	Nov04	Yes	8260, 624, CLP, 524.2
GC	Agilent S/N CN10439051	6890N	Oct04	Jun05		
Autosampler	EST S/N 14448	Archon 5100A	May05	Jun05		
Concentrator	EST S/N 430051605	Encon	May05	Jun05		
Turbo Pump Upgrade	Agilent S/N 56115832	Performance	Jun05	Jun05		
VOAMS13	Agilent S/N US43110517	5973inert	Oct04	Nov04	Yes	8260, 624, CLP, 524.2
GC	Agilent S/N CN10439052	6890N	Oct04	Jun05		
Autosampler	EST S/N 14449	Archon 5100A	May05	Jun05		
Concentrator	EST S/N 431051605	Encon	May05	Jun05		
Turbo Pump Upgrade	Agilent S/N 56069171	Performance	Jun05	Jun05		
Balance #22	Mettler 2115517886	PB1501	1997	1997	No	8260, 8015 GRO
Balance #50	Ohaus 1125573353	Explorer Pro	2006	2006	No	8260, 8015 GRO
Balance # 103	Denver Instruments 126008		2009	2009	No	8260, 8015. GRO
Oven Drying	Fisher Isotemp Oven 502N0045	13-246-516G	2/15/2005	3/3/2005	N0	
Oven Drying	Baxter 199012	DX-1	2000	2000	No	

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
GC Volatiles					Yes	8015B (GRO)
	Agilent	6890N	Mar06	May06		
GC1	S/N US10610006					
	OI	4552	Feb06	May06		
Autosampler	S/N 14608					
	OI	4660	Feb06	May06		
Concentrator	S/N D607466340					
	OI	4551A	Feb06	May06		
Autosampler	S/N D60745B342					
	OI	4660	Feb06	May06		
Concentrator	S/N D607466341					
	OI	SAM	Feb06	May06		
Spiker	S/N E610475713					
GC2	Hewlett-Packard	5890II	1993	1993	Yes	Screening/3810
	S/N 2921A23492					
Autosampler 1	Tekmar	7050	Jun04	Jul04		
	S/N US04156005					
Headspace 1	Tekmar	7000	Jun04	Jul04		
	S/N US04156003					
Autosampler 2	Tekmar	7050	Jun04	Jul04		
	S/N US04148014					
Headspace 2	Tekmar	7000	Jun04	Jul04		
	S/N US04163001					
GC3	Hewlett-Packard	5890II	1996	1996	Yes	8015B (GRO)
	S/N 3310A49242					
PID	OI	4430	1996	1996		
	S/N 91-I107					
Autosampler	Dynatech Archon	5100	1996	1996		
	S/N 11780-795					
Concnetrator	OI	4560	1996	1996		
	S/N J437460274					
SCREEN1/2 GC	Hewlett-Packard	5890 II	1989	1989	Yes	Screening
	S/N 2950A29246					
Autosampler 1	Tekmar	7050	1989	1989		
	S/N 91025014					
Headspace 1	Tekmar	7000	1989	1989		
	S/N 91163066					
Autosampler 2	Tekmar	7050	1989	1989		
	S/N 91168012					
Headspace 2	Tekmar	7000	1989	1989		
	S/N 90255003					

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
SCREEN3/4 GC	Hewlett-Packard S/N 2908A21857	5890	1998	1998	Yes	Screening/3810
Autosampler 1	Tekmar S/N 91346013	7050	1998	1998		
Headspace 1	Tekmar S/N 91339015	7000	1998	1998		
Autosampler 2	Tekmar S/N 90256011	7050	1998	1998		
Headspace 2	Tekmar S/N 91025010	7000	1998	1998		
H-Nu PID	H-nu Systems S/N 801023	PI101	1989	1989	No	Headspace Screening
Hood Ductless Fume	Air Science P41007	PurAir15	Oct04	Nov04	No	
GC Semivolatiles BNAGC1 GC Network Injector Module Tray	Agilent Technologies S/N US10248079 S/N CN24428026 S/N CN24322270	 6890N G2613A G2614A	2003	2005	Yes	NJDEP-OQA-QAM-025
BNAGC4 GC Network Injector Module 1 Injector Module 2 Tray	Agilent Technologies S/N US10610005 S/N CN43820808 S/N CN43820804 S/N CN43830663	 6890N G2913A G2914A G2614A	Feb06	Apr06	Yes	8015B DRO/Fingerprints QAM-025
BNAGC5 GC Tower Tray Controller	Hewlett-Packard S/N 2728A14513 S/N 2704A0854 S/N 2920A10887 S/N 01866	 5890 7673	1997	1997	Yes	8015B Alcohols
BNAGC6 GC Tower 1 Tower 2 Tray Controller	Hewlett-Packard S/N 3203A40054 S/N 3120A28315 S/N 3202A27987 S/N 3228A29094 S/N 3138A27180	 5890 II 7673	1997	1997	Yes	8015B Amines
BNAGC7 GC Tower 1 Tray Controller	Hewlett-Packard S/N 2443A03923 S/N 2546A02013 S/N 2718A05293 S/N 2929A15891	 5890 7673A	1999	1999	Yes	8015B Glycols

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Pest/PCB						
	Hewlett-Packard		1992	1992	Yes	8081, CLP
GC1	S/N 2612A07669	5890A				
GC Mainframe	S/N CN22321930	G1513A				
Injector Module	S/N CN00005085	G1512A				
Controller	S/N US72101578	18596C				
Tray						
GC3	Hewlett-Packard		1992	1992	Yes	Herbicides
Series II GC	S/N 3223A42873	5890A				
Injector Module	S/N 3228A31372	18593B				
Controller	S/N 3049A23890	18594B				
Tray	S/N 3202A27453	18596B				
GC4	Hewlett-Packard		1997	1997	Yes	8081
Series II Plus GC	S/N 336A54563	5890A				
Injector Module	S/N 3013A22344	18593B				
Controller	S/N 3227A29129	18594B				
Tray	S/N 3624A42191	18596B				
GC5	Agilent Technologies		2002	2002	Yes	8081
GC Network	S/N US10226033	6890N				
Injector Module	S/N CN22025340	G2613A				
Tray	S/N CN21420543	G2614A				
GC6	Hewlett-Packard		1998	1998	Yes	608
GC Mainframe	S/N 2950A26642	5890A				
Injector Module	S/N CN13420438	G1513A				
Controller	S/N CN00004777	G1512A				
Tray	S/N US20407961	18596C				
GC7	Hewlett-Packard		1998	1998	Yes	8082
GC Mainframe	S/N 3029A29927	5890A				
Injector Module	S/N C11144007141	18593A				
Controller	S/N 626059	18594A				
Tray	S/N C11154103504	18596A				
GC8	Agilent Technologies		2000	2000	Yes	8082
GC Plus	S/N US00004463	6890				
Injector Module	S/N CN15221154	G1513A				
Controller	S/N 3631A05939	G1512A				
Tray	S/N 3050A23572	18596C				
GC9	Agilent Technologies		2001	2001	Yes	8082
GC Plus	S/N US00043694	6890				
Injector Module	S/N CN13420437	G1513A				
Controller	S/N CN00004150	G1512A				
Tray	S/N US13807350	18596C				

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
GC11 GC Plus Injector Module Controller Tray	Agilent Technologies S/N US00008746 S/N US64600228 S/N US72202100 S/N US22408138	 6890 G2513A G2512A 18596C	2003	2003	Yes	CLP
Wet Chemistry						
Spectrophotometer	HACH S/N 1205122	DR2800	2007	2007	No	365.2, 7196A, 353.2, 410.4
Spectrophotometer	HACH S/N 1204684	DR2800	2007	2007	No	365.2, 7196A, 353.2, 410.4
Spectrophotometer	HACH S/N 11204422	DR2800	2007	2007	No	7196A, USGS
Turbidimeter	HF Scientific S/N 200604033	Micro 100	2006	2006	No	180.1, SM 2130B
Ion Selective Meter	Orion S/N 006825	720A	1994	1994	No	350.1+ .2, 340.2, 150.1
Ion Selective Meter	Orion S/N 092904	720A+	2007	2007	No	350.1+ .2, 340.2, 150.1
pH Meter	Orion S/N 010005	320	2002	2002	No	Cr6+
pH Meter	Orion S/N 009986	320	2002	2002	No	350.1/4500 NH3 H
pH Meter	Orion 320 S/N 016995	320	2002	2002	No	TCLP (1311)
pH meter	Orion 320 S/N 017414	320		2009	No	4500-H B
Oven	VWR S/N 0402001	1320	2001	2001	No	2540C
Oven	VWR	1300U	2001	2001	No	2540C
Oven	VWR	1305U	2001	2001	No	2540B
Oven	Fisher	230G	1997	1997	No	2540B, 2540D
Oven (Muffle Furnace)	Fisher S/N 901N002	550-14	2002	2002	No	160.4
Oven drying	VWR	1320	2001	2001	No	
Balance #27	A&D 12315883	HR-200	2005	2005	No	Gen. chem.
Balance #29	A&D 12315872	HR-200	2005	2005	No	160.1, 160.2
Balance #26	Sartorius 3503054	1712MP8	2003	2003	No	Gen. chem.
Balance #51	Ohaus 7125010794	Scout Pro	2006	2006	No	1311 (TCLP), 3060A
Balance #100	Mettler 122423439		2006	2006	No	Lloyd Kahn (TOC)
Balance # 101	Denver Instrument 126009		2009	4/16/2009	No	Gen. chem.
Water Bath	Precision S/N 9302-112	50	1995	1995	No	7196A
Water Bath	Precision S/N 9305-024	50	1995	1995	No	7196A
Water System (Log-in)	Millipore S/N 07348-C		1990	1990	No	

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Water System (Extr. room)	Barnstead S/N 1191020210415	D11911	1995	1995	No	
FTIR	Perkin Elmer S/N 139038	1600	1991	1991	No	418.1
Printer	Epson S/N 61P107612	FX-870	2003	2003	No	418.1
Fixed IR	Buck Scientific S/N 1026	404	2004	2004	No	418.1
COD reactor	HACH S/N 980300017418	45600	2007	2007	No	410.4, 5220D
COD reactor	HACH S/N 900402268	45600	2007	2007	No	410.4, 5220D
COD reactor	HACH S/N 1202323	DRB 200	2007	2007	No	410.4, 5220D
COD reactor	HACH S/N 1209887	DRB 200	2007	2007	No	410.4, 5220D
Auto-analyzer	Lachat S/N A83000	QUICKEM 8000	1997	1997	Yes	335.3, 420.2, 353.2, 351.2, 350.1+ .2
Auto-analyzer	Lachat S/N 8300-1658	8000 Series	2000	2000	Yes	335.3, 350.1+ .2
TOC Soil Analyzer (2)	Thermo Electron Corp. S/N 20034945	Flash EA 1112 Series	2004	2004	Yes	Lloyd Kahn's method
Printer	Epson S/N 41NE28676	LQ570	1997	1997	No	415.1
TOC Analyzer	Shimadzu S/N H51104335164	TOC-VCSH	2006	2006	Yes	Lloyd Kahn's method, 415.1, 9060, 5310B
Autosampler	Shimadzu S/N H52104301656SA	ASI-V	2006	2006	Yes	415.1, 5310B, 9060
Solid Sample Module	Shimadzu S/N H52504300040NK	SSM-500A	2006	2006	Yes	Lloyd Kahn's method
BOD Meter	YSI S/N 97S0534AE	5000	1998	1998	No	405.1
Incubator	GCA Precision Scientific		1998	1998	No	405.1
Hot Plate	Fischer Scientific S/N 103N0071		2001	2001	No	365.2
Hot Plate	Corning S/N 370301092774	PC-400	2007	2007	No	1311
Hot Plate	Fischer Scientific S/N 390502148495	PC-420	2007	2007	No	Lloyd Khan Method
Hot Plate	Fischer Scientific S/N 220897070707	PC-620	2007	2007	No	351.2
Conductivity Meter	Fischer Scientific S/N AB 81209007	Accumetab30	2002	2002	No	120.1, 9050A
Vortex mixer	Thermolyne S/N 632000855604	M63215	2002	2002	No	351.2
Dishwasher	Miele Professional S/N 208479	G7783CD	2003	2003	No	Glassware
Easy-Dist Distillation	Westco S/N 1095		2003	2003	No	350.1+ .2, 420.2, 9066
Easy-Dist Distillation	Westco S/N J097		2003	2003	No	335.3, 9012A & B
Easy-Dist Distillation	Westco S/N 1063		2007	2007	No	350.1+.2, 420.2, 353.3, 9012A&B
Easy-Dist Distillation	Westco S/N 1110		2007	2007	No	353.3, 420.2, 9066
Discreet Analyzer (1)	Konelab S/N S2019177	20	2003	2003	Yes	Automated Wet Chem

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Discreet Analyzer (2)	Konelab S/N 2519236	20	2003	2003	Yes	Automated Wet Chem
Dell Computer	Dell S/N 246175		2003	2003	No	Automated Wet Chem (Konelab)
BOD Aerator	Thomas Scientific S/N 1187	DOA-P104d-AA	1998	1998	No	405.1
BOD Plus Assay Liquid Handler DO meter YSI 52	Mantech Assoc., Inc. S/N 27OC3XB215 S/N O3C0812 AM	 221 & 222 52CE	2003	2003	Yes	405.1
PC-Titration Plus Autotitrator Interface Titra-Rinse 1 Titra-Rinse 2 Buret Module 1 Buret Module 2 Titration Module	Mantech Assoc., Inc S/N MS-0H4-373 S/N MS-0G4-198 S/N MS-0G4-200 S/N MS-0H4-627 S/N MS-0H4-625 S/N MS-0B5-657	 PC-1000-102/4 PC-1000-408 PC-1000-408 PC-1104-00 PC-1104-00 PC-1300-475	2004	2004	Yes	310.1, 2320B – Alkalinity 2320B – Carbonate, Bicarbonate 4500 CO2D – Carbon Dioxide 130.2, 2340C – Hardness
Ion Chromatograph Pump #1 Pump #2 Conduct. Detector Injector & Oven 2-Ch Interface Liq. Handling #1 Liq. Handling #2 Dil. Autosampler	Metrohm Peak, Inc. S/N 04187 S/N 04197 S/N 03181 S/N 04147 S/N 04184 S/N 04154 S/N 04118 S/N 03198	 818 818 819 820 830 833 833 838	May05	May05	Yes	7199
Ion chromatograph Pump #1 Pump #2 UV-VIS Detector IC Interface Separation Center Sample Processor	Metrohm Peak, Inc. SS4818011006190 SS1818011003192 SS1153001010101 SS1830002003180 SS1820023003168 SS1838001009171	 818 818 1010 (Bischoff) 830 820 838	Feb 2010	Feb 2010	Yes	7199
Filter pump	Emerson S/N SA55-NXGTB 4142		1997		No	Sample Filtering
Filter pump	Emerson S/N G8ECX	SA55JXgtd-4144	2002	2002	No	Sample Filtering
Redox meter	VWR S/N 001149	8005	1997	1997	No	SM2580
Rotator 1	AP & R Machine & Tool S/N 222307		2003	2003	No	600/8000/CLP
Rotator 2	AP & R Machine & Tool S/N 222306		2003	2003	No	600/8000/CLP
Rotator 3	AP & R Machine & Tool S/N 222305		2003	2003	No	600/8000/CLP
Rotator 4	AP & R Machine & Tool S/N 222304		2003	2003	No	600/8000/CLP
Rotator 5	AP & R Machine & Tool S/N 222303		2003	2003	No	600/8000/CLP

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Rotator 6	AP & R Machine & Tool S/N 222302		2003	2003	No	600/8000/CLP
TCLP Extraction1 Apparatus/Timer included	Assoc. Design and Mfg. Co. S/N 1352	3740-12 BRE	1997	1997	No	1311 TCLP, ZHE
TCLP Extraction2 Apparatus/Timer included	Assoc. Design and Mfg. Co. S/N 1053	3740-12 BRE	1997	1997	No	1311 TCLP, ZHE
TCLP Extraction3 Apparatus/Timer included	Assoc. Design and Mfg. Co. S/N 1249	3740-12 BRE	1997	1997	No	1311 TCLP, ZHE
TCLP Extraction4 Apparatus/Timer included	Environmental Express Limited S/N 3384-12-473	LE 1002	May05	May05	No	1311 TCLP, ZHE
TCLP Extraction5 Apparatus/Timer included	Environmental Express Limited S/N 3384-12-472	LE 1002	May05	May05	No	1311 TCLP, ZHE
TCLP Extraction6 Apparatus/Timer included	Assoc. Design and Mfg. Co. S/N 2125	3740-12 BREII	Jul06	Sep06	No	1311 TCLP, ZHE
TCLP Extraction7 Apparatus/Timer included	Assoc. Design and Mfg. Co. S/N 2126	3740-12 BREII	Jul06	Sep06	No	1311 TCLP, ZHE
SAMPLE LOGIN						
Balance #13	Satorius S/N 50709085	LC421	1995	1995	No	composite
Balance #104	Denver Instruments S/N 126006		2009	2009	No	% Solids
Isotemp Oven 1	Fisher S/N 410B01117	637G	Mar05	Mar05	No	%Solids
Isotemp Oven 2	Fisher S/N 505N0063	637G	Jun05	Jun05	No	%Solids
ORGANIC EXTRACTIONS						
N-EVAP #1	Organomation S/N 51004	8125	2004	2004	No	600/8000/CLP
N-EVAP #2	Organomation S/N 10253	N-EVAP 112	1990	1990	No	600/8000/CLP
Water Bath #1	Fisher Scientific S/N 605021280	15-491	2005	2005	No	600/8000/CLP
Water Bath #2	Fisher Scientific S/N (204272)	15-491	2007	2007	No	600/8000/CLP
Sonicator #0 (Controller)	Tekmar SN 19606F (Asset # 36339)	TM600-2				
Sonicator #1 (Controller)	Sonic & Material, Inc. S/N 38701H (Asset #36362)	VCX 500	2006	2006	No	8000/CLP
Sonicator #2 (Controller)	Sonic & Material, Inc. S/N 38710H (Asset #36361)	VCX 500	2006	2006	No	8000/CLP

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Sonicator Horn #3	Tekmar S/N 29281	CV17	1990	1990	No	8000/CLP
Sonicator Horn #4	Tekmar S/N illegible	CV17	1990	1990	No	8000/CLP
Sonicator #5 (Controller)	Sonic & Material, Inc. S/N 41748 M+ (Asset # 36363)	VCX 500	2004	2004	No	8000/CLP
Sonicator #6 (Controller)	Sonic & Material, Inc. S/N 41755 M+(Asset # 36364)	VCX 500	2004	2004	No	8000/CLP
Sonicator Horn # 7	Sonic & Material, Inc. S/N 3353027	CV33				
Sonicator Horn # 8	Sonic & Material, Inc. S/N 3353028	CV33				
Sonicator Horn # 9	Sonic & Material, Inc. S/N 3342405	CV33				
Sonicator Horn # 10	Sonic & Material, Inc. S/N 3342408	CV33				
Muffle Furnace #1	Thermolyne S/N 40800875	F6010	1990	1990	No	600/8000/CLP
Muffle Furnace #2	Thermolyne S/N (warn out)	F6028C	1990	1990	No	600/8000/CLP
Large Muffle Furnace	Wilt Industries S/N 041213	210	2001	2001	No	600/8000/CLP
Dishwasher #1	Miele Professional S/N 53075564	G7783CD	2003	2003	No	608/8000/CLP
Dishwasher #2	Miele Professional S/N 53075571	G7783CD	2003	2003	No	608/8000/CLP
Vacuum Pump #1	Emerson electric MLD S/N UNL231171	5KH36KN90HX	1990	1990	No	600/8000/CLP
Vortex	Scientific Industries S/N 2-318564	6560	1995	1995	No	600/8000/CLP
Electric Mixer	Barnstead/Thermolyne S/N 125404091646		1995	1995	No	600/8000/CLP
Mini Hotplate/Stir	VWR Scientific S/N 33918-604	220	1995	1995	No	600/8000/CLP
Centrifuge #1	Sigma S/N 78646	2-5	2001	2001	No	600/8000/CLP
Centrifuge #2	Sigma S/N 78647	2-5	2001	2001	No	600/8000/CLP
Centrifuge #3 (Out of Service)	Sigma S/N 80226	2-5	2001	2001	No	600/8000/CLP
Balance # 60	Ohaus S/N 7125471186	Scout Pro	2007	2007	No	600/8000/CLP
Balance #28	A&D S/N 12315879	HR-200	2005	2005	No	600/8000/CLP

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Balance #30	A&D S/N 12315880	HR-200	2005	2005	No	600/8000/CLP
Soxtherm 1 Controller Chiller	OI Analytical S/N 4012358 S/N 4012351 S/N 10200022	Type 07-5101	2002	2002	No	8000
Soxtherm 2 Controller Chiller	OI Analytical S/N 4010018 S/N 4010088 S/N 10200022	Type 07-5101	2002	2002	No	8000
Soxtherm 3 Controller Chiller	OI Analytical S/N 4012359 S/N 4002805 S/N 10365037	Type 07-5101	2002	2002	No	8000
Soxtherm 4 Controller Chiller	OI Analytical S/N 429023 S/N 4022012 S/N 101365037	Type 07-5101	2002	2002	No	8000
Soxtherm 5 Controller Chiller	Gerhardt S/N 4073032 S/N 4051753 S/N 107344070 (Thermo)	SOX 416	2007	2007	No	8000
Soxtherm 6 Controller Chiller	Gerhardt S/N 4073033 S/N 4051753 S/N 107344070 (Thermo)	SOX 416	2007	2007	No	8000
Soxtherm 7 Controller Chiller	Gerhardt S/N 4073030 S/N 4051753 S/N 107344069 (Thermo)	SOX 416	2007	2007	No	8000
Soxtherm 8 Controller Chiller	Gerhardt S/N 4073031 S/N 4051753 S/N 107344069 (Thermo)	SOX 416	2007	2007	No	8000
Soxtherm 9 Controller Chiller	OI Analytical S/N 4012357 S/N 4012354 S/N 101361126	Type 07-5101	2003	2003	No	8000

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Soxtherm10 Controller Chiller	OI Analytical S/N 4010016 S/N 4012353 S/N 101361126	Type 07-5101	2003	2003	No	8000
Soxtherm11 Controller Chiller	OI Analytical S/N 4012356 S/N 480017 S/N 102002024	Type 07-5101	2005	2005	No	8000
Soxtherm12 Controller Chiller	OI Analytical S/N 4033530 S/N 401812 S/N 102002024	Type 07-5101	2005	2005	No	8000
Soxtherm13 Controller Chiller	Gerhardt S/N 4031667 S/N 4051747 S/N 101361121	SOX416 1177PD	2006	2006	No	8000
Soxtherm 14	Gerhardt S/N 4031666 S/N 4051747 S/N 101361121	SOX416	2006	2006	No	8000
Soxtherm 15	Gerhardt S/N 4051583 S/N 4051747 S/N 10650017 (VWR)	SOX416	2006	2006	No	8000
Soxtherm 16	Gerhardt S/N 4051582 S/N 4051747 S/N 10650017 (VWR)	SOX416	2006	2006	No	8000
Wrist Action Shaker 1	Burrell S/N	75	2003	2003	No	8151
Wrist Action Shaker 2	Labline S/N 12910443	3589	2003	2003	No	8151
Field Services pH/Temp meter	Thermo Orion 15035	250A+	2000	2000	No	pH, Temperature
Conductivity meter	HACH 21000005660	Sension 5	2002	2002	No	Conductivity
DO meter	HACH 0200001321	Sension 6	2002	2002	No	Dissolved Oxygen
DO meter	HACH 001200002352	Sension 6	2000	2000	No	Dissolved Oxygen
Turbidity meter	La Motte 0119-0997	2020	1998	1998	No	Turbidity
Turbidity meter	La Motte 3897-5102	2020	2002	2002	No	Turbidity

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Turbidity meter	LaMotte 3649-3802	2020	2002	2002	No	Turbidity
pH/ORP meter	Cole Parmer 643409	05669-20			No	pH, Oxidation reduction
pH/ORP meter	HACH 31100003358	Sension 1	2005	2005	No	pH, Oxidation reduction
Cond./Salinity/ TDS meter	HACH 30500006215	Sension 5			No	Conductivity, Salinity, TDS
pH/ ORP meter	HACH 050400020239	Sension 1	2005	2005	No	pH, Oxidation reduction
pH/ ORP meter	HACH 050400022762	Sension 1	2005	2005	No	pH, Oxidation reduction
Cond./Salinity/ TDS meter	HACH 050300013668	Sension 5	2005	2005	No	Conductivity, Salinity, TDS
Cond./Salinity/ TDS meter	YSI 93L12159	33			No	Conductivity, Salinity, TDS
Turbidity meter	LaMotte ME 10036	2020e	2005	2005	No	Turbidity
Turbidity meter	LaMotte ME 10117	2020e	2005	2005	No	Turbidity
Cond./Salinity/ TDS meter	HACH 050506C50148	Sension 5	2005	2005	No	Conductivity, Salinity, TDS
DO meter	HACH 050500C60212	Sension 6	2005	2005	No	Dissolved oxygen
DO meter	HACH 050500C60066	Sension 6	2005	2005	No	Dissolved oxygen
pH/ ORP meter	HACH 050600C10445	Sension 1	2005	2005	No	pH, Oxidation reduction
pH/ ORP meter	HACH 4030004162	Sension 1	2005	2005	No	pH, Oxidation reduction
DO meter	Hach 040800001267		2006	2006	No	Dissolved Oxygen
Conductivity meter	Hach 050100002708		2006	2006	No	Conductivity
DO meter	Hach 040700001191		2006	2006	No	Dissolved Oxygen
pH/ mV meter	Hach 040200003831		2006	2006	No	pH, mV
Conductivity meter	Hach 050100002707		2006	2006	No	Conductivity
DO meter	Hach 030500007618		2006	2006	No	Dissolved Oxygen
pH/ mV	Hach 041200004666		2006	2006	No	pH, mV
Turbidity meter	LaMotte 4969-1604		2006	2006	No	Turbidity
Turbidity meter	LaMotte 4943-1604		2006	2006	No	Turbidity
Turbidity meter	LaMotte 1909-2900		2006	2006	No	Turbidity
pH/mV meter	Hach 041200002902		2006	2006	No	pH, mV
pH/mV meter E-019	Hach 41200002933	Sension 1	2006	2006	No	pH, mV
Conductivity meter E-027	Hach 050500C50193	Sension 5	2006	2006	No	Conductivity
pH meter E-028	Hach 040800010007	Sension 1	2006	2006	No	pH meter

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
pH/mV meter M-039	Hach 0804C410063	Sension 1				pH/ORP
pH/mV meter M-034	Hach 06070C710134	Sension 1	Oct06	Oct06	No	pH/ORP
Conductivity meter M-028	Hach 050500C50288	Sension 5	Aug05	Aug05	No	Conductivity
DO meter M-032	Hach 05070C360249	Sension 6	Nov06	Nov06	No	DO
pH/mV meter M-036	Hach 07080C710259	Sension 1	Oct07	Oct07	No	pH/ORP
pH/mV meter M-030	Hach 050600C10468	Sension 1	Aug05	Aug05	No	pH/ORP
pH/mV meter M-037	Hach 08020c110145	Sension 1	Mar08	Mar08	No	pH/ORP
DO meter E-030	Hach 07120C260018	Sension 6	2008	2008	No	DO
pH E-031	Thermo Orion 018168	Model 230			No	pH
pH/ORP E-029	Hach 07070C610178	Sension1	2008	2008	No	pH/ORP
DO E-032	YSI 01F0708AA	55/25 FT			No	DO
pH E-033	Thermo Orion 017788	Model 230A			No	pH
pH E-034	Thermo Orion 017630	Model 230A			No	pH
Chlorine meter CL-007	Hach 040200011290	Pocket Colorimeter II	2006	2006	No	330.5, SM 18th 4500 Cl G
Chlorine meter CL-002	Hach 020100174404	Pocket Colorimeter	2006	2006	No	330.5, SM 18th 4500 Cl G
Chlorine meter CL-003	Hach 040200011345	Pocket Colorimeter II	2006	2006	No	330.5, SM 18th 4500 Cl G
Chlorine meter CL-004	Hach 961200102549	Pocket Colorimeter	2006	2006	No	330.5, SM 18th 4500 Cl G
Chlorine meter CL-006	Hach 030400034505	Pocket Colorimeter	2005			
Chlorine meter CL-005	Hach 020100174252	Pocket Colorimeter	2006			
Chlorine meter CL-008	Hach 4796-4900	Colorimeter 1200				
Colorimeter M-040	Hach 041050031426	48450-60 DR/850			No	
Water level meter	Solonist S/N 37993		Jan05	Feb05	No	
Water level meter	Solonist S/N 37995		Jan05	Feb05	No	
Water level meter	Solonist S/N 42807		Jan06	Jan06	No	
Water level meter	Fisher				No	
PID meter	RAE Systems S/N 110-010953	PGM-7600	May05	May05	No	
PID meter	RAE Systems S/N 110-010984	Mini RAE 2000	May05	May05	No	
PID meter	RAE Systems S/N 110-01094	Mini Rae 2000	May05	May05	No	
PID meter	RAE Systems S/N 103958	Plus Classic	Jan05	Jan05	No	

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
PID meter	PE Photovac S/N DQGD302	2020			No	
Comp sampler	ISCO S/N 205C01376	603704001-3700	May05	May05	Yes	
Comp sampler	ISCO S/N 205C01380	603704001-3700	May05	May05	Yes	
Comp sampler	ISCO S/N 204G00984	3700			Yes	
Comp sampler	ISCO S/N 05248-001	2700			Yes	
Comp sampler	ISCO	2700			Yes	
Comp sampler	ISCO	2700			Yes	
Comp sampler	ISCO	2700			Yes	
Submersible pump	Grundfos S/N 05141-8349	MP1 / 1A106003	May05	May05	No	
Submersible pump	Grundfos S/N 05141-8361	MP1 / 1A106003	May05	May05	No	
Submersible pump	Grundfos S/N 0621-0014	A1A106003P1	Jul06	Jul06	No	
Submersible pump	Grundfos S/N 06029591				No	
Submersible pump	Grundfos S/N 98490294				No	
Submersible pump	Grundfos				No	
Submersible pump	Grundfos				No	
Submersible pump	Grundfos				No	
Submersible pump	Proactive S/N 1371	SS Monsoon	July06	Jul06	No	
Pump control box	Grundfos S/N H0412210120	91126028	May05	May05	No	
Pump control box	Grundfos S/N H0412210120	91126028	May05	May05	No	
Pump control box	Grundfos S/N P1940304254		May05	May05	No	
Pump control box	Grundfos S/N 203831		May05	May05	No	
Pump control box	Grundfos S/N H0303130012		May05	May05	No	
Pump control box	Grundfos S/N 9517		May05	May05	No	
Pump control box	Grundfos		May05	May05	No	
Pump control box	ProActive	Low-flow with power booster	Jul06	Jul06	No	
Trash pump	North Star S/N E06	10633	2007	2007	No	
Generator	Honda S/N EB-3000C	EZGP-1145763	May05	May05	No	
Generator	Honda S/N EB-3000C	EZGP-1151238	Jun05	Jun05	No	
Generator	Honda S/N EZGL1002930	EB-3000C	2005	2005	No	
Generator	Honda				No	

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Generator	Honda				No	
Control Pack	QED S/N MP15-1300	MP-15	May05	May05	No	
Control Pack	QED S/N MP15-1297	MP-15	May05	May05	No	
Control Pack	QED S/N MP15-1298	MP-15	May05	May05	No	
Control Pack	QED S/N MP15-1299	MP-15	May05	May05	No	
Control Pack	QED	MP-15	May05	May05	No	
Control Pack	QED	MP-15	May05	May05	No	
Control Pack	QED	MP-15	May05	May05	No	
Control Pack	QED	MP-15	May05	May05	No	
Control Pack	QED	MP-15	May05	May05	No	
Bladder Pump	QED S/N 10993	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED S/N 10997	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED S/N 10995	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED S/N 10996	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED S/N 11191	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED S/N 11192	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED 11512	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED 10948	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED 10949	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED	MP-SPK-4P	May05	May05	No	
Bladder Pump	QED	MP-SPK-4P			No	
Bladder Pump	QED	MP-SPK-4P			No	
Peristaltic Pump	Solonist S/N 002562	410			No	
Peristaltic Pump	Solonist S/N 002071	410			No	
Peristaltic Pump	Solonist S/N 001979	410			No	
Peristaltic Pump	Solonist S/N 002642	410			No	
Peristaltic Pump	ISCO	Accuwell 150 portable pump			No	
Peristaltic Pump	ISCO	Accuwell 150 portable pump			No	
Peristaltic Pump	ISCO	Accuwell 150 portable pump			No	
Peristaltic Pump	ISCO	Accuwell 150 portable pump			No	

Example: Edison Laboratory Instrumentation List

Instrument Type	Manufacturer	Model	Purchase Date	Install Date	Autosampler	Method Performed
Peristaltic Pump	ISCO	Accuwell 150 portable pump			No	
Peristaltic Pump	ISCO	Accuwell 150 portable pump			No	
Centrifugal Pump	Teel S/N 3021	2P110B			No	
Centrifugal Pump	Teel S/N 0036	2P110B			No	
Centrifugal Pump	Teel S/N 0034	2P110B			No	
Centrifugal Pump	Teel S/N 1962	2P110B			No	
Centrifugal Pump	Teel	2P110B			No	
Compressor	Coleman / Honda S/N D02812339	CT5090412	Jun05	Jun05	No	
Compressor	Honda/Campbell Hausfeld S/N VT697203AJ				No	
Multi-probe meter YSI-1	YSI S/N 06F1362AC	556 MPS	Jul06	Jul06	No	
GPS	Ashtech 10564	110454-01			No	
Oil/Water Interface probe	Testwell					
Oil/Water Interface probe	Testwell					
Oil/Water interface Probe	Solonist 122-008699-1	122	Sept07	Sept07	No	
Oil/Water interface probe	Solonist S/N 122 007364-1		Aug06	Aug06	No	

Table 21-2. Example: Schedule of Routine Maintenance

Instrument	Procedure	Frequency
Leeman Mercury Analyzer	Check tubing for wear Fill rinse tank with 10% HCl Change dryer tube Fill reductant bottle with 10% Stannous Chloride	Daily Daily As needed Daily
ICP	Check pump tubing Check liquid argon supply Check fluid level in waste container Check filters Clean or replace filters Check torch Check sample spray chamber for debris Clean and align nebulizer Check entrance slit for debris Change printer ribbon Replace pump tubing	Daily Daily Daily Weekly As required Daily Monthly Monthly Monthly As required As required
ICP MS	Change pump tubing Clean torch Check / clean nebulizer Clean cones Check air filters Check multiplier voltages & do cross calibration Replace sample uptake tubing Check rotary pump oil Check oil mist filters Check chiller water level	Weekly or As required Weekly or As required Weekly or As required Weekly or As required Weekly or As required Weekly or As required Weekly or As required Weekly or As required Monthly Monthly
UV-Vis Spectrophotometer	Clean ambient flow cell Precision check/alignment of flow cell Wavelength verification check	As required As required Semi-annually
Auto Analyzers	Clean sampler Check all tubing Clean inside of colorimeter Clean pump well and pump rollers Clean wash fluid receptacle Oil rollers/chains/side rails Clean optics and cells	Daily Daily Daily Quarterly Weekly Weekly Quarterly
Gas Chromatograph/Mass Spectrometer (GC/MS)	Ion gauge tube degassing Pump oil-level check Pump oil changing Analyzer bake-out Analyzer cleaning Resolution adjustment COMPUTER SYSTEM AND PRINTER: Air filter cleaning Change data system air filter Printer head carriage lubrication Paper sprocket cleaning Drive belt lubrication	As required Monthly Annually As required As required As required As required As required As required As required As required

Table 21-2. Example: Schedule of Routine Maintenance

Instrument	Procedure	Frequency
Gas Chromatograph	Compare standard response to previous day or since last initial calibration	Daily
	Check carrier gas flow rate in column	Daily via use of known compound retention
	Check temp. of detector, inlet, column oven	Daily
	Septum replacement	As required
	Glass wool replacement	As required
	Check system for gas leaks with SNOOP	W/cylinder change as required
	Check for loose/frayed wires and insulation	Monthly
	Bake injector/column	As Required
	Change/remove sections of guard column	As Required
	Replace connectors/liners	As Required
	Change/replace column(s)	As Required
Electron Capture Detector (ECD)	Detector wipe test (Ni-63)	Semi-annually
	Detector cleaning	As required
Flame Ionization Detector (FID)	Detector cleaning	As required
Photoionization Detector (PID)	Change O-rings	As required
	Clean lamp window	As required
HPLC	Change guard columns	As required
	Change lamps	As required
	Change pump seals	Semi-annually or as required
	Replace tubing	As required
	Change fuses in power supply	As required
	Filter all samples	Daily
	Change autosampler rotor/stator	As required
Balances	Class “S” traceable weight check	Daily, when used
	Clean pan and check if level	Daily
	Field service	At least Annually
Conductivity Meter	0.01M KCl calibration	Daily
	Conductivity cell cleaning	As required
Turbidimeter	Check light bulb	Daily, when used
Deionized/Distilled Water	Daily conductivity check	Daily
	Check deionizer light	Daily
	Monitor for VOA’s	Daily
	System cleaning	As required
	Replace cartridge & large mixed bed resins	As required
Drying Ovens	Temperature monitoring	Daily
	Temperature adjustments	As required
Refrigerators/ Freezers	Temperature monitoring	Daily
	Temperature adjustment	As required
	Defrosting/cleaning	As required
Vacuum Pumps/ Air Compressor	Drained	Weekly
	Belts checked	Monthly
	Lubricated	Semi-annually
pH/Specific Ion Meter	Calibration/check slope	Daily
	Clean electrode	As required

Table 21-2. Example: Schedule of Routine Maintenance

Instrument	Procedure	Frequency
BOD Incubator	Temperature monitoring Coil and incubator cleaning	Daily Monthly
Centrifuge	Check brushes and bearings	Every 6 months or as needed
Water baths	Temperature monitoring Water replaced	Daily Monthly or as needed

SECTION 21. MEASUREMENT TRACEABILITY

21.1 Overview

Traceability of measurements shall be assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration is not necessarily documented in a test method analysis or by analysis of a reference standard shall be subject to ongoing certifications of accuracy. At a minimum, these must include procedures for checking specifications of ancillary equipment: balances, thermometers, temperature, Deionized (DI) and Reverse Osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. (Refer to Section 20.3). With the exception of Class A Glassware and glass microliter syringes, quarterly accuracy checks are performed for all mechanical volumetric devices. Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. Class A Glassware and glass microliter syringes should be routinely inspected for chips, acid etching or deformity (e.g., bent needle). If the Class A glassware or syringe is suspect, the accuracy of the glassware will be assessed prior to use.

21.2 NIST-Traceable Weights and Thermometers

Reference standards of measurement shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

For NIST-traceable weights and thermometers, the laboratory requires that all calibrations be conducted by a calibration laboratory accredited by A2LA, NVLAP (National Voluntary Laboratory Accreditation Program), APLAC (Asia-Pacific Laboratory Accreditation Cooperation), or EA (European Cooperation for Accreditation). A certificate and scope of accreditation is kept on file at the laboratory.

21.3 Reference Standards / Materials

Reference standards/materials, where commercially available, are traceable to certified reference materials. Commercially prepared standard materials are purchased from vendors accredited by A2LA or NVLAP with an accompanying Certificate of Analysis that documents the standard purity. If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. The receipt of all reference standards must be documented. Reference standards are labeled with a unique Standard Identification Number and expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

All reference, primary and working standards/materials, whether commercially purchased or laboratory prepared, must be checked regularly to ensure that the variability of the standard or material from the ‘true’ value does not exceed method requirements. The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a vendor certified different lot is acceptable for use as a second source. For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or LCS (where

there is no sample preparation) is used as the second source confirmation. These checks are generally performed as an integral part of the analysis method (e.g. calibration checks, laboratory control samples).

All standards and materials must be stored and handled according to method or manufacturer's requirements in order to prevent contamination or deterioration. Refer to the Corporate Environmental Health & Safety Manual or laboratory SOPs. For safety requirements, please refer to method SOPs and the laboratory Environmental Health and Safety Manual.

Standards and reference materials shall not be used after their expiration dates unless their reliability is verified by the laboratory and their use is approved by the Quality Assurance Manager. The laboratory must have documented contingency procedures for re-verifying expired standards.

21.4 Documentation and Labeling of Standards, Reagents, and Reference Materials

Reagents must be at a minimum the purity required in the test method. The date of reagent receipt and the expiration date are documented. The lots for most of the common solvents and acids are tested for acceptability prior to company wide purchase. [Refer to TestAmerica's Corporate SOP (CA-Q-S-001), Solvent and Acid Lot Testing and Approval.]

All manufacturer or vendor supplied Certificate of Analysis or Purity must be retained, stored appropriately, and readily available for use and inspection. These records are maintained in the applicable analytical Departments. Records must be kept of the date of receipt and date of expiration of standards, reagents and reference materials. In addition, records of preparation of laboratory standards, reagents, and reference materials must be retained, stored appropriately, and be readily available for use and inspection. For detailed information on documentation and labeling, please refer to method specific SOPs.

Commercial materials purchased for preparation of calibration solutions, spike solutions, etc.., are usually accompanied with an assay certificate or the purity is noted on the label. If the assay purity is 96% or better, the weight provided by the vendor may be used without correction. If the assay purity is less than 96% a correction will be made to concentrations applied to solutions prepared from the stock commercial material.

21.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into the laboratory's LIMS system, and are assigned a unique identification number. The following information is typically recorded in the electronic database within the LIMS.

- Standard ID
- Description of Standard
- Department
- Preparer's name
- Final volume and number of vials prepared
- Solvent type and lot number
- Preparation Date

- Expiration Date
- Standard source type (stock or daughter)
- Standard type (spike, surrogate, other)
- Parent standard ID (if applicable)
- Parent Standard Analyte Concentration (if applicable)
- Parent Standard Amount used (if applicable)
- Component Analytes
- Final concentration of each analyte
- Comment box (text field)

Records are maintained (either electronically or hard-copy) for standard and reference material preparation. These records show the traceability to purchased stocks or neat compounds. These records also include method of preparation, date of preparation, expiration date and preparer's name or initials. Preparation procedures are provided in the Method SOPs.

21.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

- Expiration Date (include prep date for reagents)
- Standard ID (***Specify from LIMS or logbook***)
- Special Health/Safety warnings if applicable

Records must also be maintained of the date of receipt for commercially purchased items or date of preparation for laboratory prepared items. Special Health/Safety warnings must also be available to the analyst. This information is maintained by the facility Environmental Health and Safety Coordinator.

21.4.3 In addition, the following information may be helpful:

- Date opened (for multi-use containers, if applicable)
- Description of standard (if different from manufacturer's label or if standard was prepared in the laboratory)
- Recommended Storage Conditions
- Concentration (if applicable)
- Initials of analyst preparing standard or opening container

All containers of prepared reagents must include an expiration date and an ID number to trace back to preparation.

Procedures for preparation of reagents can be found in the Method SOPs.

Standard ID numbers must be traceable through associated logbooks, worksheets and raw data.

All reagents and standards must be stored in accordance to the following priority: 1) with the manufacturer's recommendations; 2) with requirements in the specific analytical methods as specified in the laboratory SOP.

SECTION 22. SAMPLING

22.1 Overview

The laboratory provides the following sampling and field services. Sampling procedures are described in the following SOPs as applicable:

- Groundwater Sampling (TestAmerica Edison SOP #s ED-FLD-008 and ED-FLD-009)
- Wastewater Sampling (TestAmerica Edison SOP # ED-FLD-014)
- Potable Sampling
- Waste Sampling
- Soil and Sediment Sampling
- Flow Monitoring (TestAmerica Edison SOP #s ED-FLD-008 and ED-FLD-009)
- Field Parameter Analysis (TestAmerica Edison SOPs ED-FLD-001 thru ED-FLD-007, ED-FLD-010)
- Cleaning and Decontamination of Field Equipment (see individual SOPs listed above and TestAmerica Edison SOP# ED-GEN-013)

22.2 Sampling Containers

The laboratory offers clean sampling containers for use by clients. These containers are obtained from reputable container manufacturers and meet EPA specifications as required. Any certificates of cleanliness that are provided by the supplier are maintained at the laboratory.

22.2.1 Preservatives

Upon request, preservatives are provided to the client in pre-cleaned sampling containers. In some cases containers may be purchased pre-preserved from the container supplier. Whether prepared by the laboratory or bought pre-preserved, the grades of the preservatives are at a minimum:

- Hydrochloric Acid – Reagent ACS (Certified VOA Free) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – Instra-Analyzed or equivalent
- Sodium Bisulfate – ACS Grade or equivalent
- Sodium Hydroxide – Instra-Analyzed or equivalent
- Sulfuric Acid – Instra-Analyzed or equivalent
- Sodium Thiosulfate – ACS Grade or equivalent

22.3 Definition of Holding Time

The date and time of sampling documented on the COC form establishes the day and time zero. As a general rule, when the maximum allowable holding time is expressed in “days” (e.g., 14 days, 28 days), the holding time is based on calendar day measured. Holding times expressed

in “hours” (e.g., 6 hours, 24 hours, etc.) are measured from date and time zero. The first day of holding time ends twenty-four hours after sampling. Holding times for analysis include any necessary reanalysis. However, there are some programs that determine holding time compliance based on the date and specific time of analysis compared to the time of sampling regardless of how long the holding time is.

22.4 Sampling Containers, Preservation Requirements, Holding Times

The preservation and holding time criteria specified in the laboratory SOPs are derived from the source documents for the methods. If method required holding times or preservation requirements are not met, the reports will be qualified using a flag, footnote or case narrative. As soon as possible or “ASAP” is an EPA designation for tests for which rapid analysis is advised, but for which neither EPA nor the laboratory have a basis for a holding time.

22.5 Sample Aliquots / Subsampling

Taking a representative sub-sample from a container is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need consideration when sub-sampling for sample preparation. It is the laboratory’s responsibility to take a representative subsample or aliquot of the sample provided for analysis.

Analysts should handle each sample as if it is potentially dangerous. At a minimum, safety glasses, gloves, and lab coats must be worn when preparing aliquots for analysis.

Guidelines on taking sample aliquots & subsampling are located SOP No. ED-GEN-007 (Subsampling).

SECTION 23. HANDLING OF SAMPLES

Sample management procedures at the laboratory ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

23.1 Chain of Custody (COC)

The COC form is the written documented history of any sample and is initiated when bottles are sent to the field, or at the time of sampling. This form is completed by the sampling personnel and accompanies the samples to the laboratory where it is received and stored under the laboratory’s custody. The purpose of the COC form is to provide a legal written record of the handling of samples from the time of collection until they are received at the laboratory. It also serves as the primary written request for analyses from the client to the laboratory. The COC form acts as a purchase order for analytical services when no other contractual agreement is in effect. An example of a COC form may be found in Figure 23-1.

23.1.1 Field Documentation

The information the sampler needs to provide at the time of sampling on the container label is:

- Sample identification

- Date and time
- Preservative

During the sampling process, the COC form is completed and must be legible (see Figure 23-1). This form includes information such as:

- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling
- Sample collectors name
- The matrix description
- The container description
- The total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)
- Any special instructions
- Purchase Order number or billing information (e.g. quote number) if available
- The date and time that each person received or relinquished the sample(s), including their signed name.

When the sampling personnel deliver the samples directly to TestAmerica personnel, The samples are stored in a cooler with ice, as applicable, and remain solely in the possession of the client's field technician until the samples are delivered to the laboratory personnel. The sample collector must assure that each container is in his/her physical possession or in his/her view at all times, or stored in such a place and manner to preclude tampering. The field technician relinquishes the samples in writing on the COC form to the sample control personnel at the laboratory or to a TestAmerica courier. When sampling personnel deliver the samples through a common carrier (Fed-Ex, UPS), the CoC relinquished date/time is completed by the field personnel and samples are released to the carrier. Samples are only considered to be received by lab when personnel at the fixed laboratory facility have physical contact with the samples.

Note: Independent couriers are not required to sign the COC form. The COC is usually kept in the sealed sample cooler. The receipt from the courier is stored in log-in by date; it lists all receipts each date.

23.1.2 Legal / Evidentiary Chain-of-Custody

The laboratory may, upon special request, adhere to legal/evidentiary chain of custody requirements. If TestAmerica agrees to such procedures the samples are identified for legal/evidentiary purposes on the COC, login will complete the custody seal retain the shipping record with the COC, and initiate an internal COC for laboratory use by analysts and a sample disposal record.

23.2 Sample Receipt

Samples are received at the laboratory by designated sample receiving personnel and a unique laboratory project identification number is assigned. Each sample container shall be assigned a unique sample identification number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a durable sample identification label. Sample acceptance, receipt, tracking and storage procedures are summarized in the following sections.

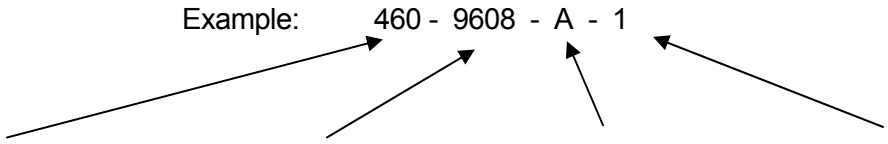
23.2.1 Laboratory Receipt

When samples arrive at the laboratory, sample receiving personnel inspect the coolers and samples. The integrity of each sample must be determined by comparing sample labels or tags with the COC and by visual checks of the container for possible damage. Any non-conformance, irregularity, or compromised sample receipt must be documented via the Sample Receipt application within TALS (the laboratory LIMS) and brought to the immediate attention of the appropriate Project Manager who will, in turn, contact the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the project record.

23.2.1.1 Unique Sample Identification

All samples that are processed through the laboratory receive a unique sample identification to ensure that there can be no confusion regarding the identity of such samples at anytime. This system includes identification for all samples, subsamples and subsequent extracts and/or digestates.

The laboratory assigns a unique identification (e.g., Sample ID) code to each sample container received at the laboratory. This Primary ID is made up of the following information (consisting of 4 components):



The above example states that TestAmerica Edison Laboratory (Location 460). Login ID is 9608 (unique to a particular client/job occurrence). The container code indicates it is the first container ("A") of Sample #1.

If the primary container goes through a prep step that creates a "new" container, then the new container is considered secondary and gets another ID. An example of this being a client sample in a 1-Liter amber bottle is sent through a Liquid/Liquid Extraction and an extraction vial is created from this step. The vial would be a SECONDARY container. The secondary ID has 5 components.

Example: 460 - 9608 - A - 1 - **A** **Secondary Container Occurrence**

Example: 460-9608-A-1-A, would indicate the PRIMARY container listed above that went through a step that created the 1st occurrence of a Secondary container.

With this system, a client sample can literally be tracked throughout the laboratory in every step from receipt to disposal.

23.3 Sample Acceptance Policy

The laboratory has a written sample acceptance policy (Figure 23-2) that clearly outlines the circumstances under which samples shall be accepted or rejected. These include:

- a COC filled out completely;
- samples must be properly labeled;
- proper sample containers with adequate volume for the analysis (Sampling Guide) and necessary QC;
- samples must be preserved according to the requirements of the requested analytical method (Sampling Guide);
- sample holding times must be adhered to (Sampling Guide);
- all samples submitted for water/solid Volatile Organic analyses must have a Trip Blank submitted at the same time;
- the project manager will be notified if any sample is received in damaged condition.

Data from samples which do not meet these criteria are flagged and the nature of the variation from policy is defined.

23.3.1 After inspecting the samples, the sample receiving personnel sign and date the COC form, make any necessary notes of the samples' conditions and store them in appropriate refrigerators or storage locations.

23.3.2 Any deviations from these checks that question the suitability of the sample for analysis, or incomplete documentation as to the tests required will be resolved by consultation with the client. If the sample acceptance policy criteria are not met, the laboratory shall either:

- Retain all correspondence and/or records of communications with the client regarding the disposition of rejected samples, or

- Fully document any decision to proceed with sample analysis that does not meet sample acceptance criteria.

Once sample acceptance is verified, the samples are logged into the LIMS according SOP No. ED-SPM-001.

23.4 Sample Storage

In order to avoid deterioration, contamination or damage to a sample during storage and handling, from the time of receipt until all analyses are complete, samples are stored in refrigerators, freezers or protected locations suitable for the sample matrix. Sample containers designated for metals only analysis are stored un-refrigerated. In addition, samples to be analyzed for volatile organic parameters are stored in separate refrigerators designated for volatile organic parameters only. Samples are never to be stored with reagents, standards or materials that may create contamination.

To ensure the integrity of the samples during storage, refrigerator blanks are maintained in the volatile sample refrigerators and analyzed every two weeks.

Analysts and technicians retrieve the sample container allocated to their analysis from the designated refrigerator and place them on carts, analyze the sample, and return the remaining sample or empty container to the refrigerator from which it originally came. All unused portions of samples, including empty sample containers, are returned to the secure sample control area. All samples are kept in the refrigerators for 30 days after delivery of the final report to the client, which meets or exceeds most sample holding times. After 30 days the samples are disposed of or, upon client request moved to an sample archive area where they are stored for an additional time period agreed upon with the client or dictated by the applicable analytical program (ex. USEPA CLP).

Access to the laboratory is controlled such that sample storage need not be locked at all times unless a project specifically demands it. Samples are accessible to laboratory personnel only. Visitors to the laboratory are prohibited from entering the refrigerator and laboratory areas unless accompanied by an employee of TestAmerica.

23.5 Hazardous Samples and Foreign Soils

To minimize exposure to personnel and to avoid potential accidents, hazardous and foreign soil samples are stored in an isolated area designated for hazardous waste only.

Procedures for the handling and storage of hazardous samples is addressed in the TestAmerica Corporate Safety Manual (TestAmercia Document No. CW-E-M-001) and in TestAmerica Edison SOP No. ED-SPM-001 (Sample Receipt, Login, Identification, And Storage).

Procedures for the acceptance and handling of USDA regulated domestic and foreign soils are detailed in TestAmerica SOP No. ED-SPM-006 (Procedure for Acceptance and Handling of Regulated Domestic and Foreign Soil).

23.6 Sample Shipping

In the event that the laboratory needs to ship samples, the samples are placed in a cooler with enough ice to ensure the samples remain just above freezing and at or below 6.0°C during transit. The samples are carefully surrounded by packing material to avoid breakage (yet maintain appropriate temperature). A trip blank is enclosed for those samples requiring water/solid volatile organic analyses. The chain-of-custody form is signed by the sample control technician and attached to the shipping paperwork. Samples are generally shipped overnight express or hand-delivered by a TestAmerica courier to maintain sample integrity. All personnel involved with shipping and receiving samples must be trained to maintain the proper chain-of-

custody documentation and to keep the samples intact and on ice. The Environmental, Health and Safety Manual contains additional shipping requirements.

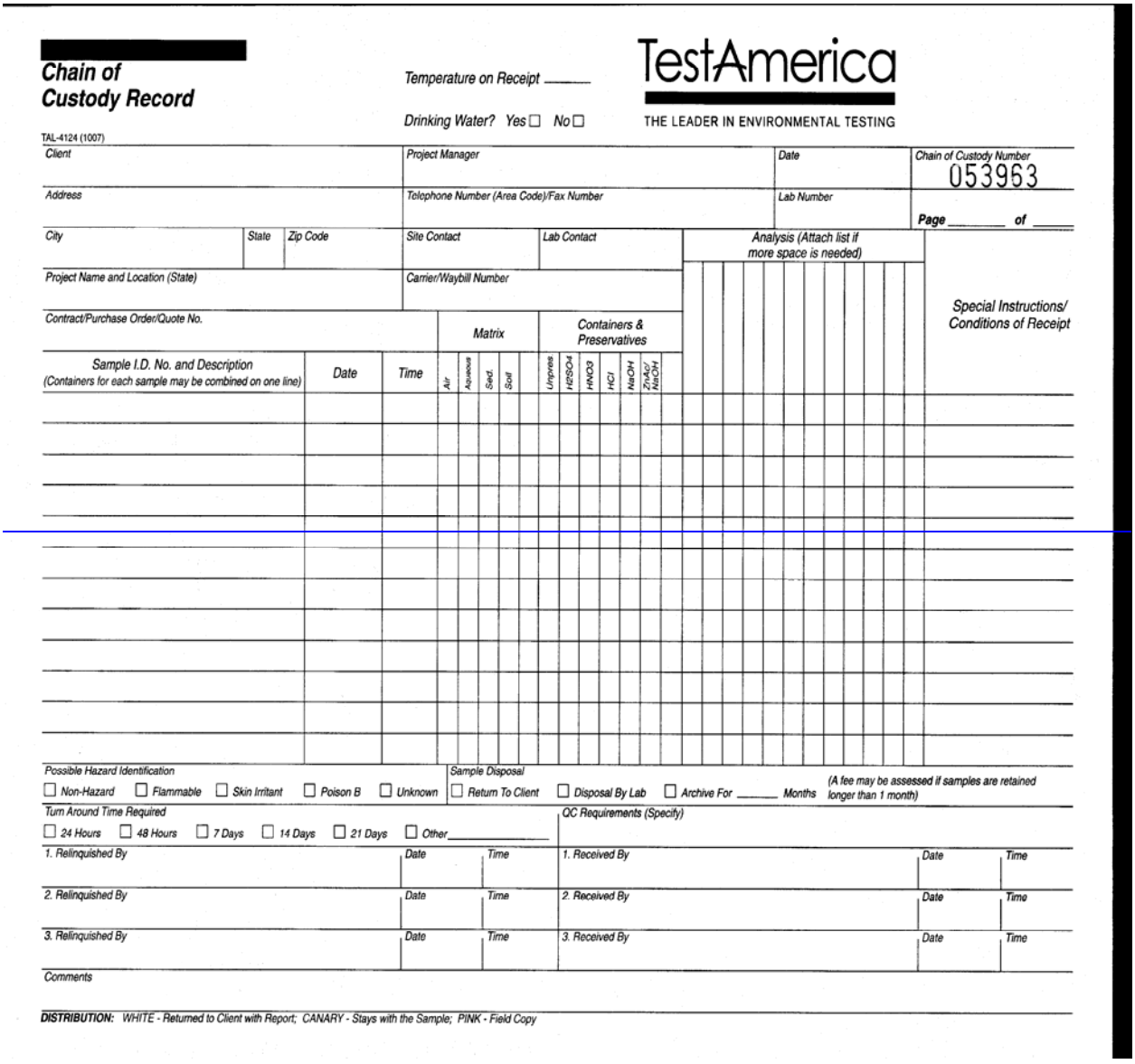
Note: If a client does not request trip blank analysis on the COC or other paperwork, the laboratory will not analyze the trip blanks that were supplied. However, in the interest of good client service, the laboratory will advise the client at the time of sample receipt that it was noted that they did not request analysis of the trip blank; and that the laboratory is providing the notification to verify that they are not inadvertently omitting a key part of regulatory compliance testing.

23.7 Sample Disposal

Samples should be retained for a minimum of 30 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after project report is sent). The laboratory must follow the longer sample retention requirements where required by regulation or client agreement. Several possibilities for sample disposal exist: the sample may be consumed completely during analysis, the sample may be returned to the customer or location of sampling for disposal, or the sample may be disposed of in accordance with the laboratory's waste disposal procedures, TestAmerica Edison SOP No. ED-SPM-007 (Disposal of Samples and Associated Laboratory Waste). All procedures in the laboratory Environmental, Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than 2 months from receipt unless otherwise requested. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

If a sample is part of a known litigation, the affected legal authority, sample data user, and/or submitter of the sample must participate in the decision about the sample's disposal. All documentation and correspondence concerning the disposal decision process must be kept on file. Pertinent information includes the date of disposal, nature of disposal (such as sample depletion, hazardous waste facility disposal, return to client), names of individuals who conducted the arrangements and physically completed the task. The laboratory will remove or deface sample labels prior to disposal unless this is accomplished through the disposal method (e.g., samples are incinerated).

Figure 24-1. Chain of Custody (COC)



Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☐

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TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number 053963
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page _____ of _____
City / State / Zip Code	Site Contact	Lab Contact	Analysis (Attach list if more space is needed)
Project Name and Location (State)	Carrier/Waybill Number		Special Instructions/ Conditions of Receipt
Contract/Purchase Order/Quote No.	Matrix	Containers & Preservatives	

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres	H_2SO_4	HNO_3	HCl	NaOH	ZnAc/ NaOH

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
(A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other_____

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Figure 23-2. Example: Sample Acceptance Policy

All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria listed below will be noted on the laboratory report defining the nature and substance of the variation. In addition the client will be notified either by telephone, fax or e-mail ASAP after the receipt of the samples.

1) Samples must arrive with labels intact with a Chain of Custody filled out completely. The following information must be recorded.
   - Client name, address, phone number and fax number (if available)
   - Project name and/or number
   - The sample identification
   - Date, time and location of sampling
   - The collectors name
   - The matrix description
   - The container description
   - The total number of each type of container
   - Preservatives used
   - Analysis requested
   - Requested turnaround time (TAT)
   - Any special instructions
   - Purchase Order number or billing information (e.g. quote number) if available
   - The date and time that each person received or relinquished the sample(s), including their signed name.
   - The date and time of receipt must be recorded between the last person to relinquish the samples and the person who receives the samples in the lab, and they must be exactly the same.
   - Information must be legible

2) Samples must be properly labeled.
   - Use durable labels (labels provided by TestAmerica are preferred)
   - Include a unique identification number
   - Include sampling date and time & sampler ID
   - Include preservative used.
   - Use indelible ink
   - Information must be legible

3) Proper sample containers with adequate volume for the analysis and necessary QC are required for each analysis requested.

4) Samples must be preserved according to the requirements of the requested analytical method.

5) Most analytical methods require chilling samples to 4° C (other than water samples for metals analysis). For these methods, the criteria are met if the samples are chilled to below 6° C and above freezing (0°C). For methods with other temperature criteria (e.g. some bacteriological methods require ≤ 10 °C), the samples must arrive within ± 2° C of the required temperature or within the method specified range. **Note:** Samples that are hand delivered to the laboratory immediately after collection may not have had time to cool sufficiently. In this case the samples will be considered acceptable as long as there is evidence that the chilling process has begun (arrival on ice).

5i.) Samples that are delivered to the laboratory on the same day they are collected may not meet the requirements of Section 5. In these cases, the samples shall be considered acceptable if the samples were received on ice.

5ii.) If sample analysis is begun within fifteen (15) minutes of collection, thermal preservation is not required.

5iii.) Thermal preservation is not required in the field if the laboratory receives and refrigerates the sample within fifteen (15) minutes of collection.

- Chemical preservation (pH) will be verified prior to analysis and documented, either in sample control or at the analyst's level. The project manager will be notified immediately if there is a discrepancy. If analyses will still be performed, all affected results will be flagged to indicate improper preservation.

- **For Volatile Organic analyses in drinking water (Methods 502.2 or 524.2**). Residual chlorine must be neutralized prior to preservation. If there is prior knowledge that the samples are not chlorinated, state it on the COC and use the VOA vials pre-preserved with HCl. The following are other options for a sampler and laboratory where the presence of chlorine is not known:

  - 1. Test for residual chlorine in the field prior to sampling.
    - If no chlorine is present, the samples are to be preserved using HCl as usual.
    - If chlorine is present, add either ascorbic acid or sodium thiosulfate prior to adding HCl.

  - 2. Use VOA vials pre-preserved with sodium thiosulfate or ascorbic acid and add HCl after filling the VOA vial with the sample.

- **FOR WATER SAMPLES TESTED FOR CYANIDE (by Standard Methods or EPA 335)**
  - In the Field: Samples are to be tested for Sulfide using lead acetate paper prior to the addition of Sodium Hydroxide (NaOH). If sulfide is present, the sample must be treated with Cadmium Chloride and filtered prior to the addition of NaOH.

    - If the sulfide test and treatment is not performed in the field, the lab will test the samples for sulfide using lead acetate paper at the time of receipt and if sulfide is present in the sample, the client will be notified and given the option of retaking the sample and treating in the field per the method requirements or the laboratory can analyze the samples as delivered and qualify the results in the final report.

  - It is the responsibility of the client to notify the laboratory if thiosulfate, sulfite, or thiocyanate are known or suspected to be present in the sample. This notification may be on the chain of custody. The samples may need to be subcontracted to a laboratory that performs a UV digestion. If the lab does not perform the UV digestion on samples that contain these compounds, the results must be qualified in the final report.

- The laboratory must test the sample for oxidizing agents (e.g. Chlorine) prior to analysis and treat according to the methods prior to distillation. (ascorbic acid or sodium arsenite are the preferred choice).

6) Sample Holding Times
   - TestAmerica will make every effort to analyze samples within the regulatory holding time. Samples must be received in the laboratory with enough time to perform the sample analysis. Except for short holding time samples (< 48hr HT) sample must be received with at least 48 hrs (2 working days) remaining on the holding time for us to ensure analysis.

   - Analyses that are designated as "field" analyses (Odor, pH, Dissolved Oxygen, Disinfectant Residual; a.k.a. Residual Chlorine, and Redox Potential) should be analyzed ASAP by the field sampler prior to delivering to the lab (within 15 minutes). However, if the analyses are to be performed in the laboratory, TestAmerica will make every effort to analyze the samples within 24 hours from receipt of the samples in the testing laboratory. Samples for "field" analyses received after 4:00 pm on Friday or on the weekend will be analyzed no later than the next business day after receipt (i.e., Monday, unless Monday is a holiday). Samples will remain refrigerated and sealed until the time of analysis. The actual times of all "field" sample analyses are noted in the final report. Samples analyzed in the laboratory will be qualified on the final report with an 'H' to indicate holding time exceedance.

7) All samples submitted for Volatile Organic analyses must have a Trip Blank submitted at the same time. TestAmerica will supply a blank with the bottle order.

8) The project manager will be notified if any sample is received in damaged condition. TestAmerica will request that a sample be resubmitted for analysis.

9) Recommendations for packing samples for shipment.

   - Pack samples in Ice rather than "Blue" ice packs.

   - Soil samples should be placed in plastic zip-lock bags. The containers often have dirt around the top, do not seal very well and are prone to intrusion from the water which results from melted ice.

   - Water samples are best package when wrapped with bubble-wrap or paper (newspaper, or paper towels) and then placed in plastic zip-lock bags.

   - Fill cooler void spaces with bubble wrap.

SECTION 24. ASSURING THE QUALITY OF TEST RESULTS

24.1 Overview

In order to assure our clients of the validity of their data, the laboratory continuously evaluates the quality of the analytical process. The analytical process is controlled not only by instrument calibration as discussed in Section 20, but also by routine process quality control measurements (e.g. Blanks, Laboratory Control Samples (LCS), Matrix Spikes (MS), duplicates (DUP), surrogates, Internal Standards (IS)). These quality control checks are performed as required by the method or regulations to assess precision and accuracy. In addition to the routine process quality control samples, Proficiency Testing (PT) Samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

24.2 Controls

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, drying and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control samples are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

24.3 Negative Controls

Table 24-1. Example – Negative Controls

Control Type	Details
Method Blank (MB)	are used to assess preparation and analysis for possible contamination during the preparation and processing steps.
	The specific frequency of use for method blanks during the analytical sequence is defined in the specific standard operating procedure for each analysis. Generally it is 1 for each batch of samples; not to exceed 20 environmental samples.
	The method blank is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (e.g., Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The method blank goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).
	Reanalyze or qualify associated sample results when the concentration of a targeted analyte in the blank is at or above the reporting limit as established by the method or by regulation, AND is greater than 1/10 of the amount measured in the sample.
Calibration Blanks	are prepared and analyzed along with calibration standards where applicable. They are prepared using the same reagents that are used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.
Instrument Blanks	are blank reagents or reagent water that may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.

Table 24-1. Example – Negative Controls

Control Type	Details
Trip Blank [1]	are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses (or as specified in the client's project plan). Additionally, trip blanks may be prepared and analyzed for volatile analysis of air samples, when required by the client. A trip blank may be purchased (certified clean) or is prepared by the laboratory by filling a clean container with pure deionized water that has been purged to remove any volatile compounds. Appropriate preservatives are also added to the container. The trip blank is sent with the bottle order and is intended to reflect the environment that the containers are subjected to throughout shipping and handling and help identify possible sources if contamination is found. The field sampler returns the trip blank in the cooler with the field samples.
Field Blanks [1]	are sometimes used for specific projects by the field samplers. A field blank prepared in the field by filling a clean container with pure reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)
Equipment Blanks [1]	are also sometimes created in the field for specific projects. An equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (TNI)
Holding Blanks	also referred to as refrigerator or freezer blanks, are used to monitor the sample storage units for volatile organic compounds during the storage of VOA samples in the laboratory

[1] When known, these field QC samples should not be selected for matrix QC as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB."

Evaluation criteria and corrective action for these controls are defined in the specific standard operating procedure for each analysis.

24.4 Positive Controls

Control samples (e.g., QC indicators) are analyzed with each batch of samples to evaluate data based upon (1) Method Performance (Laboratory Control Sample (LCS) or Blank Spike (BS)), which entails both the preparation and measurement steps; and (2) Matrix Effects (Matrix Spike (MS) or Sample Duplicate (MD, DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch

Note that frequency of control samples vary with specific regulatory, methodology and project specific criteria. Complete details on method control samples are as listed in each analytical SOP.

24.4.1 Method Performance Control - Laboratory Control Sample (LCS)

The LCS measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects in a laboratory batch.

The LCS is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (for example: Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The LCS is spiked with verified known amounts of analytes or is made of a material containing known and verified amounts of analytes, taken through all preparation and analysis steps along with the

field samples. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), a calibration verification standard is reported as the LCS. In some instances where there is no practical clean solid matrix available, aqueous LCS's may be processed for solid matrices; final results may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the field samples.

Certified pre-made reference material purchased from a NIST/A2LA accredited vendor may also be used for the LCS when the material represents the sample matrix or the analyte is not easily spiked (e.g. solid matrix LCS for metals, TDS, etc.).

The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis. It is generally 1 for each batch of samples; not to exceed 20 environmental samples.

If the mandated or requested test method, or project requirements, do not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample (and Matrix Spike) where applicable (e.g. no spike of pH). However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, at a minimum, a representative number of the listed components (see below) shall be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

- For methods that have 1-10 target analytes, spike all components.
- For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.
- For methods with more than 20 target analytes, spike at least 16 components.
- Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.
- Exception: Due to analyte incompatibility between the various PCB aroclors, aroclors 1016 and 1260 are used for spiking as they cover the range of all of the aroclors. Specific aroclors may be used by request on a project specific basis.

24.5 Sample Matrix Controls

Table 24-3. Sample Matrix Control

Control Type	Details	
Matrix Spikes (MS)	Use	used to assess the effect sample matrix of the spiked sample has on the precision and accuracy of the results generated by the method used;

Table 24-3. Sample Matrix Control

Control Type	Details	
	Typical Frequency [1]	At a minimum, with each matrix-specific batch of samples processed, an MS is carried through the complete analytical procedure. Unless specified by the client, samples used for spiking are randomly selected and rotated between different client projects.If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. Refer to the method SOP for complete details
	Description	essentially a sample fortified with a known amount of the test analyte(s).
Surrogate	Use	Measures method performance to sample matrix (organics only).
	Typical Frequency [1]	Are added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. The recovery of the surrogates is compared to the acceptance limits for the specific method. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers, to the client whose sample produced poor recovery.
	Description	Are similar to matrix spikes except the analytes are compounds with properties that mimic the analyte of interest and are unlikely to be found in environment samples.
Duplicates[2]	Use	For a measure of analytical precision, with each matrix-specific batch of samples processed, a matrix duplicate (MD or DUP) sample, matrix spike duplicate (MSD), or LCS duplicate (LCSD) is carried through the complete analytical procedure.
	Typical Frequency [1]	Duplicate samples are usually analyzed with methods that do not require matrix spike analysis.
	Description	Performed by analyzing two aliquots of the same field sample independently or an additional LCS.
Internal Standards	Use	Are spiked into all environmental and quality control samples (including the initial calibration standards) to monitor the qualitative aspect of organic and some inorganic analytical measurements.
	Typical Frequency [1]	All organic and ICP methods as required by the analytical method.
	Description	Used to correct for matrix effects and to help troubleshoot variability in analytical response and are assessed after data acquisition. Possible sources of poor internal standard response are sample matrix, poor analytical technique or instrument performance.

[1] See the specific analytical SOP for type and frequency of sample matrix control samples.
[2] LCSD's are normally not performed except when regulatory agencies or client specifications require them. The recoveries for the spiked duplicate samples must meet the same laboratory established recovery limits as the accuracy QC samples. If an LCSD is analyzed both the LCS and LCSD must meet the same recovery criteria and be included in the final report. The precision measurement is reported as "Relative Percent Difference" (RPD). Poor precision between duplicates (except LCS/LCSD) may indicate non-homogeneous matrix or sampling.

24.6 Acceptance Criteria (Control Limits)

As mandated by the test method and regulation, each individual analyte in the LCS, MS, or Surrogate Spike is evaluated against the control limits published in the test method. Where there are no established acceptance criteria, the laboratory calculates in-house control limits with the use of control charts or, in some cases, utilizes client project specific control limits. When this occurs, the regulatory or project limits will supersede the laboratory's in-house limits.

Note: For methods, analytes and matrices with very limited data (e.g., unusual matrices not analyzed often), interim limits are established using available data or by analogy to similar methods or matrices.

Once control limits have been established, they are verified, reviewed, and updated if necessary on an annual basis unless the method requires more frequent updating. Control limits are

established per method (as opposed to per instrument) regardless of the number of instruments utilized.

Laboratory generated % Recovery acceptance (control) limits are generally established by taking ± 3 Standard Deviations (99% confidence level) from the average recovery of a minimum of 20-30 data points (more points are preferred).

- Regardless of the calculated limit, the limit should be no tighter than the Calibration Verification (ICV/CCV). (Unless the analytical method specifies a tighter limit).

- In-house limits cannot be any wider than those mandated in a regulated analytical method. Client or contract required control limits are evaluated against the laboratory's statistically derived control limits to determine if the data quality objectives (DQOs) can be achieved. If laboratory control limits are not consistent with DQOs, then alternatives must be considered, such as method improvements or use of an alternate analytical method.

- The lowest acceptable recovery limit will be 10% (the analyte must be detectable and identifiable). Exception: The lowest acceptable recovery limit for Benzidine will be 5% and the analyte must be detectable and identifiable.

- The maximum acceptable recovery limit will be 150%.

- The maximum acceptable RPD limit will be 35% for waters and 40% for soils. The minimum RPD limit is 10%.

- If either the high or low end of the control limit changes by ≤ 5% from previous, the control chart is visually inspected and, using professional judgment, they may be left unchanged if there is no affect on laboratory ability to meet the existing limits.

24.6.1 The lab must be able to generate a current listing of their control limits and track when the updates are performed. In addition, the laboratory must be able to recreate historical control limits.

24.6.1.1 The QA Department generates and reviews Quality Control Limit Summaries using the TALS Control Chart module. These tables summarize the updated, proposed precision and accuracy acceptability limits for each applicable analysis performed at TestAmerica Edison Once the QA Department is satisfied that the proposed limits are satisfactory the tables are forwarded to the applicable Department (Technical) Manager for final review. Once the proposed limits have been reviewed they entered into the appropriate TALS Method Limit Group database and approved for use (effectively replacing the existing limits in the database). The Quality Assurance Department maintains an archive of all limits used within the laboratory.

24.6.2 A LCS that is within the acceptance criteria establishes that the analytical system is in control and is used to validate the process. Samples that are analyzed with an LCS with recoveries outside of the acceptance limits may be determined as out of control and should be reanalyzed if possible. If reanalysis is not possible, then the results for all affected analytes for samples within the same batch must be qualified when reported. The internal corrective action

process (see Section 12) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

- The analyte results are below the reporting limit and the LCS is above the upper control limit.
- If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

24.6.3 If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample is reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, or if requested by the client, unacceptable MS/MSDs are reprocessed and reanalyzed to prove matrix interference. A more detailed discussion of acceptance criteria and corrective action can be found in the lab's method SOPs and in Section 12.

24.6.4 If a surrogate standard falls outside the acceptance limits, if there is not obvious chromatographic matrix interference, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets surrogate recovery criteria, the second run is reported (or both are reported if requested by the client). Under certain circumstances, where all of the samples are from the same location and share similar chromatography, the reanalysis may be performed on a single sample rather than all of the samples and if the surrogate meets the recovery criteria in the reanalysis, all of the affected samples would require reanalysis.

24.7 Additional Procedures to Assure Quality Control

The laboratory has written and approved method SOPs to assure the accuracy of the test method including calibration (see Section 20), use of certified reference materials (see Section 21) and use of PT samples (see Section 15).

A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 19.

- Use of formulae to reduce data is discussed in the method SOPs and in Section 20.
- Selection of appropriate reagents and standards is included in Section 9 and 21.
- A discussion on selectivity of the test is included in Section 5.
- Constant and consistent test conditions are discussed in Section 18.
- The laboratories sample acceptance policy is included in Section 23.

SECTION 25. REPORTING RESULTS

25.1 Overview

The results of each test are reported accurately, clearly, unambiguously, and objectively in accordance with State and Federal regulations as well as client requirements. Analytical results are issued in a format that is intended to satisfy customer and laboratory accreditation requirements as well as provide the end user with the information needed to properly evaluate the results. Where there is conflict between client requests and laboratory ethics or regulatory requirements, the laboratory's ethical and legal requirements are paramount, and the laboratory will work with the client during project set up to develop an acceptable solution. Refer to Section 7.

A variety of report formats are available to meet specific needs.

In cases where a client asks for simplified reports, there must be a written request from the client. There still must be enough information that would show any analyses that were out of conformance (QC out of limits) and there should be a reference to a full report that is made available to the client. Review of reported data is included in Section 19.

25.2 Test Reports

Analytical results are reported in a format that is satisfactory to the client and meets all requirements of applicable accrediting authorities and agencies. A variety of report formats are available to meet specific needs. The report is printed on laboratory letterhead, reviewed, and signed by the appropriate project manager. At a minimum, the standard laboratory report shall contain the following information:

25.2.1 A report title (e.g. Analytical Report For Samples) with a "sample results" column header.

25.2.2 Each report cover page printed on company letterhead, which includes the laboratory name, address and telephone number.

25.2.3 A unique identification of the report (e.g. work order number) and on each page an identification in order to ensure the page is recognized as part of the report and a clear identification of the end.

Note: Page numbers of report are represented as page # of ##. Where the first number is the page number and the second is the total number of pages.

25.2.4 A copy of the chain of custody (COC).

25.2.5 The name and address of client and a project name/number, if applicable.

25.2.6 Client project manager or other contact

25.2.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

25.2.8 Date of receipt of sample, date and time of collection, and date(s) of test preparation and performance, and time of preparation or analysis if the required holding time for either activity is less than or equal to 72 hours.

25.2.9 Date reported or date of revision, if applicable.

25.2.10 Method of analysis including method code (EPA, Standard Methods, etc).

25.2.11 Reporting limit.

25.2.12 Method detection limits (if requested)

25.2.13 Definition of Data qualifiers and reporting acronyms (e.g. ND).

25.2.14 Sample results.

25.2.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits.

25.2.16 Condition of samples at receipt including temperature. This may be accomplished in a narrative or by attaching sample login sheets

25.2.17 A statement expressing the validity of the results, that the source methodology was followed and all results were reviewed for error.

25.2.18 A statement to the effect that the results relate only to the items tested and the sample as received by the laboratory.

25.2.19 A statement that the report shall not be reproduced except in full, without prior express written approval by the laboratory coordinator.

25.2.20 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Signatories are appointed by the Lab Director.

25.2.21 When TNI accreditation is required, the lab shall certify that the test results meet all requirements of TNI or provide reasons and/or justification if they do not.

25.2.22 The laboratory includes a cover letter.

25.2.23 Where applicable, a narrative to the report that explains the issue(s) and corrective action(s) taken in the event that a specific accreditation or certification requirement was not met.

25.2.24 When soil samples are analyzed, a specific identification as to whether soils are reported on a “wet weight” or “dry weight” basis.

25.2.25 Appropriate laboratory certification number for the state of origin of the sample, if applicable.

25.2.26 If only part of the report is provided to the client (client requests some results before all of it is complete), it must be clearly indicated on the report (e.g., partial report). A complete report must be sent once all of the work has been completed.

25.2.27 Any non-TestAmerica subcontracted analysis results are provided as a separate report on the official letterhead of the subcontractor. All TestAmerica subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

25.2.28 Non-accredited tests shall be clearly identified in the case narrative when claims of accreditation to the TNI standard are made.

Note: Refer to the Corporate SOP on Electronic Reporting and Signature Policy (No. CA-I-P-002) for details on internally applying electronic signatures of approval.

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25.3 Reporting Level or Report Type

The laboratory offers four levels of quality control reporting. Each level, in addition to its own specific requirements, contains all the information provided in the preceding level. The packages provide the following information in addition to the information described above:

- Level I is a report with the features described in Section 25.2 above.
- Level II (also called 'Results/QA) is a Level I report plus summary information, including results for the method blank reported to the laboratory MDL, percent recovery for laboratory control samples and matrix spike samples, and the RPD values for all MSD and sample duplicate analyses.
- NJDEP Reduced Deliverables Format which contains, at minimum, the elements listed in the current NJDEP Technical Requirements for Site Remediation, N.J.A.C. 7:26E.
- NJDEP Full Deliverables Format (Non-USEPA CLP Methods) which contains, at minimum, the elements listed in the current NJDEP Technical Requirements for Site Remediation, N.J.A.C. 7:26E.
- NJDEP Full Deliverables Format (USEPA CLP Methods) which contains, at minimum, the elements listed in the current NJDEP Technical Requirements for Site Remediation, N.J.A.C. 7:26E.
- NYSDEC ASP 'A' and 'B' Deliverables Format which contain, at minimum, the elements listed in the current *New York State Department of Environmental Conservation Analytical Services Protocol*.

In addition to the various levels of QC packaging, the laboratory also provides reports in diskette deliverable form. Initial reports may be provided to clients by facsimile. All faxed reports are followed by hardcopy. Procedures used to ensure client confidentiality are outlined in Section 25.6.

25.3.1 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of TestAmerica's services. TestAmerica Edison offers a variety of EDD formats including NJ Hazsite Deliverables, Excel, Dbase, GISKEY, and Text Files.

EDD specifications are submitted to the IT Department by the PM for review and undergo the contract review process. Once the facility has committed to providing data in a specific electronic format, the coding of the format may need to be performed. This coding is documented and validated. The validation of the code is retained by the IT staff coding the EDD.

EDDs shall be subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory can demonstrate that it can routinely generate that EDD without errors. Any revisions to the EDD format must be reviewed until it is demonstrated that it can routinely be generated without errors. If the EDD can be reproduced accurately and if all subsequent EDDs can be produced error-free, each EDD does not necessarily require a review.

25.4 Supplemental Information for Test

The lab identifies any unacceptable QC analyses or any other unusual circumstances or observations such as environmental conditions and any non-standard conditions that may have affected the quality of a result. This is typically in the form of a footnote or a qualifier and/or a narrative explaining the discrepancy in the front of the report.

Numeric results with values outside of the calibration range, either high or low are qualified as 'estimated'.

Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications is required, including identification of test results derived from any sample that did not meet TNI sample acceptance requirements such as improper container, holding time, or temperature.

Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

Opinions and Interpretations - The test report contains objective information, and generally does not contain subjective information such as opinions and interpretations. If such information is required by the client, the Laboratory Director will determine if a response can be prepared. If so, the Laboratory Director will designate the appropriate member of the management team to prepare a response. The response will be fully documented, and reviewed by the Laboratory Director, before release to the client. There may be additional fees charged to the client at this time, as this is a non-routine function of the laboratory.

Note: Review of data deliverable packages for submittal to regulatory authorities requires responses to non-conforming data concerning potential impact on data quality. This necessitates a limited scope of interpretation, and this work is performed by the QA Department. This is the only form of "interpretation" of data that is routinely performed by the laboratory.

When opinions or interpretations are included in the report, the laboratory provides an explanation as to the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly noted as such and where applicable, a comment should be added suggesting that the client verify the opinion or interpretation with their regulator.

25.5 Environmental Testing Obtained From Subcontractors

If the laboratory is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in the Corporate SOP on Subcontracting (SOP No. CA-L-S-002).

Data reported from analyses performed by a subcontractor laboratory are clearly identified as such on the analytical report provided to the client. Results from a subcontract laboratory outside of TestAmerica are reported to the client on the subcontract laboratory's original report stationary and the report includes any accompanying documentation.

25.6 Client Confidentiality

In situations involving the transmission of environmental test results by telephone, facsimile or other electronic means, client confidentiality must be maintained.

TestAmerica will not intentionally divulge to any person (other than the Client or any other person designated by the Client in writing) any information regarding the services provided by TestAmerica or any information disclosed to TestAmerica by the Client. Furthermore, information known to be potentially endangering to national security or an entity's proprietary rights will not be released.

Note: This shall not apply to the extent that the information is required to be disclosed by TestAmerica under the compulsion of legal process. TestAmerica will, to the extent feasible, provide reasonable notice to the client before disclosing the information.

Note: Authorized representatives of an accrediting authority are permitted to make copies of any analyses or records relevant to the accreditation process, and copies may be removed from the laboratory for purposes of assessment.

25.6.1 Report deliverable formats are discussed with each new client. If a client requests that reports be faxed or e-mailed, the reports are faxed with a cover sheet or e-mailed with the following note that includes a confidentiality statement similar to the following:

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone at the 1-800-765-0980 (or for e-mails: please notify us immediately by e-mail or by phone (1-800-765-0980) and delete this material from any computer).

25.7 Format of Reports

The format of reports is designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

25.8 Amendments to Test Reports

Corrections, additions, or deletions to reports are only made when justification arises through supplemental documentation. Justification is documented using the laboratory's corrective action system (refer to Section 12).

The revised report is retained on the Archive data server, as is the original report. The revised report is stored in the Archive data server under the sample number followed by "Rev (n)" where 'n' is the revision number. The revised report will have the words "Revision (n)" on the report cover page beneath the report date. Additionally, a section entitled "Revised Report" will appear on the Case Narrative page. A brief explanation of the reasons for the re-issue will be included in this section.

25.9 Policies on Client Requests for Amendments

25.9.1 Policy on Data Omissions or Reporting Limit Increases

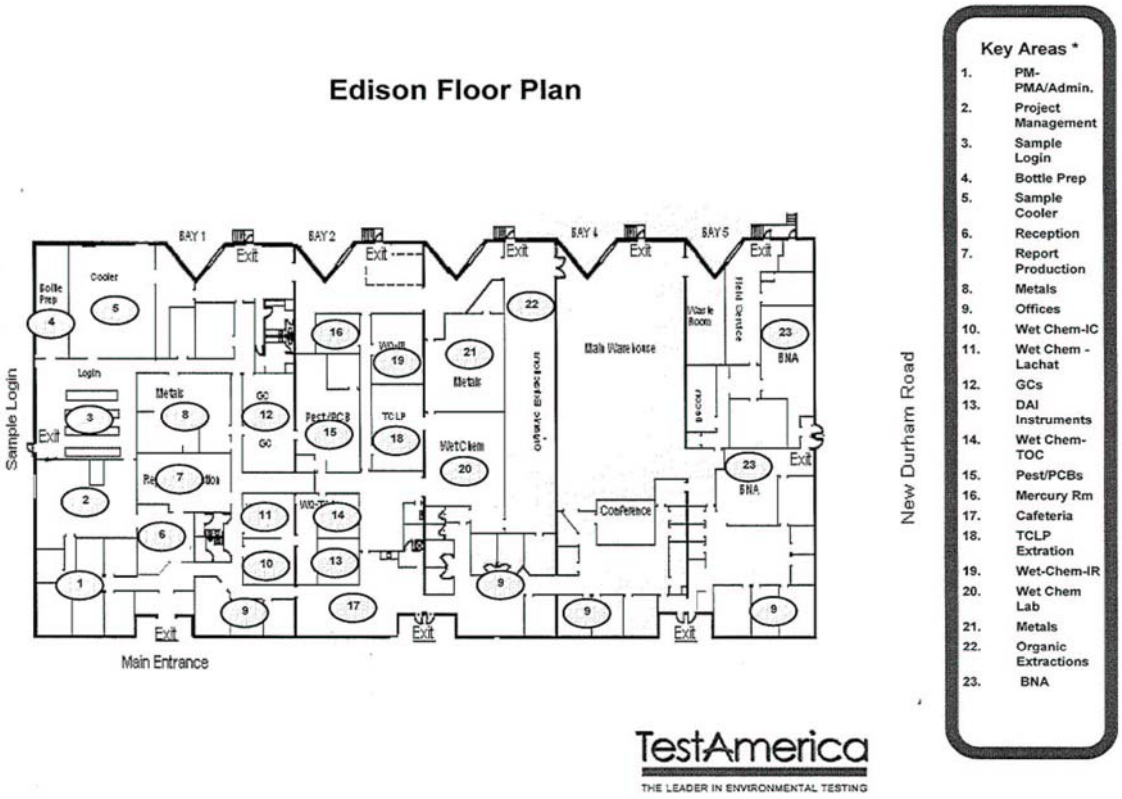
Fundamentally, our policy is simply to not omit previously reported results (including data qualifiers) or to not raise reporting limits and report sample results as ND. This policy has few exceptions. Exceptions are:

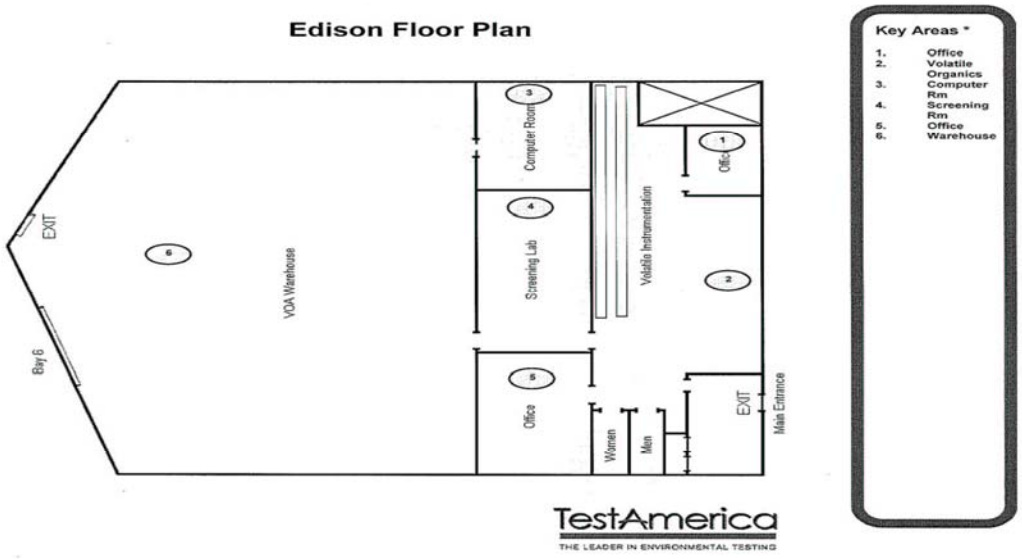
- Laboratory error.
- Sample identification is indeterminate (confusion between COC and sample labels).
- An incorrect analysis (not analyte) was requested (e.g., COC lists 8315 but client wanted 8310). A written request for the change is required.
- Incorrect limits reported based on regulatory requirements.
- The requested change has absolutely *no possible* impact on the interpretation of the analytical results and there is *no possibility* of the change being interpreted as misrepresentation by anyone inside or outside of our company.

25.9.2 Multiple Reports

TestAmerica does not issue multiple reports for the same work order where there is different information on each report (this does not refer to copies of the same report) unless required to meet regulatory needs and approved by QA.

Appendix 1. Laboratory Floor Plan





Appendix 2. Glossary/Acronyms (EL-V1M2 Sec. 3.1)

Glossary:

Acceptance Criteria: Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst: The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Analytical Uncertainty: A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis. (TNI)

Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of laboratory accreditation). (TNI)

Audit: A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives. (TNI)

Batch: Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one (1) to twenty (20) environmental samples of the same quality systems matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be twenty-four (24) hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed twenty (20) samples. (TNI)

Bias: The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). (TNI)

Blank: A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Calibration: A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. (TNI)

1) In calibration of support equipment the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI).

2) In calibration according to methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.

Calibration Curve: The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (TNI)

Calibration Standard: A substance or reference material used to calibrate an instrument (QAMS)

Certified Reference Material (CRM): A reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute. (TNI).

Chain of Custody (COC) Form: Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; the collector; time of collection; preservation; and requested analyses. (TNI)

Compromised Samples: Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions, compromised samples are not analyzed. If emergency situation require analysis, the results must be appropriately qualified.

Confidential Business Information (CBI): Information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products. TNI and its representatives agree to safeguarding identified CBI and to maintain all information identified as such in full confidentiality.

Confirmation: Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to Second Column Confirmation; Alternate wavelength; Derivatization; Mass spectral interpretation; Alternative detectors or Additional Cleanup procedures. (TNI)

Conformance: An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Correction: Actions necessary to correct or repair analysis specific non-conformances. The acceptance criteria for method specific QC and protocols as well as the associated corrective actions. The analyst will most frequently be the one to identify the need for this action as a result of calibration checks and QC sample analysis**.** No significant action is taken to change behavior, process or procedure.

Corrective Action: The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit: A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data re of acceptable quality (i.e., that they meet specified acceptance criteria).

Data Reduction: The process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors, and collation into a more useable form. (TNI)

Deficiency: An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC)

Demonstration of Capability: A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. (TNI)

Document Control: The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity if performed. (ASQC)

Duplicate Analyses: The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA-QAD)

Equipment Blank: Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures.

External Standard Calibration: Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Field Blank: Blank prepared in the field by filing a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken (EPA OSWER)

Field of Accreditation: Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.

Holding Times: The maximum time~~s~~ that samples may be held prior to analyses and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (TNI)

Internal Standard Calibration: Calibrations for methods that utilize internal standards to compensate for changes in instrument conditions.

Instrument Blank: A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Instrument Detection Limit (IDL): The minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific instrument. The IDL is associated with the instrumental portion of a specific method only, and sample preparation steps are not considered in its derivation. The IDL is a statistical estimation at a specified confidence interval of the concentration at which the relative uncertainty is ± 100%. The IDL represents a range where qualitative detection occurs on a specific instrument. Quantitative results are not produced in this range.

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, taken through all preparation and analysis steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

An LCS shall be prepared at a minimum of 1 per batch of 20 or less samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to determine batch acceptance.

Least Squares Regression (1st Order Curve): The least squares regression is a mathematical calculation of a straight line over two axes. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The regression calculation will generate a correlation coefficient (r) that is a measure of the "goodness of fit" of the regression line to the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r must be greater than or equal to 0.99 for organics and 0.995 for inorganics.

Limit(s) of Detection (LOD) [a.k.a., Method Detection Limit (MDL)]: A laboratory's estimate of the minimum amount of an analyte in a given matrix that an analytical process can reliably detect in their facility. (TNI)

LOD Verification [a.k.a., MDL Verification]: A processed QC sample in the matrix of interest, spiked with the analyte at no more than 3X the LOD for single analyte tests and 4X the LOD for multiple analyte tests and processed through the entire analytical procedure.

Limit(s) of Quantitation (LOQ) [a.k.a., Reporting Limit]: The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. (TNI)

Quality System (QS) Matrix: The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine —Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: Any aqueous sample that has been designated as a potable or potential potable water source.

Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

Non-Aqueous Liquid: Any organic liquid with <15% settleable solids.

Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.

Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.

Air & Emissions: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device. (TNI)

Matrix Spike (spiked sample or fortified sample): A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): A replicate matrix spike prepared and analyzed to obtain a measure of the precision of the recovery for each analyte.

Method Blank: A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

Method Detection Limit: The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

Negative Control: Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.

Non-conformance: An indication, judgment, or state of not having met the requirements of the relevant specifications, contract, or regulation.

Performance Audit: The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory.

Positive Control: Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.

Precision: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (TNI)

Preservation: Any conditions under which a sample must be kept in order to maintain chemical and/or biological integrity prior to analysis. (TNI)

Proficiency Testing: A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (TNI)

Proficiency Testing Program: The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (TNI)

Proficiency Test Sample (PT): A sample, the composition of which is unknown to the laboratory and is provided to test whether the laboratory can produce analytical results within specified acceptance criteria. (TNI)

Quality Assurance: An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type of quality needed and expected by the client. (TNI)

Quality Assurance [Project] Plan (QAPP): A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EAP-QAD)

Quality Control: The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality. (TNI)

Quality Control Sample: A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control. (TNI)

Quality Manual: A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (TNI)

Quality System: A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC activities. (TNI)

Raw Data: The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records. (TNI)

Record Retention: The systematic collection, indexing and storing of documented information under secure conditions.

Reference Material: Material or substance one or more properties of which are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (TNI)

Reference Standard: Standard used for the calibration of working measurement standards in a given organization or a given location. (TNI)

Sampling: Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.

Second Order Polynomial Curve (Quadratic): The 2nd order curves are a mathematical calculation of a slightly curved line over two axis. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The 2nd order regression will generate a coefficient of determination (COD or r^2) that is a measure of the "goodness of fit" of the quadratic curvature the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r^2 must be greater than or equal to 0.99.

Selectivity: The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system. (TNI)

Sensitivity: The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (TNI)

Spike: A known mass of target analyte added to a blank, sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

Standard: The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies. (TNI)

Standard Operating Procedures (SOPs): A written document which details the method for an operation, analysis, or action, with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks. (TNI)

Storage Blank: A blank matrix stored with field samples of a similar matrix (volatiles only) that measures storage contribution to any source of contamination.

Surrogate: A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with sample composition and shall be reported to the client whose sample produced poor recovery. (QAMS)

Systems Audit (also Technical Systems Audit): A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

Technical Manager: A member of the staff of an environmental laboratory who exercises actual day-to-day supervision of laboratory operations for the appropriate fields of accreditation and reporting of results

Technology: A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.

Traceability: The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project. (TNI)

Trip Blank: A blank matrix placed in a sealed container at the laboratory that is shipped, held unopened in the field, and returned to the laboratory in the shipping container with the field samples.

Uncertainty: A parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measured value.

Acronyms:

CAR – Corrective Action Report
CCV – Continuing Calibration Verification
CF – Calibration Factor
CFR – Code of Federal Regulations
COC – Chain of Custody
DOC – Demonstration of Capability
DQO – Data Quality Objectives
DUP - Duplicate
EHS – Environment, Health and Safety
EPA – Environmental Protection Agency
GC - Gas Chromatography
GC/MS - Gas Chromatography/Mass Spectrometry
HPLC - High Performance Liquid Chromatography
ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy
ICP/MS – ICP/Mass Spectrometry
ICV – Initial Calibration Verification
IDL – Instrument Detection Limit
IH – Industrial Hygiene
IS – Internal Standard
LCS – Laboratory Control Sample
LCSD – Laboratory Control Sample Duplicate
LIMS – Laboratory Information Management System
LOD – Limit of Detection
LOQ – Limit of Quantitation
MDL – Method Detection Limit
MDLCK – MDL Check Standard
MDLV – MDL Verification Check Standard
MRL – Method Reporting Limit Check Standard
MS – Matrix Spike
MSD – Matrix Spike Duplicate
NELAP - National Environmental Laboratory Accreditation Program
PT – Performance Testing
TNI – The NELAC Institute
QAM – Quality Assurance Manual
QA/QC – Quality Assurance / Quality Control
QAPP – Quality Assurance Project Plan
RF – Response Factor
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
SD – Standard Deviation
SOP – Standard Operating Procedure
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound

Appendix 3. Laboratory Certifications, Accreditations, Validations

TestAmerica Edison maintains accreditations, certifications, and approvals with numerous state and national entities. Programs vary but may include on-site audits, reciprocal agreements with another entity, performance testing evaluations, review of the QA Manual, Standard Operating Procedures, Method Detection Limits, training records, etc. At the time of this QA Manual revision, the laboratory has accreditation/certification/licensing with the following organizations:

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Certifications

Laboratory	Program	Authority	Identification	Expiration Date
TestAmerica Edison	Delaware DNREC	Delaware	N/A	12/31/2011
TestAmerica Edison	NELAC	New Jersey	12028	06/30/2012
TestAmerica Edison	NELAC	New York	11452	04/01/2012
TestAmerica Edison	NELAC	Pennsylvania	68-00522	02/29/2012
TestAmerica Edison	State Program	Connecticut	PH-0200	09/30/2012
TestAmerica Edison	State Program	Rhode Island	LAO00132	12/30/2011
TestAmerica Edison	USDA	USDA	NJCA-003-08	03/11/2014

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For more information, or to contact a local TestAmerica representative nearest you, please visit our website at www.testamericainc.com

The certificates and parameter lists (which may differ) are available, upon request, from a laboratory representative. for each organization may be found on the corporate web site, the laboratory's public server, the final report review table, and in the following offices: QA, marketing, and project management.

SIR/RIR/RAW ATTACHMENT C

Complete RI Analytical Data Packages (on disk)
NJDEP Electronic Data Submission Application (EDSA) Deliverables (on disk)
and EDSA Submission Confirmation Emails

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

EDSA Submissions for MEDICAL CENTER @ PRINCETON , Case No.: N98-1151 (Preferred ID = 011700)

CATALOG#	Replaced By	DIRECTORY	SUB DATE	DATE RECEIVED	APP/REJ	DESCRIPTION	CONSULTANT
HZ002592	HZ002593	QCINC		3/23/1999	S	PRINCETON MEDICAL CENTER	
HZ002593		QCINC	3/19/1999	9/22/1999	R	PRINCETON MEDICAL CENTER	
HZ054634		MCPSI	2/22/2000	5/31/2005	A	SI-WELLS	GHR CONSULTING SERVICES, INC.
HZ058177		QCINC	8/26/2005	10/6/2005	A	PRINCETON MEDICAL CENTER	Criterium Lockatong Engineers
HZ074206		L2288420	7/23/2007	1/24/2011	A	PRINCETON MEDICAL CENTER	CRITERIUM LOCKATONG ENGINEERS
HZ074207		L2320742	7/23/2007	1/24/2011	A	PRINCETON MEDICAL CENTER	CRITERIUM LOCKATONG ENGINEERS
HZ171550		99997-1	9/10/2015	9/10/2015	A	Princeton Med Ctr RI 8/20/2015	EcolSciences, Inc.

A - Approved S - Superseded

R - Rejected Replaced by in parentheses has not yet been confirmed.

SIR/RIR/RAW ATTACHMENT D

Initial Characterization of Onsite Reworked Material

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

TE0522 - AVALONBAY COMMUNITIES, INC ---- 7/28/15 ----- PRINCETON, SP-SS-1 COMP

8/7/15 -

LAB SAMPLE ID	CUSTOMER SAMPLE ID	METHOD NAME	ANALYTE NAME	RESULT	UNIT	QUALIFIER	NJDEP 2008 RES LIMIT	NJDEP 2008 NONRES LIMIT
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 7471B	MERCURY	0.0735	mg/kg		23	65
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	IRON	52500	mg/kg		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	ALUMINUM	50100	mg/kg		78000	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	ANTIMONY	4.11	mg/kg		31	450
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	ARSENIC	10.8	mg/kg		19	19
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	BARIUM	487	mg/kg		16000	59000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	BERYLLIUM	1.93	mg/kg		16	140
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	CADMIUM	0.0807	mg/kg	U	78	78
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	CALCIUM	24100	mg/kg		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	CHROMIUM	51.6	mg/kg		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	COBALT	21.5	mg/kg		1600	590
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	COPPER	53.3	mg/kg		3100	45000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	LEAD	30.4	mg/kg		400	800
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	MAGNESIUM	12400	mg/kg		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	MANGANESE	1120	mg/kg		11000	5900
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	NICKEL	36.2	mg/kg		1600	23000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	POTASSIUM	9530	mg/kg		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	SELENIUM	1.42	mg/kg	U	390	5700
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	SILVER	0.0858	mg/kg	U	390	5700
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	SODIUM	1300	mg/kg		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	THALLIUM	0.194	mg/kg	U	5	79
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	VANADIUM	60.1	mg/kg		78	1100
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 6010C	ZINC	199	mg/kg		23000	110000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	SM 2540G	TOTAL SOLIDS PERCENT	92.55	%		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 9010/9014	CYANIDE, TOTAL	0.425	mg/kg	U	1600	23000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 3060A/7196A	CHROMIUM HEXAVALENT	0.636	mg/kg		240	20
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1016	0.0052	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1221	0.00594	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1232	0.00395	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1242	0.0019	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1248	0.00216	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1254	0.00201	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1260	0.0947	mg/kg	P1	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1262	0.00211	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	AROCLOR-1268	0.00194	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8082A	Total PCBs by Calculation	0.0947	mg/kg		0.2	1

TE0522 - AVALONBAY COMMUNITIES, INC ---- 7/28/15 ----- PRINCETON, SP-SS-1 COMP								
8/7/15 -								
LAB SAMPLE ID	CUSTOMER SAMPLE ID	METHOD NAME	ANALYTE NAME	RESULT	UNIT	QUALIFIER	NJDEP 2008 RES LIMIT	NJDEP 2008 NONRES LIMIT
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	4,4'-DDT	0.17	mg/kg		2	8
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	4,4'-DDD	0.00971	mg/kg		3	13
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	4,4'-DDE	0.0634	mg/kg		2	9
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ALDRIN	0.000464	mg/kg	U	0.04	0.2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ALPHA-BHC	0.000167	mg/kg	U	0.1	0.5
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ALPHA-CHLORDANE	0.0541	mg/kg		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	BETA-BHC	0.00124	mg/kg	U	0.4	2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	DELTA-BHC	0.000354	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	DIELDRIN	0.000199	mg/kg	U	0.04	0.2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ENDOSULFAN I	0.000178	mg/kg	U	235	3400
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ENDOSULFAN II	0.000191	mg/kg	U	235	3400
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ENDOSULFAN SULFATE	0.000357	mg/kg	U	470	6800
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ENDRIN	0.000227	mg/kg	U	23	340
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ENDRIN ALDEHYDE	0.000198	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	ENDRIN KETONE	0.000201	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	GAMMA-BHC (LINDANE)	0.000188	mg/kg	U	0.4	2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	GAMMA-CHLORDANE	0.0602	mg/kg		NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	HEPTACHLOR	0.00542	mg/kg		0.1	0.7
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	HEPTACHLOR EPOXIDE	0.00267	mg/kg	P1	0.07	0.3
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	METHOXYCHLOR	0.000251	mg/kg	U	390	5700
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	TOXAPHENE	0.0217	mg/kg	U	0.6	3
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8081B	Total Alpha + Gamma Chlordane	0.1143	mg/kg		0.2	1
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	1,2,4,5-TETRACHLOROBENZENE	0.0414	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	1,2,4-TRICHLOROBENZENE	0.0527	mg/kg	U	73	820
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	1,2-DICHLOROBENZENE	0.0561	mg/kg	U	5300	59000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	1,2-DIPHENYLHYDRAZINE	0.033	mg/kg	U	0.7	2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	1,3-DICHLOROBENZENE	0.056	mg/kg	U	5300	59000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	1,4-DICHLOROBENZENE	0.0525	mg/kg	U	5	13
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2,3,4,6-TETRACHLOROPHENOL	0.0263	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2,4,5-TRICHLOROPHENOL	0.029	mg/kg	U	6100	68000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2,4,6-TRICHLOROPHENOL	0.0304	mg/kg	U	19	74
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2,4-DICHLOROPHENOL	0.0653	mg/kg	U	180	2100
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2,4-DIMETHYLPHENOL	0.0308	mg/kg	U	1200	14000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2,4-DINITROPHENOL	0.148	mg/kg	U	120	1400
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2,4-DINITROTOLUENE	0.0347	mg/kg	U	0.7	3
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2,6-DINITROTOLUENE	0.0303	mg/kg	U	0.7	3
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2-CHLORONAPHTHALENE	0.0306	mg/kg	U	NA	NA

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LAB SAMPLE ID	CUSTOMER SAMPLE ID	METHOD NAME	ANALYTE NAME	RESULT	UNIT	QUALIFIER	NJDEP 2008 RES LIMIT	NJDEP 2008 NONRES LIMIT
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2-CHLOROPHENOL	0.0377	mg/kg	U	310	2200
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2-METHYLNAPHTHALENE	0.0413	mg/kg	U	230	2400
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2-METHYLPHENOL	0.0377	mg/kg	U	310	3400
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2-NITROANILINE	0.0377	mg/kg	U	39	23000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	2-NITROPHENOL	0.0376	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	3&4-METHYLPHENOL	0.0573	mg/kg	U	31	340
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	3,3'-DICHLOROBENZIDINE	0.0412	mg/kg	U	1	4
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	3-NITROANILINE	0.0424	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	4,6-DINITRO-2-METHYLPHENOL	0.03	mg/kg	U	6	68
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	4-BROMOPHENYL-PHENYLETHER	0.0326	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	4-CHLORO-3-METHYLPHENOL	0.031	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	4-CHLOROANILINE	0.0281	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	4-CHLOROPHENYL-PHENYLETHER	0.0281	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	4-NITROANILINE	0.0321	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	4-NITROPHENOL	0.0361	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	ACENAPHTHENE	0.108	mg/kg	J	3400	37000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	ACENAPHTHYLENE	0.0301	mg/kg	U	NA	300000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	ACETOPHENONE	0.0288	mg/kg	U	2	5
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	ANTHRACENE	0.274	mg/kg		17000	30000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	ATRAZINE	0.0405	mg/kg	U	210	2400
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BENZALDEHYDE	0.209	mg/kg	U	6100	68000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BENZIDINE	0.404	mg/kg	U	0.7	0.7
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BENZO(A)ANTHRACENE	0.606	mg/kg		0.6	2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BENZO(A)PYRENE	0.429	mg/kg		0.2	0.2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BENZO(B)FLUORANTHENE	0.414	mg/kg		0.6	2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BENZO(G,H,I)PERYLENE	0.254	mg/kg	J	380000	30000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BENZO(K)FLUORANTHENE	0.481	mg/kg		6	23
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BIPHENYL	0.0269	mg/kg	U	3100	34000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BIS(2-CHLOROETHOXY)METHANE	0.0384	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BIS(2-CHLOROETHYL)ETHER	0.0533	mg/kg	U	0.4	2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BIS(2-CHLOROISOPROPYL)ETHER	0.0558	mg/kg	U	23	67
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BIS(2-ETHYLHEXYL)PHTHALATE	0.406	mg/kg		35	140
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	BUTYLBENZYLPHTHALATE	0.297	mg/kg		1200	14000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	CAPROLACTAM	0.926	mg/kg	U	31000	340000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	CARBAZOLE	0.172	mg/kg	J	24	96
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	CHRYSENE	0.635	mg/kg		62	230
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	DI-N-BUTYLPHTHALATE	0.0305	mg/kg	U	6100	68000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	DI-N-OCTYLPHTHALATE	0.0268	mg/kg	U	2400	27000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	DIBENZ(A,H)ANTHRACENE	0.118	mg/kg	J	0.2	0.2

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LAB SAMPLE ID	CUSTOMER SAMPLE ID	METHOD NAME	ANALYTE NAME	RESULT	UNIT	QUALIFIER	NJDEP 2008 RES LIMIT	NJDEP 2008 NONRES LIMIT
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	DIBENZOFURAN	0.0823	mg/kg	J	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	DIETHYLPHTHALATE	0.0324	mg/kg	U	49000	550000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	DIMETHYLPHTHALATE	0.0816	mg/kg	U	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	FLUORANTHENE	1.68	mg/kg		2300	24000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	FLUORENE	0.085	mg/kg	J	2300	24000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	HEXACHLOROBENZENE	0.04	mg/kg	U	0.3	1
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	HEXACHLOROBUTADIENE	0.0549	mg/kg	U	6	25
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	HEXACHLOROCYCLOPENTADIENE	0.0306	mg/kg	U	45	110
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	HEXACHLOROETHANE	0.0414	mg/kg	U	35	140
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	INDENO(1,2,3-CD)PYRENE	0.235	mg/kg	J	0.6	2
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	ISOPHORONE	0.0296	mg/kg	U	510	2000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	N-NITROSO-DI-N-PROPYLAMINE	0.0301	mg/kg	U	0.2	0.3
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	N-NITROSODIMETHYLAMINE	0.0531	mg/kg	U	0.7	0.7
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	N-NITROSODIPHENYLAMINE	0.0403	mg/kg	U	99	390
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	NAPHTHALENE	0.0507	mg/kg	U	6	17
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	NITROBENZENE	0.0541	mg/kg	U	31	340
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	PENTACHLOROPHENOL	0.0483	mg/kg	U	3	10
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	PHENANTHRENE	1.41	mg/kg		NA	300000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	PHENOL	0.0347	mg/kg	U	18000	210000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C	PYRENE	2.04	mg/kg		1700	18000
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C LIB SR	SUBSTITUTED PAH-1	0.22	mg/kg	J	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C LIB SR	SUBSTITUTED PAH-2	0.351	mg/kg	J	NA	NA
L5728206-1	PRINCETON, SP-SS-1 COMPOSITE	EPA 8270C LIB SR	UNKNOWN ORGANIC ACID-1	1.14	mg/kg	J	NA	NA
L5728206-2	SP-SS-1G GRAB	SM 2540G	TOTAL SOLIDS PERCENT	92.8	%		NA	NA
L5728206-2	SP-SS-1G GRAB	NJDEP EPH 10/08	TOTAL EPH	38.8	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	SM 2540G	TOTAL SOLIDS PERCENT	96.06	%		NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,1,1-TRICHLOROETHANE	0.00046	mg/kg	U	290	4200
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,1,2,2-TETRACHLOROETHANE	0.00043	mg/kg	U	1	3
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,1,2-TRICHLORO-1,2,2-TRIFLUOROET	0.00046	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,1,2-TRICHLOROETHANE	0.00046	mg/kg	U	2	6
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,1-DICHLOROETHANE	0.00053	mg/kg	U	8	24
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,1-DICHLOROETHENE	0.0004	mg/kg	U	11	150
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,2,3-TRICHLOROBENZENE	0.00041	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,2,4-TRICHLOROBENZENE	0.0006	mg/kg	U	73	820
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,2-DIBROMO-3-CHLOROPROPANE	0.0004	mg/kg	U	0.08	0.2

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LAB SAMPLE ID	CUSTOMER SAMPLE ID	METHOD NAME	ANALYTE NAME	RESULT	UNIT	QUALIFIER	NJDEP 2008 RES LIMIT	NJDEP 2008 NONRES LIMIT
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,2-DIBROMOETHANE	0.00056	mg/kg	U	0.008	0.04
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,2-DICHLOROBENZENE	0.00059	mg/kg	U	5300	59000
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,2-DICHLOROETHANE	0.00056	mg/kg	U	0.9	3
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,2-DICHLOROPROPANE	0.00054	mg/kg	U	2	5
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,3-DICHLOROBENZENE	0.00063	mg/kg	U	5300	59000
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,4-DICHLOROBENZENE	0.00068	mg/kg	U	5	13
L5728206-3	SP-SS-1V GRAB	EPA 8260B	1,4-DIOXANE	0.0221	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	2-BUTANONE	0.00362	mg/kg	J	3100	44000
L5728206-3	SP-SS-1V GRAB	EPA 8260B	2-HEXANONE	0.00088	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	4-METHYL-2-PENTANONE	0.00074	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	ACETONE	0.012	mg/kg	J	70000	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	ACROLEIN	0.00204	mg/kg	U	0.5	1
L5728206-3	SP-SS-1V GRAB	EPA 8260B	ACRYLONITRILE	0.00066	mg/kg	U	0.9	3
L5728206-3	SP-SS-1V GRAB	EPA 8260B	BENZENE	0.00046	mg/kg	U	2	5
L5728206-3	SP-SS-1V GRAB	EPA 8260B	BROMOCHLOROMETHANE	0.00062	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	BROMODICHLOROMETHANE	0.00054	mg/kg	U	1	3
L5728206-3	SP-SS-1V GRAB	EPA 8260B	BROMOFORM	0.00044	mg/kg	U	81	280
L5728206-3	SP-SS-1V GRAB	EPA 8260B	BROMOMETHANE	0.00147	mg/kg	U	25	59
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CARBON DISULFIDE	0.00094	mg/kg	U	7800	110000
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CARBON TETRACHLORIDE	0.00046	mg/kg	U	0.6	2
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CHLOROBENZENE	0.00065	mg/kg	U	510	7400
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CHLOROETHANE	0.00074	mg/kg	U	220	1100
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CHLOROFORM	0.00079	mg/kg	U	0.6	2
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CHLOROMETHANE	0.0011	mg/kg	U	4	12
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CIS-1,2-DICHLOROETHENE	0.0005	mg/kg	U	230	560
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CIS-1,3-DICHLOROPROPENE	0.00056	mg/kg	U	1	3.5
L5728206-3	SP-SS-1V GRAB	EPA 8260B	CYCLOHEXANE	0.00052	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	DIBROMOCHLOROMETHANE	0.00047	mg/kg	U	3	8
L5728206-3	SP-SS-1V GRAB	EPA 8260B	DICHLORODIFLUOROMETHANE	0.00034	mg/kg	U	490	230000
L5728206-3	SP-SS-1V GRAB	EPA 8260B	ETHYL BENZENE	0.0006	mg/kg	U	7800	1110000
L5728206-3	SP-SS-1V GRAB	EPA 8260B	ISOPROPYLBENZENE	0.00052	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	M&P-XYLENES	0.00153	mg/kg	J	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	METHYL ACETATE	0.00046	mg/kg	U	78000	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	METHYL TERTIARY BUTYL ETHER	0.00054	mg/kg	U	110	320
L5728206-3	SP-SS-1V GRAB	EPA 8260B	METHYLCYCLOHEXANE	0.00037	mg/kg	U	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	METHYLENE CHLORIDE	0.00206	mg/kg	U	34	97
L5728206-3	SP-SS-1V GRAB	EPA 8260B	O-XYLENE	0.00077	mg/kg	J	NA	NA
L5728206-3	SP-SS-1V GRAB	EPA 8260B	STYRENE	0.00052	mg/kg	U	90	260
L5728206-3	SP-SS-1V GRAB	EPA 8260B	TERTIARY BUTYL ALCOHOL	0.0051	mg/kg	J	1400	11000

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LAB SAMPLE ID	CUSTOMER SAMPLE ID	METHOD NAME	ANALYTE NAME	RESULT	UNIT	QUALIFIER	NJDEP 2008 RES LIMIT	NJDEP 2008 NONRES LIMIT
L5728206-3	SP-SS-1V GRAB	EPA 8260B	TETRACHLOROETHENE	0.0005	mg/kg	U	2	5
L5728206-3	SP-SS-1V GRAB	EPA 8260B	TOLUENE	0.00065	mg/kg	U	6300	91000
L5728206-3	SP-SS-1V GRAB	EPA 8260B	TRANS-1,2-DICHLOROETHENE	0.00052	mg/kg	U	300	720
L5728206-3	SP-SS-1V GRAB	EPA 8260B	TRANS-1,3-DICHLOROPROPENE	0.00053	mg/kg	U	1	3.5
L5728206-3	SP-SS-1V GRAB	EPA 8260B	TRICHLOROETHENE	0.0005	mg/kg	U	7	20
L5728206-3	SP-SS-1V GRAB	EPA 8260B	TRICHLOROFLUOROMETHANE	0.00038	mg/kg	U	23000	340000
L5728206-3	SP-SS-1V GRAB	EPA 8260B	VINYL CHLORIDE	0.00046	mg/kg	U	0.7	2
L5728206-3	SP-SS-1V GRAB	EPA 8260B	Total Xylenes by Calculation	0.0023	mg/kg		12000	170000

Notes: U = Not Detected, ND = Not Detected, J = Estimated Value above the MDL, but below the LOQ for Organics. B = Also present in Lab Blank.
NA = Not Applicable, or No Standard Established, P = % D>40% for Primary vs Conformation GC column.

NOTE: **= Sample Concentration Exceeds Applicable Soil Standard**

REF: N.J.A.C. 7:26D: 1. Direct Contact Residential Standards Appendix 1, Table 1A, Non-Residential Soil Standards Appendix 1, Table 1B , Amended 7-May-2012,
NJDIGWS - Source: Development of Impact to Ground Water Soil Remeidation Standards Using the Soil-Water Partition Equation Guidance Doc. Version 2.0, November 2013
NJDIGWS = NJDEP Guidance Document Default Impact to Ground Water Soil Screening Screening – Table I , Version 2.0, November 2013
NJDEP Chromium Soil Cleanup Criteria Sept-2008, Revised April 2010.

Note: Combined Cis & Trans - 1,3-DICHLOROPROPENE , Residential Limt 2.0 mg/Kg, Non-Residential Limit 7.0 mg/kg, NJDIGWS Limit 0.005 mg/Kg. QCL Limit Set at 1/2 the limit for each individually.
Note: Combined Standards for Endosulfan I & Endosulfan II (alpha + beta) Residential limit 470 mg/Kg, Non-Residential Limit 6800 mg/Kg, NJDIGWS Limit 4.0 mg/Kg. QCL Limit set at 1/2 Limit for each.
Note: 3&4-METHYLPHENOL - Co-elute.
Note: Limit for Total PCBS (All AROCLORS), Residential 0.2 mg/kg, Non-Residential 1.0 mg/Kg, NJDIGWS 0.2 mg/Kg
Note: Limit for Total Alpha + Gamma Chlordane Isomers: Residential 0.2 mg/kg, Non-Residential 1.0 mg/kg, NJDIGWS 0.05 mg/Kg.
Note: Limit for Total Xylenes (m&p plus o-xylene isomers) Residential 12000 mg/kg, Non-Residential 170000 mg/kg, NJDIGWS 19 mg/kg.

Analytical Report

Serialized: 08/10/2015 05:58pm QC19

ALBERT HROMIN
AVALONBAY COMMUNITIES, INC.
517 ROUTE ONE SOUTH
SUITE 550
ISELIN,NJ 08830

Regarding:

AVALONBAY COMMUNITIES, INC.
517 ROUTE ONE SOUTH
SUITE 550
ISELIN, NJ 08830

PROJECT ID:

TE0522

LABORATORY REPORT NUMBER:

L5728207

Authorized by: Oommen V. Kappil, QA Director

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State ID's: CT PH-0768, DE PA-018, MD 206, SC 89021001; FDA Reg. # : 2515238
Eurofins QC, Inc - Delaware Division: State ID's: DE 00011, MD 138
Eurofins QC, Inc - Vineland Division: State ID: NJ 06005; Eurofins QC, Inc - Reading Div: State ID: PA 06-03543
Eurofins QC, Inc - Wind Gap Division: State ID's: PA 48-01334, NJ PA001
Eurofins QC, Inc - E. Rutherford Division: State ID: NJ 02015

Eurofins QC, Inc.

Analytical Report

Printed 08/10/15 17:58 QC19

ALBERT HROMIN
AVALONBAY COMMUNITIES, INC.
517 ROUTE ONE SOUTH
SUITE 550
ISELIN, NJ 08830

Regarding:
ALBERT HROMIN
AVALONBAY COMMUNITIES, INC.
517 ROUTE ONE SOUTH
SUITE 550
ISELIN, NJ 08830

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-1
Sample Description PRINCETON- CC1 GRAB
Samp. Date/Time/Temp 07/28/15 02:50pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	85.12 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES						
2-Methylnaphthalene	EPA 8270C	230,000	N/A	90.1 J ug/kg DRY	44.9 ug/kg*	08/04/15
Acenaphthene	EPA 8270C	3,400,000	37,000,000	835 ug/kg DRY	33.4 ug/kg*	08/04/15
Acenaphthylene	EPA 8270C	NL	300,000,000	ND ug/kg DRY	32.8 ug/kg*	08/04/15
Anthracene	EPA 8270C	17,000,000	30,000,000	2030 ug/kg DRY	36.8 ug/kg*	08/04/15
Benzo(a)anthracene	EPA 8270C	600	2,000	5760 ug/kg DRY	330 ug/kg*	08/07/15
Benzo(a)pyrene	EPA 8270C	200	200	4450 ug/kg DRY	335 ug/kg*	08/07/15
Benzo(b)fluoranthene	EPA 8270C	600	2,000	4760 ug/kg DRY	315 ug/kg*	08/07/15
Benzo(g,h,i)perylene	EPA 8270C	380,000,000	30,000,000	1860 J ug/kg DRY	343 ug/kg*	08/07/15
Benzo(k)fluoranthene	EPA 8270C	6,000	23,000	4190 ug/kg DRY	337 ug/kg*	08/07/15
Chrysene	EPA 8270C	62,000	230,000	6000 ug/kg DRY	315 ug/kg*	08/07/15
Dibenz(a,h)anthracene	EPA 8270C	200	200	902. J ug/kg DRY	282 ug/kg*	08/07/15
Fluoranthene	EPA 8270C	2,300,000	24,000,000	15900 ug/kg DRY	323 ug/kg*	08/07/15
Fluorene	EPA 8270C	2,300,000	24,000,000	488 ug/kg DRY	31.2 ug/kg*	08/04/15
Indeno(1,2,3-cd)pyrene	EPA 8270C	600	2,000	1780 J ug/kg DRY	364 ug/kg*	08/07/15
Naphthalene	EPA 8270C	N/A	17,000	173. J ug/kg DRY	55.1 ug/kg*	08/04/15
Phenanthrene	EPA 8270C	NL	300,000,000	8490 ug/kg DRY	37.4 ug/kg*	08/04/15
Pyrene	EPA 8270C	1,700,000	18,000,000	14500 ug/kg DRY	397 ug/kg*	08/07/15
GAS CHROMATOGRAPHY						
Aroclor 1016	EPA 8082A	N/A	NL	ND ug/kg DRY	5.65 ug/kg*	08/04/15
Aroclor 1221	EPA 8082A	NL	NL	ND ug/kg DRY	6.46 ug/kg*	08/04/15
Aroclor 1232	EPA 8082A	NL	NL	ND ug/kg DRY	4.30 ug/kg*	08/04/15
Aroclor 1242	EPA 8082A	NL	NL	ND ug/kg DRY	2.07 ug/kg*	08/04/15
Aroclor 1248	EPA 8082A	NL	NL	ND ug/kg DRY	2.35 ug/kg*	08/04/15
Aroclor 1254	EPA 8082A	NL	NL	ND ug/kg DRY	2.19 ug/kg*	08/04/15

PIN: 30706 Serial Number: 4929797

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-1
Sample Description PRINCETON- CC1 GRAB
Samp. Date/Time/Temp 07/28/15 02:50pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY continued						
Aroclor 1260	EPA 8082A	NL	N/A	369 ug/kg DRY	6.43 ug/kg*	08/04/15
Aroclor 1262	EPA 8082A	N/A	N/A	ND ug/kg DRY	2.29 ug/kg*	08/04/15
Aroclor 1268	EPA 8082A	N/A	N/A	ND ug/kg DRY	2.11 ug/kg*	08/04/15

Sample Comments | Result Qualifiers:
For 8082A PCB analysis, the recoveries of Aroclor 1254 in the Matrix Spike (MS) (374%) and the Matrix Spike Duplicate (MSD) (212%) were above the method control limits of 70 to 130% due to matrix effects. The Relative Percent Difference (RPD) of Aroclor 1254 in the MS/MSD (55%) was above the method control limits of 0 to 20% due to matrix effects. The sample has a detected hit for Aroclor 1260 which overlaps Aroclor 1254 and is impacting the recoveries.

For the 8270C fraction, a dilution was required to be performed on this sample because of the sample matrix and/or interferences by nontarget compounds. The surrogate recoveries may have been impacted. The RLs have been adjusted to reflect the dilution.

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-2
Sample Description CC2 GRAB
Samp. Date/Time/Temp 07/28/15 02:55pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	90.21 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES						
2-Methylnaphthalene	EPA 8270C	230,000	N/A	221. J ug/kg DRY	42.3 ug/kg*	08/04/15
Acenaphthene	EPA 8270C	3,400,000	37,000,000	1600 ug/kg DRY	31.5 ug/kg*	08/04/15
Acenaphthylene	EPA 8270C	NL	300,000,000	ND ug/kg DRY	30.9 ug/kg*	08/04/15
Anthracene	EPA 8270C	17,000,000	30,000,000	3230 ug/kg DRY	34.7 ug/kg*	08/04/15
Benzo(a)anthracene	EPA 8270C	600	2,000	6460 ug/kg DRY	311 ug/kg*	08/07/15
Benzo(a)pyrene	EPA 8270C	200	200	4930 ug/kg DRY	316 ug/kg*	08/07/15
Benzo(b)fluoranthene	EPA 8270C	600	2,000	5820 ug/kg DRY	297 ug/kg*	08/07/15
Benzo(g,h,i)perylene	EPA 8270C	380,000,000	30,000,000	2150 J ug/kg DRY	324 ug/kg*	08/07/15
Benzo(k)fluoranthene	EPA 8270C	6,000	23,000	4670 ug/kg DRY	318 ug/kg*	08/07/15
Chrysene	EPA 8270C	62,000	230,000	6630 ug/kg DRY	297 ug/kg*	08/07/15
Dibenz(a,h)anthracene	EPA 8270C	200	200	1010 J ug/kg DRY	266 ug/kg*	08/07/15
Fluoranthene	EPA 8270C	2,300,000	24,000,000	19200 ug/kg DRY	305 ug/kg*	08/07/15
Fluorene	EPA 8270C	2,300,000	24,000,000	1090 ug/kg DRY	29.5 ug/kg*	08/04/15
Indeno(1,2,3-cd)pyrene	EPA 8270C	600	2,000	2010 J ug/kg DRY	344 ug/kg*	08/07/15
Naphthalene	EPA 8270C	N/A	17,000	443 ug/kg DRY	52.0 ug/kg*	08/04/15
Phenanthrene	EPA 8270C	NL	300,000,000	17300 ug/kg DRY	353 ug/kg*	08/07/15
Pyrene	EPA 8270C	1,700,000	18,000,000	17100 ug/kg DRY	375 ug/kg*	08/07/15
GAS CHROMATOGRAPHY						
Aroclor 1016	EPA 8082A	N/A	NL	ND ug/kg DRY	5.33 ug/kg*	08/04/15
Aroclor 1221	EPA 8082A	NL	NL	ND ug/kg DRY	6.10 ug/kg*	08/04/15
Aroclor 1232	EPA 8082A	NL	NL	ND ug/kg DRY	4.06 ug/kg*	08/04/15
Aroclor 1242	EPA 8082A	NL	NL	ND ug/kg DRY	1.95 ug/kg*	08/04/15
Aroclor 1248	EPA 8082A	NL	NL	ND ug/kg DRY	2.22 ug/kg*	08/04/15
Aroclor 1254	EPA 8082A	NL	NL	ND ug/kg DRY	2.06 ug/kg*	08/04/15
Aroclor 1260	EPA 8082A	NL	N/A	270 ug/kg DRY	6.06 ug/kg*	08/04/15
Aroclor 1262	EPA 8082A	N/A	N/A	ND ug/kg DRY	2.16 ug/kg*	08/04/15
Aroclor 1268	EPA 8082A	N/A	N/A	ND ug/kg DRY	2.00 ug/kg*	08/04/15

Sample Comments | Result Qualifiers:
For the 8270C fraction, a dilution was required to be performed on this sample because of the sample matrix and/or interferences by nontarget compounds. The surrogate recoveries may have been impacted. The RLs have been adjusted to reflect the dilution.

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

PIN: 30706 Serial Number: 4929797

Eurofins QC, Inc.

Analytical Report

Printed 08/10/15 17:58

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-3
Sample Description CC3 GRAB
Samp. Date/Time/Temp 07/28/15 03:10pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	84.05 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES						
2-Methylnaphthalene	EPA 8270C	230,000	N/A	256. J ug/kg DRY	45.4 ug/kg*	08/04/15
Acenaphthene	EPA 8270C	3,400,000	37,000,000	1650 ug/kg DRY	33.8 ug/kg*	08/04/15
Acenaphthylene	EPA 8270C	NL	300,000,000	ND ug/kg DRY	33.2 ug/kg*	08/04/15
Anthracene	EPA 8270C	17,000,000	30,000,000	4050 ug/kg DRY	37.2 ug/kg*	08/04/15
Benzo(a)anthracene	EPA 8270C	600	2,000	7140 ug/kg DRY	334 ug/kg*	08/07/15
Benzo(a)pyrene	EPA 8270C	200	200	5240 ug/kg DRY	339 ug/kg*	08/07/15
Benzo(b)fluoranthene	EPA 8270C	600	2,000	5440 ug/kg DRY	319 ug/kg*	08/07/15
Benzo(g,h,i)perylene	EPA 8270C	380,000,000	30,000,000	2250 J ug/kg DRY	347 ug/kg*	08/07/15
Benzo(k)fluoranthene	EPA 8270C	6,000	23,000	5730 ug/kg DRY	341 ug/kg*	08/07/15
Chrysene	EPA 8270C	62,000	230,000	7230 ug/kg DRY	319 ug/kg*	08/07/15
Dibenz(a,h)anthracene	EPA 8270C	200	200	1070 J ug/kg DRY	286 ug/kg*	08/07/15
Fluoranthene	EPA 8270C	2,300,000	24,000,000	22500 ug/kg DRY	327 ug/kg*	08/07/15
Fluorene	EPA 8270C	2,300,000	24,000,000	1130 ug/kg DRY	31.6 ug/kg*	08/04/15
Indeno(1,2,3-cd)pyrene	EPA 8270C	600	2,000	2200 J ug/kg DRY	369 ug/kg*	08/07/15
Naphthalene	EPA 8270C	N/A	17,000	401 ug/kg DRY	55.8 ug/kg*	08/04/15
Phenanthrene	EPA 8270C	NL	300,000,000	21000 ug/kg DRY	378 ug/kg*	08/07/15
Pyrene	EPA 8270C	1,700,000	18,000,000	21400 ug/kg DRY	402 ug/kg*	08/07/15
GAS CHROMATOGRAPHY						
Aroclor 1016	EPA 8082A	N/A	NL	ND ug/kg DRY	5.72 ug/kg*	08/04/15
Aroclor 1221	EPA 8082A	NL	NL	ND ug/kg DRY	6.54 ug/kg*	08/04/15
Aroclor 1232	EPA 8082A	NL	NL	ND ug/kg DRY	4.35 ug/kg*	08/04/15
Aroclor 1242	EPA 8082A	NL	NL	ND ug/kg DRY	2.09 ug/kg*	08/04/15
Aroclor 1248	EPA 8082A	NL	NL	ND ug/kg DRY	2.38 ug/kg*	08/04/15
Aroclor 1254	EPA 8082A	NL	NL	ND ug/kg DRY	2.21 ug/kg*	08/04/15
Aroclor 1260	EPA 8082A	NL	N/A	267 ug/kg DRY	6.51 ug/kg*	08/04/15
Aroclor 1262	EPA 8082A	N/A	N/A	ND ug/kg DRY	2.32 ug/kg*	08/04/15
Aroclor 1268	EPA 8082A	N/A	N/A	ND ug/kg DRY	2.14 ug/kg*	08/04/15

Sample Comments | Result Qualifiers:
For the 8270C fraction, a dilution was required to be performed on this sample because of the sample matrix and/or interferences by nontarget compounds. The surrogate recoveries may have been impacted. The RLs have been adjusted to reflect the dilution.

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

PIN: 30706 Serial Number: 4929797

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-4
Sample Description CC4 GRAB
Samp. Date/Time/Temp 07/28/15 03:15pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	82.85 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES						
2-Methylnaphthalene	EPA 8270C	230,000	N/A	390 ug/kg DRY	46.1 ug/kg*	08/04/15
Acenaphthene	EPA 8270C	3,400,000	37,000,000	2700 ug/kg DRY	34.3 ug/kg*	08/04/15
Acenaphthylene	EPA 8270C	NL	300,000,000	36.5 J ug/kg DRY	33.7 ug/kg*	08/04/15
Anthracene	EPA 8270C	17,000,000	30,000,000	5480 ug/kg DRY	37.8 ug/kg*	08/04/15
Benzo(a)anthracene	EPA 8270C	600	2,000	10400 ug/kg DRY	678 ug/kg*	08/10/15
Benzo(a)pyrene	EPA 8270C	200	200	7250 ug/kg DRY	688 ug/kg*	08/10/15
Benzo(b)fluoranthene	EPA 8270C	600	2,000	8180 ug/kg DRY	647 ug/kg*	08/10/15
Benzo(g,h,i)perylene	EPA 8270C	380,000,000	30,000,000	3130 J ug/kg DRY	705 ug/kg*	08/10/15
Benzo(k)fluoranthene	EPA 8270C	6,000	23,000	6120 ug/kg DRY	693 ug/kg*	08/10/15
Chrysene	EPA 8270C	62,000	230,000	10800 ug/kg DRY	647 ug/kg*	08/10/15
Dibenz(a,h)anthracene	EPA 8270C	200	200	1660 J ug/kg DRY	579 ug/kg*	08/10/15
Fluoranthene	EPA 8270C	2,300,000	24,000,000	33400 ug/kg DRY	664 ug/kg*	08/10/15
Fluorene	EPA 8270C	2,300,000	24,000,000	1670 ug/kg DRY	32.1 ug/kg*	08/04/15
Indeno(1,2,3-cd)pyrene	EPA 8270C	600	2,000	3120 J ug/kg DRY	748 ug/kg*	08/10/15
Naphthalene	EPA 8270C	N/A	17,000	990 ug/kg DRY	56.6 ug/kg*	08/04/15
Phenanthrene	EPA 8270C	NL	300,000,000	31800 ug/kg DRY	768 ug/kg*	08/10/15
Pyrene	EPA 8270C	1,700,000	18,000,000	25000 ug/kg DRY	816 ug/kg*	08/10/15
GAS CHROMATOGRAPHY						
Aroclor 1016	EPA 8082A	N/A	NL	ND ug/kg DRY	29.0 ug/kg*	08/05/15
Aroclor 1221	EPA 8082A	NL	NL	ND ug/kg DRY	33.2 ug/kg*	08/05/15
Aroclor 1232	EPA 8082A	NL	NL	ND ug/kg DRY	22.1 ug/kg*	08/05/15
Aroclor 1242	EPA 8082A	NL	NL	ND ug/kg DRY	10.6 ug/kg*	08/05/15
Aroclor 1248	EPA 8082A	NL	NL	ND ug/kg DRY	12.1 ug/kg*	08/05/15
Aroclor 1254	EPA 8082A	NL	NL	ND ug/kg DRY	11.2 ug/kg*	08/05/15
Aroclor 1260	EPA 8082A	NL	N/A	392 ug/kg DRY	33.0 ug/kg*	08/05/15
Aroclor 1262	EPA 8082A	N/A	N/A	ND ug/kg DRY	11.8 ug/kg*	08/05/15
Aroclor 1268	EPA 8082A	N/A	N/A	ND ug/kg DRY	10.9 ug/kg*	08/05/15

Sample Comments | Result Qualifiers:

A dilution was required to be performed on this sample because of the sample matrix and/or interferences by non-target compounds. The surrogate recoveries may have been impacted. The RL's have been adjusted to reflect the dilution.
For the 8270C fraction, a dilution was required to be performed on this sample because of the sample matrix and/or interferences by nontarget compounds. The surrogate recoveries may have been impacted. The RLs have been adjusted to reflect the dilution.

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

PIN: 30706 Serial Number: 4929797

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-5
Sample Description CC5 GRAB
Samp. Date/Time/Temp 07/28/15 03:20pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	85.21 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES						
2-Methylnaphthalene	EPA 8270C	230,000	N/A	1320 ug/kg DRY	44.8 ug/kg*	08/04/15
Acenaphthene	EPA 8270C	3,400,000	37,000,000	6670 ug/kg DRY	33.3 ug/kg*	08/04/15
Acenaphthylene	EPA 8270C	NL	300,000,000	89.5 J ug/kg DRY	32.7 ug/kg*	08/04/15
Anthracene	EPA 8270C	17,000,000	30,000,000	18900 ug/kg DRY	735 ug/kg*	08/10/15
Benzo(a)anthracene	EPA 8270C	600	2,000	24300 ug/kg DRY	660 ug/kg*	08/10/15
Benzo(a)pyrene	EPA 8270C	200	200	16600 ug/kg DRY	669 ug/kg*	08/10/15
Benzo(b)fluoranthene	EPA 8270C	600	2,000	15400 ug/kg DRY	629 ug/kg*	08/10/15
Benzo(g,h,i)perylene	EPA 8270C	380,000,000	30,000,000	6900 ug/kg DRY	685 ug/kg*	08/10/15
Benzo(k)fluoranthene	EPA 8270C	6,000	23,000	16600 ug/kg DRY	674 ug/kg*	08/10/15
Chrysene	EPA 8270C	62,000	230,000	23400 ug/kg DRY	629 ug/kg*	08/10/15
Dibenz(a,h)anthracene	EPA 8270C	200	200	3510 J ug/kg DRY	563 ug/kg*	08/10/15
Fluoranthene	EPA 8270C	2,300,000	24,000,000	74300 ug/kg DRY	645 ug/kg*	08/10/15
Fluorene	EPA 8270C	2,300,000	24,000,000	4170 ug/kg DRY	31.2 ug/kg*	08/04/15
Indeno(1,2,3-cd)pyrene	EPA 8270C	600	2,000	6190 ug/kg DRY	728 ug/kg*	08/10/15
Naphthalene	EPA 8270C	N/A	17,000	2380 ug/kg DRY	55.0 ug/kg*	08/04/15
Phenanthrene	EPA 8270C	NL	300,000,000	75700 ug/kg DRY	746 ug/kg*	08/10/15
Pyrene	EPA 8270C	1,700,000	18,000,000	58100 ug/kg DRY	793 ug/kg*	08/10/15
GAS CHROMATOGRAPHY						
Aroclor 1016	EPA 8082A	N/A	NL	ND ug/kg DRY	5.64 ug/kg*	08/04/15
Aroclor 1221	EPA 8082A	NL	NL	ND ug/kg DRY	6.45 ug/kg*	08/04/15
Aroclor 1232	EPA 8082A	NL	NL	ND ug/kg DRY	4.30 ug/kg*	08/04/15
Aroclor 1242	EPA 8082A	NL	NL	ND ug/kg DRY	2.07 ug/kg*	08/04/15
Aroclor 1248	EPA 8082A	NL	NL	ND ug/kg DRY	2.35 ug/kg*	08/04/15
Aroclor 1254	EPA 8082A	NL	NL	ND ug/kg DRY	2.18 ug/kg*	08/04/15
Aroclor 1260	EPA 8082A	NL	N/A	ND ug/kg DRY	6.42 ug/kg*	08/04/15
Aroclor 1262	EPA 8082A	N/A	N/A	ND ug/kg DRY	2.29 ug/kg*	08/04/15
Aroclor 1268	EPA 8082A	N/A	N/A	ND ug/kg DRY	2.11 ug/kg*	08/04/15

Sample Comments | Result Qualifiers:
For the 8270C fraction, a dilution was required to be performed on this sample because of the sample matrix and/or interferences by nontarget compounds. The surrogate recoveries may have been impacted. The RLs have been adjusted to reflect the dilution.

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

PIN: 30706 Serial Number: 4929797

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-6
Sample Description SP-CC-1 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:30pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Chromium, hexavalent	EPA 3060A/7196A	240	20	0.634 J mg/kg DRY	0.173 mg/kg*	07/31/15
Cyanide, total	EPA 9010/9014	1,600	23,000	0.850 J mg/kg DRY	0.423 mg/kg*	07/30/15
Total Solids Percent	SM 2540G	N/A	N/A	92.91 %	0.01000 %	07/29/15
METALS						
Aluminum	EPA 6010C	78,000	NL	10600 mg/kg DRY	6.60 mg/kg*	08/03/15
Antimony	EPA 6010C	31	450	2.50 mg/kg DRY	1.51 mg/kg*	08/03/15
Arsenic	EPA 6010C	19	19	12.4 mg/kg DRY	0.460 mg/kg*	08/03/15
Barium	EPA 6010C	16,000	59,000	95.5 mg/kg DRY	0.154 mg/kg*	08/03/15
Beryllium	EPA 6010C	16	140	0.495 mg/kg DRY	0.0236 mg/kg*	08/03/15
Cadmium	EPA 6010C	78	78	ND mg/kg DRY	0.0804 mg/kg*	08/03/15
Calcium	EPA 6010C	N/A	N/A	99200 mg/kg DRY	3.23 mg/kg*	08/03/15
Chromium	EPA 6010C	N/A	N/A	34.7 mg/kg DRY	0.267 mg/kg*	08/03/15
Cobalt	EPA 6010C	1,600	590	6.32 mg/kg DRY	0.173 mg/kg*	08/03/15
Copper	EPA 6010C	3,100	45,000	36.8 mg/kg DRY	0.322 mg/kg*	08/03/15
Iron	EPA 6010C	N/A	N/A	13600 mg/kg DRY	2.07 mg/kg*	08/03/15
Lead	EPA 6010C	400	800	49.3 mg/kg DRY	0.741 mg/kg*	08/03/15
Magnesium	EPA 6010C	N/A	N/A	8620 mg/kg DRY	3.08 mg/kg*	08/03/15
Manganese	EPA 6010C	11,000	5,900	307 mg/kg DRY	0.142 mg/kg*	08/03/15
Nickel	EPA 6010C	1,600	23,000	17.3 mg/kg DRY	0.185 mg/kg*	08/03/15
Potassium	EPA 6010C	N/A	N/A	2200 mg/kg DRY	15.8 mg/kg*	08/03/15
Selenium	EPA 6010C	390	5,700	ND mg/kg DRY	1.41 mg/kg*	08/03/15
Silver	EPA 6010C	390	5,700	ND mg/kg DRY	0.0855 mg/kg*	08/03/15
Sodium	EPA 6010C	N/A	N/A	1010 mg/kg DRY	12.9 mg/kg*	08/03/15
Thallium	EPA 6010C	5	79	ND mg/kg DRY	0.194 mg/kg*	08/03/15
Vanadium	EPA 6010C	78	1,100	27.9 mg/kg DRY	0.174 mg/kg*	08/03/15
Zinc	EPA 6010C	23,000	110,000	290 mg/kg DRY	0.961 mg/kg*	08/03/15
Mercury	EPA 7471B	23	65	0.136 mg/kg DRY	0.0377 mg/kg*	07/31/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES						
1,2,4,5-Tetrachlorobenzene	EPA 8270C	N/A	N/A	ND ug/kg DRY	41.2 ug/kg*	08/04/15
1,2,4-Trichlorobenzene	EPA 8270C	73,000	820,000	ND ug/kg DRY	52.5 ug/kg*	08/04/15
1,2-Dichlorobenzene	EPA 8270C	5,300,000	59,000,000	ND ug/kg DRY	55.9 ug/kg*	08/04/15
1,2-Diphenylhydrazine	EPA 8270C	700	2,000	ND ug/kg DRY	32.8 ug/kg*	08/04/15
1,3-Dichlorobenzene	EPA 8270C	5,300,000	59,000,000	ND ug/kg DRY	55.8 ug/kg*	08/04/15
1,4-Dichlorobenzene	EPA 8270C	5,000	13,000	ND ug/kg DRY	52.3 ug/kg*	08/04/15
2,3,4,6-Tetrachlorophenol	EPA 8270C	N/A	N/A	ND ug/kg DRY	26.2 ug/kg*	08/04/15
2,4,5-Trichlorophenol	EPA 8270C	6,100,000	68,000,000	ND ug/kg DRY	28.8 ug/kg*	08/04/15
2,4,6-Trichlorophenol	EPA 8270C	19,000	74,000	ND ug/kg DRY	30.2 ug/kg*	08/04/15
2,4-Dichlorophenol	EPA 8270C	180,000	2,100,000	ND ug/kg DRY	65.0 ug/kg*	08/04/15
2,4-Dimethylphenol	EPA 8270C	1,200,000	14,000,000	ND ug/kg DRY	30.7 ug/kg*	08/04/15
2,4-Dinitrophenol	EPA 8270C	120,000	1,400,000	ND ug/kg DRY	147 ug/kg*	08/04/15
2,4-Dinitrotoluene	EPA 8270C	700	1,500	ND ug/kg DRY	34.5 ug/kg*	08/04/15

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-6
Sample Description SP-CC-1 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:30pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES continued						
2,6-Dinitrotoluene	EPA 8270C	700	1,500	ND ug/kg DRY	30.1 ug/kg*	08/04/15
2-Chloronaphthalene	EPA 8270C	N/A	N/A	ND ug/kg DRY	30.5 ug/kg*	08/04/15
2-Chlorophenol	EPA 8270C	310,000	2,200,000	ND ug/kg DRY	37.6 ug/kg*	08/04/15
2-Methylnaphthalene	EPA 8270C	230,000	N/A	238. J ug/kg DRY	41.1 ug/kg*	08/04/15
2-Methylphenol	EPA 8270C	310,000	3,400,000	ND ug/kg DRY	37.6 ug/kg*	08/04/15
2-Nitroaniline	EPA 8270C	39,000	23,000,000	ND ug/kg DRY	37.6 ug/kg*	08/04/15
2-Nitrophenol	EPA 8270C	N/A	N/A	ND ug/kg DRY	37.5 ug/kg*	08/04/15
3&4-Methylphenol	EPA 8270C	31,000	340,000	ND ug/kg DRY	57.0 ug/kg*	08/04/15
3,3'-Dichlorobenzidine	EPA 8270C	1,000	4,000	ND ug/kg DRY	820 ug/kg*	08/10/15
3-Nitroaniline	EPA 8270C	N/A	N/A	ND ug/kg DRY	42.2 ug/kg*	08/04/15
4,6-Dinitro-2-methylphenol	EPA 8270C	6,000	68,000	ND ug/kg DRY	29.9 ug/kg*	08/04/15
4-Bromophenyl phenyl ether	EPA 8270C	N/A	N/A	ND ug/kg DRY	32.5 ug/kg*	08/04/15
4-Chloro-3-methylphenol	EPA 8270C	N/A	N/A	ND ug/kg DRY	30.9 ug/kg*	08/04/15
4-Chloroaniline	EPA 8270C	N/A	N/A	ND ug/kg DRY	28.0 ug/kg*	08/04/15
4-Chlorophenyl phenyl ether	EPA 8270C	N/A	N/A	ND ug/kg DRY	28.0 ug/kg*	08/04/15
4-Nitroaniline	EPA 8270C	N/A	N/A	ND ug/kg DRY	32.0 ug/kg*	08/04/15
4-Nitrophenol	EPA 8270C	N/A	N/A	ND ug/kg DRY	35.9 ug/kg*	08/04/15
Acenaphthene	EPA 8270C	3,400,000	37,000,000	1610 ug/kg DRY	30.6 ug/kg*	08/04/15
Acenaphthylene	EPA 8270C	NL	300,000,000	ND ug/kg DRY	30.0 ug/kg*	08/04/15
Acetophenone	EPA 8270C	2,000	5,000	153. J ug/kg DRY	28.7 ug/kg*	08/04/15
Anthracene	EPA 8270C	17,000,000	30,000,000	3480 ug/kg DRY	33.7 ug/kg*	08/04/15
Atrazine	EPA 8270C	210,000	2,400,000	ND ug/kg DRY	40.4 ug/kg*	08/04/15
Benzaldehyde	EPA 8270C	6,100,000	68,000,000	ND ug/kg DRY	208 ug/kg*	08/04/15
Benzidine	EPA 8270C	700	700	ND ug/kg DRY	8050 ug/kg*	08/10/15
Benzo(a)anthracene	EPA 8270C	600	2,000	7800 ug/kg DRY	605 ug/kg*	08/10/15
Benzo(a)pyrene	EPA 8270C	200	200	5740 ug/kg DRY	613 ug/kg*	08/10/15
Benzo(b)fluoranthene	EPA 8270C	600	2,000	5930 ug/kg DRY	577 ug/kg*	08/10/15
Benzo(g,h,i)perylene	EPA 8270C	380,000,000	30,000,000	2340 J ug/kg DRY	629 ug/kg*	08/10/15
Benzo(k)fluoranthene	EPA 8270C	6,000	23,000	5560 ug/kg DRY	618 ug/kg*	08/10/15
Biphenyl	EPA 8270C	3,100,000	34,000,000	112. J ug/kg DRY	26.8 ug/kg*	08/04/15
bis(2-Chloroethoxy)methane	EPA 8270C	N/A	N/A	ND ug/kg DRY	38.2 ug/kg*	08/04/15
bis(2-Chloroethyl) ether	EPA 8270C	400	N/A	ND ug/kg DRY	53.1 ug/kg*	08/04/15
bis(2-Chloroisopropyl) ether	EPA 8270C	23,000	67,000	ND ug/kg DRY	55.5 ug/kg*	08/04/15
bis(2-Ethylhexyl) phthalate	EPA 8270C	35,000	140,000	3170 J ug/kg DRY	590 ug/kg*	08/10/15
Butyl benzyl phthalate	EPA 8270C	1,200,000	14,000,000	5390 ug/kg DRY	700 ug/kg*	08/10/15
Caprolactam	EPA 8270C	31,000,000	340,000,000	ND ug/kg DRY	922 ug/kg*	08/04/15
Carbazole	EPA 8270C	24,000	96,000	1900 ug/kg DRY	33.4 ug/kg*	08/04/15
Chrysene	EPA 8270C	62,000	230,000	8070 ug/kg DRY	577 ug/kg*	08/10/15
Di-n-Butylphthalate	EPA 8270C	6,100,000	68,000,000	177. J ug/kg DRY	30.4 ug/kg*	08/04/15
Di-n-Octylphthalate	EPA 8270C	2,400,000	27,000,000	ND ug/kg DRY	534 ug/kg*	08/10/15
Dibenz(a,h)anthracene	EPA 8270C	200	200	1290 J ug/kg DRY	517 ug/kg*	08/10/15
Dibenzofuran	EPA 8270C	N/A	N/A	1040 ug/kg DRY	28.8 ug/kg*	08/04/15
Diethylphthalate	EPA 8270C	49,000,000	550,000,000	ND ug/kg DRY	32.3 ug/kg*	08/04/15
Dimethylphthalate	EPA 8270C	N/A	N/A	109. J ug/kg DRY	81.3 ug/kg*	08/04/15
Fluoranthene	EPA 8270C	2,300,000	24,000,000	23100 ug/kg DRY	592 ug/kg*	08/10/15

PIN: 30706 Serial Number: 4929797

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-6
Sample Description SP-CC-1 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:30pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES continued						
Fluorene	EPA 8270C	2,300,000	24,000,000	1230 ug/kg DRY	28.6 ug/kg*	08/04/15
Hexachlorobenzene	EPA 8270C	300	1,000	ND ug/kg DRY	39.8 ug/kg*	08/04/15
Hexachlorobutadiene	EPA 8270C	6,000	25,000	ND ug/kg DRY	54.7 ug/kg*	08/04/15
Hexachlorocyclopentadiene	EPA 8270C	45,000	110,000	ND ug/kg DRY	30.5 ug/kg*	08/04/15
Hexachloroethane	EPA 8270C	35,000	140,000	ND ug/kg DRY	41.2 ug/kg*	08/04/15
Indeno(1,2,3-cd)pyrene	EPA 8270C	600	2,000	2320 J ug/kg DRY	667 ug/kg*	08/10/15
Isophorone	EPA 8270C	510,000	2,000,000	ND ug/kg DRY	29.5 ug/kg*	08/04/15
N-Nitroso-di-n-propylamine	EPA 8270C	200	300	ND ug/kg DRY	30.0 ug/kg*	08/04/15
N-Nitrosodimethylamine	EPA 8270C	700	700	ND ug/kg DRY	52.8 ug/kg*	08/04/15
N-Nitrosodiphenylamine	EPA 8270C	99,000	390,000	ND ug/kg DRY	40.1 ug/kg*	08/04/15
Naphthalene	EPA 8270C	N/A	17,000	453 ug/kg DRY	50.5 ug/kg*	08/04/15
Nitrobenzene	EPA 8270C	31,000	340,000	ND ug/kg DRY	53.9 ug/kg*	08/04/15
Pentachlorophenol	EPA 8270C	3,000	10,000	ND ug/kg DRY	48.1 ug/kg*	08/04/15
Phenanthrene	EPA 8270C	NL	300,000,000	21000 ug/kg DRY	685 ug/kg*	08/10/15
Phenol	EPA 8270C	18,000,000	210,000,000	225. J ug/kg DRY	34.5 ug/kg*	08/04/15
Pyrene	EPA 8270C	1,700,000	18,000,000	17600 ug/kg DRY	728 ug/kg*	08/10/15
None Found	EPA 8270C LIB SR	N/A	N/A	ND DRY		08/10/15
Substituted PAH-1	EPA 8270C LIB SR	N/A	N/A	1430 J ug/kg DRY		08/04/15
Substituted PAH-10	EPA 8270C LIB SR	N/A	N/A	359. J ug/kg DRY		08/04/15
Substituted PAH-11	EPA 8270C LIB SR	N/A	N/A	304. J ug/kg DRY		08/04/15
Substituted PAH-12	EPA 8270C LIB SR	N/A	N/A	3180 J ug/kg DRY		08/04/15
Substituted PAH-2	EPA 8270C LIB SR	N/A	N/A	1050 J ug/kg DRY		08/04/15
Substituted PAH-3	EPA 8270C LIB SR	N/A	N/A	902. J ug/kg DRY		08/04/15
Substituted PAH-4	EPA 8270C LIB SR	N/A	N/A	2070 J ug/kg DRY		08/04/15
Substituted PAH-5	EPA 8270C LIB SR	N/A	N/A	612. J ug/kg DRY		08/04/15
Substituted PAH-6	EPA 8270C LIB SR	N/A	N/A	938. J ug/kg DRY		08/04/15
Substituted PAH-7	EPA 8270C LIB SR	N/A	N/A	364. J ug/kg DRY		08/04/15
Substituted PAH-8	EPA 8270C LIB SR	N/A	N/A	540. J ug/kg DRY		08/04/15
Substituted PAH-9	EPA 8270C LIB SR	N/A	N/A	300. J ug/kg DRY		08/04/15
Unknown Alkane-1	EPA 8270C LIB SR	N/A	N/A	449. J ug/kg DRY		08/04/15
Unknown Alkane-2	EPA 8270C LIB SR	N/A	N/A	738. J ug/kg DRY		08/04/15
Unknown Alkane-3	EPA 8270C LIB SR	N/A	N/A	686. J ug/kg DRY		08/04/15
Unknown Alkane-4	EPA 8270C LIB SR	N/A	N/A	316. J ug/kg DRY		08/04/15
Unknown Alkane-5	EPA 8270C LIB SR	N/A	N/A	367. J ug/kg DRY		08/04/15
Unknown Alkane-6	EPA 8270C LIB SR	N/A	N/A	322. J ug/kg DRY		08/04/15
Unknown Biphenyl-1	EPA 8270C LIB SR	N/A	N/A	438. J ug/kg DRY		08/04/15
Unknown Organic Acid-1	EPA 8270C LIB SR	N/A	N/A	4130 J ug/kg DRY		08/04/15
GAS CHROMATOGRAPHY						
4,4'-DDD	EPA 8081B	3,000	13,000	ND ug/kg DRY	0.214 ug/kg*	08/06/15
4,4'-DDE	EPA 8081B	2,000	9,000	15.7 ug/kg DRY	0.279 ug/kg*	08/06/15
4,4'-DDT	EPA 8081B	2,000	8,000	11.4 ug/kg DRY	0.232 ug/kg*	08/06/15
Aldrin	EPA 8081B	40	200	ND ug/kg DRY	0.462 ug/kg*	08/06/15
alpha-BHC	EPA 8081B	100	500	ND ug/kg DRY	0.166 ug/kg*	08/06/15
alpha-Chlordane	EPA 8081B	NL	NL	16.5 ug/kg DRY	0.205 ug/kg*	08/06/15

PIN: 30706 Serial Number: 4929797

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-6
Sample Description SP-CC-1 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:30pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY continued						
beta-BHC	EPA 8081B	400	2,000	ND ug/kg DRY	1.23 ug/kg*	08/06/15
delta-BHC	EPA 8081B	N/A	N/A	ND ug/kg DRY	0.353 ug/kg*	08/06/15
Dieldrin	EPA 8081B	40	200	ND ug/kg DRY	0.198 ug/kg*	08/06/15
Endosulfan I	EPA 8081B	235,000	3,400,000	ND ug/kg DRY	0.177 ug/kg*	08/06/15
Endosulfan II	EPA 8081B	235,000	3,400,000	ND ug/kg DRY	0.190 ug/kg*	08/06/15
Endosulfan sulfate	EPA 8081B	470,000	6,800,000	ND ug/kg DRY	0.355 ug/kg*	08/06/15
Endrin	EPA 8081B	23,000	340,000	ND ug/kg DRY	0.226 ug/kg*	08/06/15
Endrin aldehyde	EPA 8081B	N/A	N/A	ND ug/kg DRY	0.197 ug/kg*	08/06/15
Endrin ketone	EPA 8081B	N/A	N/A	ND ug/kg DRY	0.200 ug/kg*	08/06/15
gamma-BHC (Lindane)	EPA 8081B	400	2,000	ND ug/kg DRY	0.187 ug/kg*	08/06/15
gamma-Chlordane	EPA 8081B	NL	N/A	20.1 ug/kg DRY	0.194 ug/kg*	08/06/15
Heptachlor	EPA 8081B	100	700	2.48 ug/kg DRY	0.216 ug/kg*	08/06/15
Heptachlor epoxide	EPA 8081B	70	300	ND ug/kg DRY	0.198 ug/kg*	08/06/15
Methoxychlor	EPA 8081B	390,000	5,700,000	ND ug/kg DRY	0.250 ug/kg*	08/06/15
Toxaphene	EPA 8081B	600	3,000	ND ug/kg DRY	21.6 ug/kg*	08/06/15
Aroclor 1016	EPA 8082A	N/A	NL	ND ug/kg DRY	25.9 ug/kg*	08/05/15
Aroclor 1221	EPA 8082A	NL	NL	ND ug/kg DRY	29.6 ug/kg*	08/05/15
Aroclor 1232	EPA 8082A	NL	NL	ND ug/kg DRY	19.7 ug/kg*	08/05/15
Aroclor 1242	EPA 8082A	NL	NL	ND ug/kg DRY	9.47 ug/kg*	08/05/15
Aroclor 1248	EPA 8082A	NL	NL	ND ug/kg DRY	10.8 ug/kg*	08/05/15
Aroclor 1254	EPA 8082A	NL	NL	ND ug/kg DRY	10.0 ug/kg*	08/05/15
Aroclor 1260	EPA 8082A	NL	N/A	ND ug/kg DRY	29.4 ug/kg*	08/05/15
Aroclor 1262	EPA 8082A	N/A	N/A	ND ug/kg DRY	10.5 ug/kg*	08/05/15
Aroclor 1268	EPA 8082A	N/A	N/A	ND ug/kg DRY	9.69 ug/kg*	08/05/15

Sample Comments | Result Qualifiers:

A dilution was required to be performed on this sample because of the sample matrix and/or interferences by non-target compounds. The surrogate recoveries may have been impacted. The RL's have been adjusted to reflect the dilution.
For 8081B Pesticides analysis, the recoveries of Alpha BHC (125%), Gamma BHC (126%), Delta BHC (136%), 4,4 DDD (127%), Endrin Aldehyde (124%), Endosulfan Sulfate (125%), and Endrin Ketone (127%) in the closing continuing calibration verification standard (CCV) were above the method control limits of 80 to 120%. The detected results for 4,4 DDD may be biased high. The other listed analytes were not detected in the sample.

For 8081B Pesticides analysis, the recoveries of several analytes in the Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples were outside the laboratory control limits due to matrix effects. The Relative Percent difference of several analytes in the MS/MSD were outside the laboratory control limits due to matrix effects.

For the 8270C analysis, the Continuing Calibration Verification (CCV) analyzed on 8/5/15 recovered the compound Di_n_octylphthalate (125%) above the method criteria (80% to 120%). This compound was not detected in the sample.

For the 8270C analysis, the surrogates 2_Fluorophenol (11% in 1x, 14% in 20x) and 2,4,6_Tribromophenol (0% in both 1x and 20x) recovered below the laboratory control limits (21% to 105%, 11% to 123% respectively) due to matrix effects.

For the 8270C fraction, a dilution was required to be performed on this sample because of the sample matrix and/or interferences by nontarget compounds. The surrogate recoveries may have been impacted. The RLs have been adjusted to reflect the dilution.

PIN: 30706 Serial Number: 4929797

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-6
Sample Description SP-CC-1 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:30pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date

GAS CHROMATOGRAPHY continued

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-7
Sample Description SP-CC-1G GRAB
Samp. Date/Time/Temp 07/28/15 03:35pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	88.37 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY						
EPH, total	NJDEP EPH 10/08	N/A	N/A	275 mg/kg DRY	40.7 mg/kg*	07/29/15

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-8
Sample Description SP-CC-1V GRAB
Samp. Date/Time/Temp 07/28/15 03:40pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	86.06 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; VOLATILES						
1,1,1-Trichloroethane	EPA 8260B	290,000	4,200,000	ND ug/kg DRY	1.07 ug/kg*	07/30/15
1,1,2,2-Tetrachloroethane	EPA 8260B	1,000	3,000	ND ug/kg DRY	1.00 ug/kg*	07/30/15
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 8260B	N/A	N/A	ND ug/kg DRY	1.07 ug/kg*	07/30/15
1,1,2-Trichloroethane	EPA 8260B	2,000	6,000	ND ug/kg DRY	1.07 ug/kg*	07/30/15
1,1-Dichloroethane	EPA 8260B	8,000	24,000	ND ug/kg DRY	1.24 ug/kg*	07/30/15
1,1-Dichloroethene	EPA 8260B	11,000	150,000	ND ug/kg DRY	0.930 ug/kg*	07/30/15
1,2,3-Trichlorobenzene	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.960 ug/kg*	07/30/15
1,2,4-Trichlorobenzene	EPA 8260B	73,000	820,000	ND ug/kg DRY	1.41 ug/kg*	07/30/15
1,2-Dibromo-3-chloropropane	EPA 8260B	80	200	ND ug/kg DRY	0.930 ug/kg*	07/30/15
1,2-Dibromoethane	EPA 8260B	8	40	ND ug/kg DRY	1.31 ug/kg*	07/30/15
1,2-Dichlorobenzene	EPA 8260B	5,300,000	59,000,000	ND ug/kg DRY	1.38 ug/kg*	07/30/15
1,2-Dichloroethane	EPA 8260B	900	3,000	ND ug/kg DRY	1.31 ug/kg*	07/30/15
1,2-Dichloropropane	EPA 8260B	2,000	5,000	ND ug/kg DRY	1.27 ug/kg*	07/30/15
1,3-Dichlorobenzene	EPA 8260B	5,300,000	59,000,000	ND ug/kg DRY	1.48 ug/kg*	07/30/15
1,4-Dichlorobenzene	EPA 8260B	5,000	13,000	ND ug/kg DRY	1.58 ug/kg*	07/30/15
1,4-Dioxane	EPA 8260B	N/A	N/A	ND ug/kg DRY	51.7 ug/kg*	07/30/15
2-Butanone	EPA 8260B	3,100,000	44,000,000	ND ug/kg DRY	3.61 ug/kg*	07/30/15
2-Hexanone	EPA 8260B	N/A	N/A	ND ug/kg DRY	2.06 ug/kg*	07/30/15
4-Methyl-2-pentanone	EPA 8260B	N/A	N/A	ND ug/kg DRY	1.72 ug/kg*	07/30/15
Acetone	EPA 8260B	70,000,000	NL	29.6 J ug/kg DRY	12.6 ug/kg*	07/30/15
Acrolein	EPA 8260B	500	1,000	ND ug/kg DRY	4.78 ug/kg*	07/30/15
Acrylonitrile	EPA 8260B	900	3,000	ND ug/kg DRY	1.55 ug/kg*	07/30/15
Benzene	EPA 8260B	2,000	5,000	ND ug/kg DRY	1.07 ug/kg*	07/30/15
Bromochloromethane	EPA 8260B	N/A	N/A	ND ug/kg DRY	1.44 ug/kg*	07/30/15
Bromodichloromethane	EPA 8260B	1,000	3,000	ND ug/kg DRY	1.27 ug/kg*	07/30/15
Bromoform	EPA 8260B	81,000	280,000	ND ug/kg DRY	1.03 ug/kg*	07/30/15
Bromomethane	EPA 8260B	25,000	59,000	ND ug/kg DRY	3.44 ug/kg*	07/30/15
Carbon disulfide	EPA 8260B	7,800,000	110,000,000	ND ug/kg DRY	2.20 ug/kg*	07/30/15
Carbon tetrachloride	EPA 8260B	600	2,000	ND ug/kg DRY	1.07 ug/kg*	07/30/15
Chlorobenzene	EPA 8260B	510,000	7,400,000	ND ug/kg DRY	1.51 ug/kg*	07/30/15
Chloroethane	EPA 8260B	220,000	1,100,000	ND ug/kg DRY	1.72 ug/kg*	07/30/15
Chloroform	EPA 8260B	600	2,000	ND ug/kg DRY	1.86 ug/kg*	07/30/15
Chloromethane	EPA 8260B	4,000	12,000	ND ug/kg DRY	2.58 ug/kg*	07/30/15
cis-1,2-Dichloroethene	EPA 8260B	230,000	560,000	ND ug/kg DRY	1.17 ug/kg*	07/30/15
cis-1,3-Dichloropropene	EPA 8260B	1,000	3,500	ND ug/kg DRY	1.31 ug/kg*	07/30/15
Cyclohexane	EPA 8260B	N/A	N/A	ND ug/kg DRY	1.20 ug/kg*	07/30/15
Dibromochloromethane	EPA 8260B	3,000	8,000	ND ug/kg DRY	1.10 ug/kg*	07/30/15
Dichlorodifluoromethane	EPA 8260B	490,000	230,000,000	ND ug/kg DRY	0.790 ug/kg*	07/30/15
Ethylbenzene	EPA 8260B	7,800,000	1,110,000,000	ND ug/kg DRY	1.41 ug/kg*	07/30/15
Isopropylbenzene	EPA 8260B	N/A	N/A	ND ug/kg DRY	1.20 ug/kg*	07/30/15

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-8
Sample Description SP-CC-1V GRAB
Samp. Date/Time/Temp 07/28/15 03:40pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY MASS SPECTROMETRY; VOLATILES continued						
m, p-Xylenes	EPA 8260B	NL	NL	ND ug/kg DRY	2.48 ug/kg*	07/30/15
Methyl acetate	EPA 8260B	78,000,000	NL	ND ug/kg DRY	1.07 ug/kg*	07/30/15
Methyl tert-butyl ether (MTBE)	EPA 8260B	110,000	320,000	ND ug/kg DRY	1.27 ug/kg*	07/30/15
Methylcyclohexane	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.860 ug/kg*	07/30/15
Methylene chloride	EPA 8260B	34,000	97,000	ND ug/kg DRY	4.81 ug/kg*	07/30/15
o-Xylene	EPA 8260B	NL	NL	ND ug/kg DRY	1.27 ug/kg*	07/30/15
Styrene	EPA 8260B	90,000	260,000	ND ug/kg DRY	1.20 ug/kg*	07/30/15
tert-Butyl alcohol	EPA 8260B	1,400,000	11,000,000	ND ug/kg DRY	8.73 ug/kg*	07/30/15
Tetrachloroethene	EPA 8260B	2,000	5,000	ND ug/kg DRY	1.17 ug/kg*	07/30/15
Toluene	EPA 8260B	6,300,000	91,000,000	ND ug/kg DRY	1.51 ug/kg*	07/30/15
trans-1,2-Dichloroethene	EPA 8260B	300,000	720,000	ND ug/kg DRY	1.20 ug/kg*	07/30/15
trans-1,3-Dichloropropene	EPA 8260B	1,000	3,500	ND ug/kg DRY	1.24 ug/kg*	07/30/15
Trichloroethene	EPA 8260B	7,000	20,000	ND ug/kg DRY	1.17 ug/kg*	07/30/15
Trichlorofluoromethane	EPA 8260B	23,000,000	340,000,000	ND ug/kg DRY	0.890 ug/kg*	07/30/15
Vinyl chloride	EPA 8260B	700	2,000	ND ug/kg DRY	1.07 ug/kg*	07/30/15
Unknown Alcohol	EPA 8260B LIB SR	N/A	N/A	19.0 J ug/kg DRY		07/30/15

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-9
Sample Description SP-CC-2 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:45pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Chromium, hexavalent	EPA 3060A/7196A	240	20	1.78 mg/kg DRY	0.189 mg/kg*	07/31/15
Cyanide, total	EPA 9010/9014	1,600	23,000	ND mg/kg DRY	0.461 mg/kg*	07/30/15
Total Solids Percent	SM 2540G	N/A	N/A	85.28 %	0.01000 %	07/29/15
METALS						
Aluminum	EPA 6010C	78,000	NL	12800 mg/kg DRY	7.19 mg/kg*	08/03/15
Antimony	EPA 6010C	31	450	1.90 B mg/kg DRY	1.64 mg/kg*	08/03/15
Arsenic	EPA 6010C	19	19	6.38 mg/kg DRY	0.501 mg/kg*	08/03/15
Barium	EPA 6010C	16,000	59,000	86.9 mg/kg DRY	0.168 mg/kg*	08/03/15
Beryllium	EPA 6010C	16	140	0.443 mg/kg DRY	0.0257 mg/kg*	08/03/15
Cadmium	EPA 6010C	78	78	ND mg/kg DRY	0.0876 mg/kg*	08/03/15
Calcium	EPA 6010C	N/A	N/A	74300 mg/kg DRY	3.52 mg/kg*	08/03/15
Chromium	EPA 6010C	N/A	N/A	38.6 mg/kg DRY	0.291 mg/kg*	08/03/15
Cobalt	EPA 6010C	1,600	590	12.0 mg/kg DRY	0.189 mg/kg*	08/03/15
Copper	EPA 6010C	3,100	45,000	38.5 mg/kg DRY	0.351 mg/kg*	08/03/15
Iron	EPA 6010C	N/A	N/A	16800 mg/kg DRY	2.25 mg/kg*	08/03/15
Lead	EPA 6010C	400	800	47.0 mg/kg DRY	0.807 mg/kg*	08/03/15
Magnesium	EPA 6010C	N/A	N/A	7820 mg/kg DRY	3.35 mg/kg*	08/03/15
Manganese	EPA 6010C	11,000	5,900	362 mg/kg DRY	0.155 mg/kg*	08/03/15
Nickel	EPA 6010C	1,600	23,000	34.8 mg/kg DRY	0.202 mg/kg*	08/03/15
Potassium	EPA 6010C	N/A	N/A	2310 mg/kg DRY	17.2 mg/kg*	08/03/15
Selenium	EPA 6010C	390	5,700	ND mg/kg DRY	1.54 mg/kg*	08/03/15
Silver	EPA 6010C	390	5,700	ND mg/kg DRY	0.0931 mg/kg*	08/03/15
Sodium	EPA 6010C	N/A	N/A	1000 mg/kg DRY	14.1 mg/kg*	08/03/15
Thallium	EPA 6010C	5	79	ND mg/kg DRY	0.211 mg/kg*	08/03/15
Vanadium	EPA 6010C	78	1,100	34.9 mg/kg DRY	0.190 mg/kg*	08/03/15
Zinc	EPA 6010C	23,000	110,000	213 mg/kg DRY	1.05 mg/kg*	08/03/15
Mercury	EPA 7471B	23	65	0.410 mg/kg DRY	0.0410 mg/kg*	07/31/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES						
1,2,4,5-Tetrachlorobenzene	EPA 8270C	N/A	N/A	ND ug/kg DRY	44.9 ug/kg*	08/04/15
1,2,4-Trichlorobenzene	EPA 8270C	73,000	820,000	ND ug/kg DRY	57.2 ug/kg*	08/04/15
1,2-Dichlorobenzene	EPA 8270C	5,300,000	59,000,000	ND ug/kg DRY	60.9 ug/kg*	08/04/15
1,2-Diphenylhydrazine	EPA 8270C	700	2,000	ND ug/kg DRY	35.8 ug/kg*	08/04/15
1,3-Dichlorobenzene	EPA 8270C	5,300,000	59,000,000	ND ug/kg DRY	60.7 ug/kg*	08/04/15
1,4-Dichlorobenzene	EPA 8270C	5,000	13,000	ND ug/kg DRY	57.0 ug/kg*	08/04/15
2,3,4,6-Tetrachlorophenol	EPA 8270C	N/A	N/A	ND ug/kg DRY	28.5 ug/kg*	08/04/15
2,4,5-Trichlorophenol	EPA 8270C	6,100,000	68,000,000	ND ug/kg DRY	31.4 ug/kg*	08/04/15
2,4,6-Trichlorophenol	EPA 8270C	19,000	74,000	ND ug/kg DRY	33.0 ug/kg*	08/04/15
2,4-Dichlorophenol	EPA 8270C	180,000	2,100,000	ND ug/kg DRY	70.8 ug/kg*	08/04/15
2,4-Dimethylphenol	EPA 8270C	1,200,000	14,000,000	ND ug/kg DRY	33.4 ug/kg*	08/04/15
2,4-Dinitrophenol	EPA 8270C	120,000	1,400,000	ND ug/kg DRY	161 ug/kg*	08/04/15
2,4-Dinitrotoluene	EPA 8270C	700	1,500	ND ug/kg DRY	37.6 ug/kg*	08/04/15

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-9
Sample Description SP-CC-2 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:45pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES continued						
2,6-Dinitrotoluene	EPA 8270C	700	1,500	ND ug/kg DRY	32.8 ug/kg*	08/04/15
2-Chloronaphthalene	EPA 8270C	N/A	N/A	ND ug/kg DRY	33.2 ug/kg*	08/04/15
2-Chlorophenol	EPA 8270C	310,000	2,200,000	ND ug/kg DRY	40.9 ug/kg*	08/04/15
2-Methylnaphthalene	EPA 8270C	230,000	N/A	178. J ug/kg DRY	44.8 ug/kg*	08/04/15
2-Methylphenol	EPA 8270C	310,000	3,400,000	ND ug/kg DRY	40.9 ug/kg*	08/04/15
2-Nitroaniline	EPA 8270C	39,000	23,000,000	ND ug/kg DRY	40.9 ug/kg*	08/04/15
2-Nitrophenol	EPA 8270C	N/A	N/A	ND ug/kg DRY	40.8 ug/kg*	08/04/15
3&4-Methylphenol	EPA 8270C	31,000	340,000	ND ug/kg DRY	62.1 ug/kg*	08/04/15
3,3'-Dichlorobenzidine	EPA 8270C	1,000	4,000	ND ug/kg DRY	894 ug/kg*	08/10/15
3-Nitroaniline	EPA 8270C	N/A	N/A	ND ug/kg DRY	46.0 ug/kg*	08/04/15
4,6-Dinitro-2-methylphenol	EPA 8270C	6,000	68,000	ND ug/kg DRY	32.6 ug/kg*	08/04/15
4-Bromophenyl phenyl ether	EPA 8270C	N/A	N/A	ND ug/kg DRY	35.4 ug/kg*	08/04/15
4-Chloro-3-methylphenol	EPA 8270C	N/A	N/A	ND ug/kg DRY	33.7 ug/kg*	08/04/15
4-Chloroaniline	EPA 8270C	N/A	N/A	ND ug/kg DRY	30.5 ug/kg*	08/04/15
4-Chlorophenyl phenyl ether	EPA 8270C	N/A	N/A	ND ug/kg DRY	30.5 ug/kg*	08/04/15
4-Nitroaniline	EPA 8270C	N/A	N/A	ND ug/kg DRY	34.8 ug/kg*	08/04/15
4-Nitrophenol	EPA 8270C	N/A	N/A	ND ug/kg DRY	39.2 ug/kg*	08/04/15
Acenaphthene	EPA 8270C	3,400,000	37,000,000	1400 ug/kg DRY	33.3 ug/kg*	08/04/15
Acenaphthylene	EPA 8270C	NL	300,000,000	ND ug/kg DRY	32.7 ug/kg*	08/04/15
Acetophenone	EPA 8270C	2,000	5,000	117. J ug/kg DRY	31.3 ug/kg*	08/04/15
Anthracene	EPA 8270C	17,000,000	30,000,000	3660 ug/kg DRY	36.7 ug/kg*	08/04/15
Atrazine	EPA 8270C	210,000	2,400,000	ND ug/kg DRY	44.0 ug/kg*	08/04/15
Benzaldehyde	EPA 8270C	6,100,000	68,000,000	ND ug/kg DRY	226 ug/kg*	08/04/15
Benzidine	EPA 8270C	700	700	ND ug/kg DRY	8770 ug/kg*	08/10/15
Benzo(a)anthracene	EPA 8270C	600	2,000	7510 ug/kg DRY	659 ug/kg*	08/10/15
Benzo(a)pyrene	EPA 8270C	200	200	4790 J ug/kg DRY	668 ug/kg*	08/10/15
Benzo(b)fluoranthene	EPA 8270C	600	2,000	4650 J ug/kg DRY	629 ug/kg*	08/10/15
Benzo(g,h,i)perylene	EPA 8270C	380,000,000	30,000,000	1800 J ug/kg DRY	685 ug/kg*	08/10/15
Benzo(k)fluoranthene	EPA 8270C	6,000	23,000	5240 J ug/kg DRY	673 ug/kg*	08/10/15
Biphenyl	EPA 8270C	3,100,000	34,000,000	87.9 J ug/kg DRY	29.2 ug/kg*	08/04/15
bis(2-Chloroethoxy)methane	EPA 8270C	N/A	N/A	ND ug/kg DRY	41.6 ug/kg*	08/04/15
bis(2-Chloroethyl) ether	EPA 8270C	400	N/A	ND ug/kg DRY	57.8 ug/kg*	08/04/15
bis(2-Chloroisopropyl) ether	EPA 8270C	23,000	67,000	ND ug/kg DRY	60.5 ug/kg*	08/04/15
bis(2-Ethylhexyl) phthalate	EPA 8270C	35,000	140,000	2770 J ug/kg DRY	643 ug/kg*	08/10/15
Butyl benzyl phthalate	EPA 8270C	1,200,000	14,000,000	17600 ug/kg DRY	762 ug/kg*	08/10/15
Caprolactam	EPA 8270C	31,000,000	340,000,000	ND ug/kg DRY	1000 ug/kg*	08/04/15
Carbazole	EPA 8270C	24,000	96,000	1880 ug/kg DRY	36.4 ug/kg*	08/04/15
Chrysene	EPA 8270C	62,000	230,000	7590 ug/kg DRY	629 ug/kg*	08/10/15
Di-n-Butylphthalate	EPA 8270C	6,100,000	68,000,000	168. J ug/kg DRY	33.1 ug/kg*	08/04/15
Di-n-Octylphthalate	EPA 8270C	2,400,000	27,000,000	ND ug/kg DRY	582 ug/kg*	08/10/15
Dibenz(a,h)anthracene	EPA 8270C	200	200	922. J ug/kg DRY	563 ug/kg*	08/10/15
Dibenzofuran	EPA 8270C	N/A	N/A	962 ug/kg DRY	31.4 ug/kg*	08/04/15
Diethylphthalate	EPA 8270C	49,000,000	550,000,000	ND ug/kg DRY	35.2 ug/kg*	08/04/15
Dimethylphthalate	EPA 8270C	N/A	N/A	ND ug/kg DRY	88.5 ug/kg*	08/04/15
Fluoranthene	EPA 8270C	2,300,000	24,000,000	8840 ug/kg DRY	32.2 ug/kg*	08/04/15

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-9
Sample Description SP-CC-2 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:45pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES continued						
Fluorene	EPA 8270C	2,300,000	24,000,000	948 ug/kg DRY	31.2 ug/kg*	08/04/15
Hexachlorobenzene	EPA 8270C	300	1,000	ND ug/kg DRY	43.4 ug/kg*	08/04/15
Hexachlorobutadiene	EPA 8270C	6,000	25,000	ND ug/kg DRY	59.6 ug/kg*	08/04/15
Hexachlorocyclopentadiene	EPA 8270C	45,000	110,000	ND ug/kg DRY	33.2 ug/kg*	08/04/15
Hexachloroethane	EPA 8270C	35,000	140,000	ND ug/kg DRY	44.9 ug/kg*	08/04/15
Indeno(1,2,3-cd)pyrene	EPA 8270C	600	2,000	1810 J ug/kg DRY	727 ug/kg*	08/10/15
Isophorone	EPA 8270C	510,000	2,000,000	ND ug/kg DRY	32.1 ug/kg*	08/04/15
N-Nitroso-di-n-propylamine	EPA 8270C	200	300	ND ug/kg DRY	32.7 ug/kg*	08/04/15
N-Nitrosodimethylamine	EPA 8270C	700	700	ND ug/kg DRY	57.6 ug/kg*	08/04/15
N-Nitrosodiphenylamine	EPA 8270C	99,000	390,000	ND ug/kg DRY	43.7 ug/kg*	08/04/15
Naphthalene	EPA 8270C	N/A	17,000	284. J ug/kg DRY	55.0 ug/kg*	08/04/15
Nitrobenzene	EPA 8270C	31,000	340,000	ND ug/kg DRY	58.7 ug/kg*	08/04/15
Pentachlorophenol	EPA 8270C	3,000	10,000	ND ug/kg DRY	52.4 ug/kg*	08/04/15
Phenanthrene	EPA 8270C	NL	300,000,000	21900 ug/kg DRY	746 ug/kg*	08/10/15
Phenol	EPA 8270C	18,000,000	210,000,000	223. J ug/kg DRY	37.6 ug/kg*	08/04/15
Pyrene	EPA 8270C	1,700,000	18,000,000	18900 ug/kg DRY	793 ug/kg*	08/10/15
None Found	EPA 8270C LIB SR	N/A	N/A	ND DRY		08/10/15
Substituted PAH-1	EPA 8270C LIB SR	N/A	N/A	469. J ug/kg DRY		08/04/15
Substituted PAH-10	EPA 8270C LIB SR	N/A	N/A	408. J ug/kg DRY		08/04/15
Substituted PAH-11	EPA 8270C LIB SR	N/A	N/A	2990 J ug/kg DRY		08/04/15
Substituted PAH-2	EPA 8270C LIB SR	N/A	N/A	1720 J ug/kg DRY		08/04/15
Substituted PAH-3	EPA 8270C LIB SR	N/A	N/A	1110 J ug/kg DRY		08/04/15
Substituted PAH-4	EPA 8270C LIB SR	N/A	N/A	1510 J ug/kg DRY		08/04/15
Substituted PAH-5	EPA 8270C LIB SR	N/A	N/A	534. J ug/kg DRY		08/04/15
Substituted PAH-6	EPA 8270C LIB SR	N/A	N/A	644. J ug/kg DRY		08/04/15
Substituted PAH-7	EPA 8270C LIB SR	N/A	N/A	447. J ug/kg DRY		08/04/15
Substituted PAH-8	EPA 8270C LIB SR	N/A	N/A	500. J ug/kg DRY		08/04/15
Substituted PAH-9	EPA 8270C LIB SR	N/A	N/A	479. J ug/kg DRY		08/04/15
Unknown Alkane-1	EPA 8270C LIB SR	N/A	N/A	560. J ug/kg DRY		08/04/15
Unknown Aromatic-1	EPA 8270C LIB SR	N/A	N/A	357. J ug/kg DRY		08/04/15
Unknown Organic Acid-1	EPA 8270C LIB SR	N/A	N/A	5470 J ug/kg DRY		08/04/15
GAS CHROMATOGRAPHY						
4,4'-DDD	EPA 8081B	3,000	13,000	ND ug/kg DRY	0.233 ug/kg*	08/06/15
4,4'-DDE	EPA 8081B	2,000	9,000	21.3 ug/kg DRY	0.304 ug/kg*	08/06/15
4,4'-DDT	EPA 8081B	2,000	8,000	14.4 P1 ug/kg DRY	0.253 ug/kg*	08/06/15
Aldrin	EPA 8081B	40	200	ND ug/kg DRY	0.503 ug/kg*	08/06/15
alpha-BHC	EPA 8081B	100	500	ND ug/kg DRY	0.181 ug/kg*	08/06/15
alpha-Chlordane	EPA 8081B	NL	NL	15.7 P1 ug/kg DRY	0.224 ug/kg*	08/06/15
beta-BHC	EPA 8081B	400	2,000	ND ug/kg DRY	1.35 ug/kg*	08/06/15
delta-BHC	EPA 8081B	N/A	N/A	ND ug/kg DRY	0.385 ug/kg*	08/06/15
Dieldrin	EPA 8081B	40	200	ND ug/kg DRY	0.216 ug/kg*	08/06/15
Endosulfan I	EPA 8081B	235,000	3,400,000	ND ug/kg DRY	0.193 ug/kg*	08/06/15
Endosulfan II	EPA 8081B	235,000	3,400,000	ND ug/kg DRY	0.207 ug/kg*	08/06/15
Endosulfan sulfate	EPA 8081B	470,000	6,800,000	ND ug/kg DRY	0.387 ug/kg*	08/06/15

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-9
Sample Description SP-CC-2 COMPOSITE
Samp. Date/Time/Temp 07/28/15 03:45pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY continued						
Endrin	EPA 8081B	23,000	340,000	ND ug/kg DRY	0.247 ug/kg*	08/06/15
Endrin aldehyde	EPA 8081B	N/A	N/A	ND ug/kg DRY	0.215 ug/kg*	08/06/15
Endrin ketone	EPA 8081B	N/A	N/A	ND ug/kg DRY	0.218 ug/kg*	08/06/15
gamma-BHC (Lindane)	EPA 8081B	400	2,000	ND ug/kg DRY	0.204 ug/kg*	08/06/15
gamma-Chlordane	EPA 8081B	NL	N/A	30.1 ug/kg DRY	0.212 ug/kg*	08/06/15
Heptachlor	EPA 8081B	100	700	7.36 ug/kg DRY	0.235 ug/kg*	08/06/15
Heptachlor epoxide	EPA 8081B	70	300	ND ug/kg DRY	0.216 ug/kg*	08/06/15
Methoxychlor	EPA 8081B	390,000	5,700,000	ND ug/kg DRY	0.273 ug/kg*	08/06/15
Toxaphene	EPA 8081B	600	3,000	ND ug/kg DRY	23.5 ug/kg*	08/06/15
Aroclor 1016	EPA 8082A	N/A	NL	ND ug/kg DRY	11.3 ug/kg*	08/05/15
Aroclor 1221	EPA 8082A	NL	NL	ND ug/kg DRY	12.9 ug/kg*	08/05/15
Aroclor 1232	EPA 8082A	NL	NL	ND ug/kg DRY	8.58 ug/kg*	08/05/15
Aroclor 1242	EPA 8082A	NL	NL	ND ug/kg DRY	4.13 ug/kg*	08/05/15
Aroclor 1248	EPA 8082A	NL	NL	ND ug/kg DRY	4.69 ug/kg*	08/05/15
Aroclor 1254	EPA 8082A	NL	NL	ND ug/kg DRY	4.36 ug/kg*	08/05/15
Aroclor 1260	EPA 8082A	NL	N/A	247. P1 ug/kg DRY	12.8 ug/kg*	08/05/15
Aroclor 1262	EPA 8082A	N/A	N/A	ND ug/kg DRY	4.57 ug/kg*	08/05/15
Aroclor 1268	EPA 8082A	N/A	N/A	ND ug/kg DRY	4.22 ug/kg*	08/05/15

Sample Comments | Result Qualifiers:

A dilution was required to be performed on this sample because of the sample matrix and/or interferences by non-target compounds. The surrogate recoveries may have been impacted. The RL's have been adjusted to reflect the dilution.
For 8081B Pesticides analysis, the recoveries of Alpha BHC (125%), Gamma BHC (126%), Delta BHC (136%), 4,4 DDD (127%), Endrin Aldehyde (124%), Endosulfan Sulfate (125%), and Endrin Ketone (127%) in the closing continuing calibration verification standard (CCV) were above the method control limits of 80 to 120%. The detected results for 4,4 DDD may be biased high. The other listed analytes were not detected in the sample.

For 8081B Pesticides analysis, the recovery of Toxaphene (987% in MSD) in the Matrix Spike Duplicate (MSD) sample was outside the laboratory control limits due to matrix effects.

For method EPA 6010C analysis, the recoveries of Aluminum (511% MS, 128% MSD), Antimony (25% MS, 30% MSD), Calcium (0% MS, 197% MSD), Iron (940% MS, 0% MSD), Manganese (41% MS, 3% MSD), Magnesium (131% MS) and Copper(145% MSD) in the Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples were outside the laboratory control limits of 75 to 125% due to either matrix effect or high analyte concentration.

For the 8270C analysis, the Continuing Calibration Verification (CCV) analyzed on 8/5/15 recovered the compound Di_n_octylphthalate (125%) above the method criteria (80% to 120%). This compound was not detected in the sample.

For the 8270C analysis, the surrogate 2,4,6_Tribromophenol (0% in both 1x and 20x) recovered below the laboratory control limits (11% to 123%) due to matrix effects.

For the 8270C fraction, a dilution was required to be performed on this sample because of the sample matrix and/or interferences by nontarget compounds. The surrogate recoveries may have been impacted. The RLs have been adjusted to reflect the dilution.

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

PIN: 30706 Serial Number: 4929797

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-10
Sample Description SP-CC-2G GRAB
Samp. Date/Time/Temp 07/28/15 03:50pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	84.05 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY						
EPH, total	NJDEP EPH 10/08	N/A	N/A	397 mg/kg DRY	42.8 mg/kg*	07/29/15

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-11
Sample Description SP-CC-2V GRAB
Samp. Date/Time/Temp 07/28/15 03:55pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GENERAL CHEMISTRY						
Total Solids Percent	SM 2540G	N/A	N/A	96.42 %	0.01000 %	07/29/15
GAS CHROMATOGRAPHY MASS SPECTROMETRY; VOLATILES						
1,1,1-Trichloroethane	EPA 8260B	290,000	4,200,000	ND ug/kg DRY	0.360 ug/kg*	07/30/15
1,1,2,2-Tetrachloroethane	EPA 8260B	1,000	3,000	ND ug/kg DRY	0.340 ug/kg*	07/30/15
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.360 ug/kg*	07/30/15
1,1,2-Trichloroethane	EPA 8260B	2,000	6,000	ND ug/kg DRY	0.360 ug/kg*	07/30/15
1,1-Dichloroethane	EPA 8260B	8,000	24,000	ND ug/kg DRY	0.420 ug/kg*	07/30/15
1,1-Dichloroethene	EPA 8260B	11,000	150,000	ND ug/kg DRY	0.310 ug/kg*	07/30/15
1,2,3-Trichlorobenzene	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.320 ug/kg*	07/30/15
1,2,4-Trichlorobenzene	EPA 8260B	73,000	820,000	ND ug/kg DRY	0.470 ug/kg*	07/30/15
1,2-Dibromo-3-chloropropane	EPA 8260B	80	200	ND ug/kg DRY	0.310 ug/kg*	07/30/15
1,2-Dibromoethane	EPA 8260B	8	40	ND ug/kg DRY	0.440 ug/kg*	07/30/15
1,2-Dichlorobenzene	EPA 8260B	5,300,000	59,000,000	ND ug/kg DRY	0.460 ug/kg*	07/30/15
1,2-Dichloroethane	EPA 8260B	900	3,000	ND ug/kg DRY	0.440 ug/kg*	07/30/15
1,2-Dichloropropane	EPA 8260B	2,000	5,000	ND ug/kg DRY	0.430 ug/kg*	07/30/15
1,3-Dichlorobenzene	EPA 8260B	5,300,000	59,000,000	ND ug/kg DRY	0.500 ug/kg*	07/30/15
1,4-Dichlorobenzene	EPA 8260B	5,000	13,000	ND ug/kg DRY	0.530 ug/kg*	07/30/15
1,4-Dioxane	EPA 8260B	N/A	N/A	ND ug/kg DRY	17.4 ug/kg*	07/30/15
2-Butanone	EPA 8260B	3,100,000	44,000,000	10.2 J ug/kg DRY	1.21 ug/kg*	07/30/15
2-Hexanone	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.690 ug/kg*	07/30/15
4-Methyl-2-pentanone	EPA 8260B	N/A	N/A	2.25 J ug/kg DRY	0.580 ug/kg*	07/30/15
Acetone	EPA 8260B	70,000,000	NL	57.4 ug/kg DRY	4.24 ug/kg*	07/30/15
Acrolein	EPA 8260B	500	1,000	ND ug/kg DRY	1.61 ug/kg*	07/30/15
Acrylonitrile	EPA 8260B	900	3,000	ND ug/kg DRY	0.520 ug/kg*	07/30/15
Benzene	EPA 8260B	2,000	5,000	ND ug/kg DRY	0.360 ug/kg*	07/30/15
Bromochloromethane	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.490 ug/kg*	07/30/15
Bromodichloromethane	EPA 8260B	1,000	3,000	ND ug/kg DRY	0.430 ug/kg*	07/30/15
Bromoform	EPA 8260B	81,000	280,000	ND ug/kg DRY	0.350 ug/kg*	07/30/15
Bromomethane	EPA 8260B	25,000	59,000	ND ug/kg DRY	1.15 ug/kg*	07/30/15
Carbon disulfide	EPA 8260B	7,800,000	110,000,000	ND ug/kg DRY	0.740 ug/kg*	07/30/15
Carbon tetrachloride	EPA 8260B	600	2,000	ND ug/kg DRY	0.360 ug/kg*	07/30/15
Chlorobenzene	EPA 8260B	510,000	7,400,000	ND ug/kg DRY	0.510 ug/kg*	07/30/15
Chloroethane	EPA 8260B	220,000	1,100,000	ND ug/kg DRY	0.580 ug/kg*	07/30/15
Chloroform	EPA 8260B	600	2,000	ND ug/kg DRY	0.620 ug/kg*	07/30/15
Chloromethane	EPA 8260B	4,000	12,000	ND ug/kg DRY	0.870 ug/kg*	07/30/15
cis-1,2-Dichloroethene	EPA 8260B	230,000	560,000	ND ug/kg DRY	0.390 ug/kg*	07/30/15
cis-1,3-Dichloropropene	EPA 8260B	1,000	3,500	ND ug/kg DRY	0.440 ug/kg*	07/30/15
Cyclohexane	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.400 ug/kg*	07/30/15
Dibromochloromethane	EPA 8260B	3,000	8,000	ND ug/kg DRY	0.370 ug/kg*	07/30/15
Dichlorodifluoromethane	EPA 8260B	490,000	230,000,000	ND ug/kg DRY	0.270 ug/kg*	07/30/15
Ethylbenzene	EPA 8260B	7,800,000	1,110,000,000	ND ug/kg DRY	0.470 ug/kg*	07/30/15
Isopropylbenzene	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.400 ug/kg*	07/30/15

Account No:TE0522, AVALONBAY COMMUNITIES, INC. **P.O. No:** **Inv. No:** 1724628
Project No: TE0522, AVALONBAY COMMUNITIES, INC. **PWSID No:**

Sample ID L5728207-11
Sample Description SP-CC-2V GRAB
Samp. Date/Time/Temp 07/28/15 03:55pm NA C
Sampled by Mara Ploch, Eurofins QC, Inc.
Received Date/Time/Temp 07/28/15 08:22pm 1.5 C **Iced (Y/N):** Y

Parameter	Method	RDCSRS	NRDCSRS	Result	RL	Test Date
GAS CHROMATOGRAPHY MASS SPECTROMETRY; VOLATILES continued						
m, p-Xylenes	EPA 8260B	NL	NL	1.04 J ug/kg DRY	0.830 ug/kg*	07/30/15
Methyl acetate	EPA 8260B	78,000,000	NL	ND ug/kg DRY	0.360 ug/kg*	07/30/15
Methyl tert-butyl ether (MTBE)	EPA 8260B	110,000	320,000	ND ug/kg DRY	0.430 ug/kg*	07/30/15
Methylcyclohexane	EPA 8260B	N/A	N/A	ND ug/kg DRY	0.290 ug/kg*	07/30/15
Methylene chloride	EPA 8260B	34,000	97,000	ND ug/kg DRY	1.62 ug/kg*	07/30/15
o-Xylene	EPA 8260B	NL	NL	0.510 J ug/kg DRY	0.430 ug/kg*	07/30/15
Styrene	EPA 8260B	90,000	260,000	ND ug/kg DRY	0.400 ug/kg*	07/30/15
tert-Butyl alcohol	EPA 8260B	1,400,000	11,000,000	3.15 J ug/kg DRY	2.93 ug/kg*	07/30/15
Tetrachloroethene	EPA 8260B	2,000	5,000	ND ug/kg DRY	0.390 ug/kg*	07/30/15
Toluene	EPA 8260B	6,300,000	91,000,000	ND ug/kg DRY	0.510 ug/kg*	07/30/15
trans-1,2-Dichloroethene	EPA 8260B	300,000	720,000	ND ug/kg DRY	0.400 ug/kg*	07/30/15
trans-1,3-Dichloropropene	EPA 8260B	1,000	3,500	ND ug/kg DRY	0.420 ug/kg*	07/30/15
Trichloroethene	EPA 8260B	7,000	20,000	ND ug/kg DRY	0.390 ug/kg*	07/30/15
Trichlorofluoromethane	EPA 8260B	23,000,000	340,000,000	ND ug/kg DRY	0.300 ug/kg*	07/30/15
Vinyl chloride	EPA 8260B	700	2,000	ND ug/kg DRY	0.360 ug/kg*	07/30/15
Unknown	EPA 8260B LIB SR	N/A	N/A	8.01 J ug/kg DRY		07/30/15

N.J.A.C 7:26 Direct Contact Soil Remediation Standard-Effective 12/2/2008, Residential=RDCSRS, Non-Residential=NRDCSRS.

General Notes:
- A result of "ND" indicates the concentration of the analyte tested was either not detected or below the RLs.
- All analysis, except field tests are conducted in Southampton,PA unless otherwise identified.
- The reported results relate only to the samples.
- Definitions: ND=not detected; NEG=negative; POS=positive; COL=colonies; RLs=Laboratory reporting limits; L/A=laboratory accident; TNTC=too numerous to count.
- A result marked with "DRY" indicates that the result was calculated and reported on a dry weight basis.
- EQC NELAP ID's:PA 09-00131, NJ PA166, NY 11223
- EQC STATE ID's:CT PH-0768, DEA-018, MD 206; Wind Gap: NJ PA001,PA 48-01334;E RUTHERFORD NJ02015;Vineland NJ06005; Reading PA 06-03543.
- All samples are collected as "grab" samples unless otherwise identified.
- MCL=is the EPA recommended "maximum contaminant level" for a parameter, PLs=customer specific permit limits.
- The test results meet all requirements of NELAC unless otherwise specified.
- The report shall not be reproduced except in full without the written consent of the laboratory.

* - The "RLs" represents a reporting/quantitation limit. When an "*" is present in the column identified as the "RLs", it is being reported as a Method Detection Limit (MDL).

QC LABORATORIES
1205 Industrial Blvd. Phone: 215-355-3900
Southampton, PA 18966-0514 Fax: 215-355-7231

CHAIN OF CUSTODY

Page 1 of 2

Lab LIMS No: L5728207

LAB USE ONLY: 1-encores 1-MeOH 2-DI

___ Ascorbic/HCl Vials # ___ HCl Vials
___ $Na_2S_2O_3$
___ Na OH/Zn acetate pH
___ HNO_3 pH
___ H_2SO_4 pH
___ NaOH pH
24 Unpreserved 11-250G, 9-SP&T-5, 1-Bag
___ Hcl pH
1.5 Temp control ice ID# 1m20

MATRIX CODES
DW: DRINKING WATER
GW: GROUND WATER
WW: WASTEWATER
SO: SOIL
SL: SLUDGE
OIL: OIL
SOL: NON SOIL SOLID
MI: MISCELLANEOUS
X: OTHER

Client/Acct. No. Avalon Bay TE0522
Address 517 Route One South
City/State/Zip Iselin, NJ.
Phone/Fax
Client Contact Albert Hronan / Paul Sheer

Bill to/Report to: (if different)
Sampling Site Address: (if different)
P.O. No.
Lab Contact Mara Ploch

PROJECT Princeton

LAB USE ONLY

FIELD ID	Collection Date	Military Time	GRAB	COMP	Matrix Code	Total	Number of Containers	ANALYSIS REQUESTED
CC1	7/28/15	1450	1		X	1	1	PAH (8270), PCB6 (8082)
CC2		1455	1			1	1	
CC3		1510	1			1	1	
CC4		1515	1			1	1	
CC5		1520	1			1	1	
SP-CC-Comp1		1530	1			1	1	TAL/TCL+30, Cr^{+6}, %TS
SP-CC-1G		1535	1			1	1	EPH
SP-CC-1V		1540	1		HNP	3	3	TCL VOC (8260), %TS
SP-CC-Comp2		1545	1			1	1	TAL/TCL+30, Cr^{+6}, %TS
SP-CC-2G		1550	1			1	1	EPH

SAMPLED BY: (Name/Company) Mara Ploch / Cap Test

Verbal/fax data due: 8/6/15
Hardcopy due: ___/___/___

Report Format: ☐ Standard ☐ Forms ☐ Standard + QC ☐ NJ Reduced ☐ Disk

Please call for pricing and availability on rush (<14-21 day) turnaround and on all but standard format.

Field Parameters Analyzed By:
Sig: Date/Time:

FINAL REPORT

SAMPLE CUSTODY EXCHANGES MUST BE DOCUMENTED BELOW. USE FULL LEGAL SIGNATURE, DATE AND MILITARY TIME (24 HOUR CLOCK, I.E. 8AM IS 0800, 4 PM IS 1600)

	RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
1	Cap Test	7/28/15	1750	Cooler # 007		1750
2	007	7/28/15	2105		7/28/15	2105
3						
4						
5						

DELIVERY METHOD: ☐ QC COURIER ☐ CLIENT ☐ UPS ☐ FEDEX ☐ OTHER ___ Custody Seal Number

COMMENTS: X = Crushed Concrete
NJRES/Non RES SRS Excel Spreadsheet.

Hazardous: yes / no

For example to aid completion, see reverse side.

CHAIN OF CUSTODY

Page 2 of 2

QC LABORATORIES
1205 Industrial Blvd.
Southampton, PA 18966-0514
Phone: 215-355-3900
Fax: 215-355-7231

Lab LIMS No: L5728207

LAB USE ONLY: 3-encores, 1-meth, 2-DI

Client/Acct. No.	AVALON BAY / TE0522
Address	Bill to/Report to: (if different)
	Sampling Site Address: (if different)
City/State/Zip	
Phone/Fax	P.O. No.
Client Contact	Albert Hronan / Paul Ste — QC Contact Mara Poch

ANALYSIS REQUESTED

PROJECT: Princeton

FIELD ID	Collection Date	Collection Military Time	GRAB	COMP	Matrix Code	Number of Containers Total	H_2SO_4	HCl	VIALS	HNO_3	NaOH	ZnAc	Unpres	Bact	ANALYSIS REQUESTED
SP CC-2V	7/28/15	1555	X		S	3								3	TCL VOC (8260), %IS

LAB USE ONLY

MATRIX CODES
DW: DRINKING WATER
GW: GROUND WATER
WW: WASTEWATER
SO: SOIL
SL: SLUDGE
OIL: OIL
SOL: NON SOIL SOLID
MI: MISCELLANEOUS
X: OTHER

- # ___ Ascorbic/HCl Vials # ___ HCl Vials
- # ___ $Na_2S_2O_3$
- # ___ Na OH/Zn acetate pH
- # ___ HNO_3 pH
- # ___ H_2SO_4 pH
- # ___ NaOH pH
- # 1 Unpreserved DI9
- # ___ Hcl pH
- # 1-5 Temp control MWS ID# IR#5

Field pH, Temp (C or F), DO, Cl_2, S, Cond. etc.

SAMPLED BY: (Name/Company)

Verbal/fax data due: 8/6/15

Hardcopy due:

Report Format: ☐ Standard ☐ Forms
☐ Standard + QC ☐ NJ Reduced ☐ Disk

Please call for pricing and availability on rush (<14-21 day) turnaround and on all but standard format.

Field Parameters Analyzed By:
Sig:
Date/Time:

SAMPLE CUSTODY EXCHANGES MUST BE DOCUMENTED BELOW. USE FULL LEGAL SIGNATURE, DATE AND MILITARY TIME (24 HOUR CLOCK, I.E. 8AM IS 0800, 4 PM IS 1600)

	DATE	TIME		DATE	TIME
RELINQUISHED BY SAMPLER 1	7/28/15	1750	RECEIVED BY 1 Coder #007	7/28/15	1750
RELINQUISHED BY 2 007	7/28/15	2105	RECEIVED BY 2	7/28/15	2105
RELINQUISHED BY 3	DATE	TIME	RECEIVED BY 3	DATE	TIME
RELINQUISHED BY 4	DATE	TIME	RECEIVED BY 4	DATE	TIME
RELINQUISHED BY 5	DATE	TIME	RECEIVED BY 5	DATE	TIME

DELIVERY METHOD: ☐ QC COURIER ☐ CLIENT ☐ UPS ☐ FEDEX ☐ OTHER ___

Custody Seal Number

COMMENTS: X = Crushed Concrete

Hazardous: yes / no

FINAL REPORT

For example to aid completion, see reverse side.

QC Laboratories

1205 Industrial Highway, Southampton, PA 18966

EAST RUTHERFORD-SOUTHAMPTON

Inter-Laboratory Transport Form: ES072815

Coolers for Transport

To be completed by person sealing coolers					Complete Section Upon Delivery	
Cooler ID No.	Custody Seal No.	Date	Time	Initials	Temp °C	Iced Y/N
MCD 556	072815-1	072815	1825	BRG	2.5	Y
X5	072815-2	072815	1825	BRG	0.9	Y
37	072815-3	072815	1825	BRG	0.5	Y
72	072815-4	072815	1825	BRG	1.4	Y
48	072815-5	072815	1825	BRG	2.7	Y
711	072815-6	7-28-15	1700	AS	0.6	Y
007	072815-7	7/29/15	1825	CP	1.5	Y
F24	072815-8	7-29-15	1825	ACR	0.6	Y

Please Note the Following:

Individual sample chains of custody must accompany this form.

Once a cooler is sealed, custody seals may not be broken until samples are received at the designated QCL laboratory.

Laboratory use only

Custody Seals intact upon receipt? (Y) N Initials: MKJ

List ID of any seal found broken upon receipt below:

A full legal signature is required. Record all times in military time (24-HR Clock; 4:00 PM=1600)

Relinquished by:	Date:	Time:		Received by:	Date:	Time:
[signature]	7/28/15	1830		[signature]	7/28/15	1830
Relinquished by:	Date:	Time:		Received by:	Date:	Time:
[signature]	7/28/15	2105		[signature]	7/28/15	2105
Relinquished by:	Date:	Time:		Received by:	Date:	Time:
Relinquished by:	Date:	Time:		Received by:	Date:	Time:

SIR/RIR/RAW ATTACHMENT E

Stratigraphic Test Pit Logs

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

ATTACHMENT E
Test Pits Descriptions
Former University Medical Center @ Princeton
253 Witherspoon Street, Princeton, Mercer County, New Jersey
SRP PI# 011700, Case 15-09-09-1706-55

(Test Pit study conducted on August 20, 2015)

Test Pit / Sample ID#	Lithological Description
ES-1	0'-2' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). Sample ES-1 at 0.5'-1' 2'-3' Asphalt pavement and subbase. 3'-6' Native material-Brown silty sand and some clay.
ES-2	0'-5' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). 5'-6' Native material - brown silty sand and some clay. Sample ES-2 at 0.5'-1'
ES-3	0'-3.5' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). 3.5'-6' Native material - brown silty sand and some clay. Sample ES-3 at 0'-0.5'
ES-4	0'-7' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). 7'-8' Native material-Brown silty sand and some clay. Sample ES-4 at 1'-1.5'
ES-5	0'-4.5' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). 4.5'-6' Native material – Brown silty sand and some clay. Sample ES-5 at 1.5'-2'
ES-6	0'-2' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). 2'-4' Native material-Brown silty sand and some clay. Sample ES-6 at 1.5'-2'
ES-7	0'-3' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). 3'-6' Native material - brown silty sand and some clay. Sample ES-7 at 2.5'-3'
ES-8	0'-3' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). 3'-6' Native material - brown silty sand and some clay. Sample ES-8 at 2.5'-3'
ES-9	0'-4' Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt). 4'-6' Native material - brown silty sand and some clay. Sample ES-9 at 2.5'-3'

ES-10 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-10 at 2.5’-3’

ES-11 0’-5’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
5’-6’ Native material - brown silty sand and some clay.
Sample ES-11 at 3.5’-4’

ES-12 0’-5’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
5’-6’ Native material - brown silty sand and some clay.
Sample ES-12 at 1.5’-2’

ES-13 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-13 at 2.5’-3’

ES-14 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-14 at 1.5’-2’

ES-15 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-15 at 2.5’-3’

ES-16 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-16 at 1.5’-2’

ES-17 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-17 at 1.5’-2’

ES-18 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-18 at 2.5’-3’

ES-19 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-19 at 2.5’-3’

ES-20 0’-5’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
5’-6’ Native material - brown silty sand and some clay.
Sample ES-20 at 4.5’-5’

ES-21 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-21 at 2.5’-3’

ES-22 0’-3’ Reworked site material (mixture of soil, crushed concrete and brick and crushed asphalt).
3’-6’ Native material - brown silty sand and some clay.
Sample ES-22 at 2.5’-3’