Site Inspection Report

Middlesex Municipal Landfill
Formerly Utilized Sites Remedial Action Program
Middlesex Borough, New Jersey

U. S. Army Corps of Engineers
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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

^{228}**Ac**	actinium (mesothorium2)
ALS	Analytical Laboratory Services
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substance and Disease Report
ATV	all-terrain vehicle
AEC	US Atomic Energy Commission
AOI	Area of Interest
APP	Accident Prevention Plan
bgs	below ground surface
^{214}**B**i	bismuth – 214
BWA	Bureau of Waste Allocation
BZ	breathing zone
CABRERA	Cabrera Services, Inc.
CD	compact disc
CEC	cation exchange capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLASS™	Cabrera Large Area Scanning System
cm	centimeter
cm/s	centimeter per second
COC	Chain of Custody
cpm	count per minute
cps	count per second
CSM	conceptual site model
CQCM	Contractor Quality Control Manager
cm	centimeter(s)
cy	cubic yards
DAC	derived air concentrations
DCB	dechachlorobiphenyl
DGL	down-hole gamma logging
DGPS	Digital GPS
DOE	U.S. Department of Energy
DQCR	Daily Quality Control Report
DOT	U.S. Department of Transportation
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
°F	Fahrenheit
FEMA	Federal Emergency Management Agency
FR	Federal Register
FUSRAP	Formerly Utilized Sites Remedial Action Program
ft	foot (feet)
FSM	Field Site Manager
FSP	Field Sampling Plan
g	gram(s)
gpm	gallons per minute
GPS	Global Positioning System
GWQS	groundwater quality standards
GWS	Gamma Walkover Survey

IAEA	International Atomic Energy Agency
IDW	investigative derived waste
ISV	investigative screening value
keV	kilo-electron volts
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LEL	lower explosive limit
LQAP	laboratory quality assurance plan
m, m^2	meter(s), square meter(s)
mgd	million gallons per day
MARSSIM	Multi Agency Radiation Survey and Site Inspection Manual
MCA	multi-channel analyzer
MCL	maximum contaminant level
MDCR	minimum detectable rate count
MED	Manhattan Engineering District
MGD	million gallons per day
MGM	multi-gas meter
µCi/ml	microcuries per milliter
µg/l	microcuries per gram
MML	Middlesex Municipal Landfill
mR/hr	millirem per hour
m/s	meter per second
MS	matrix spike
MSD	matrix spike duplicate
MSL	mean sea level
MSP	Middlesex Sampling Plant
NAD	normalized absolute difference
NaI (Tl)	Sodium Iodide, Thallium doped
NJ	New Jersey
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJDFGW	NJ Department of Fish, Game, and Wildlife
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon
^{214}Pb	lead (Pb-214)
PCB	polychlorinated biphenyl
pCi,	picoCurie(s),
pCi/g	picoCuries per gram
pCi/l	picoCuries per liter
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
PWP	Project Work Plan
PVC	polyvinyl chloride
QA/QC	Quality Assurance / Quality Control
QAPP	Quality Assurance Project Plan
^{226,228}Ra	radium-226, radium-228
RCRA	Resource Conservation and Recovery Act

RI	Remedial Investigation
RL	reporting limits
ROI	Regions of Interest
ROPC	Radionuclide of Potential Concern
RPP	Radiation Protection Plan
RSI	Radiation Solutions, Inc.
RSO	Radiation Safety Officer
SEL	severe effects level
SI	Site Inspection
SOP	Standard Operating Procedure
SSC	Soil Screening Criteria
SVOC	semivolatile organic compound
SWQS	surface water quality standards
TCLP	Toxicity Characteristic Leaching Procedure
^{234}**Th**	thorium-234
^{208}Tl	thallium-208
TMX	tetrachloro-meta-xylene
^{234,235,238}**U**	Uranium-234, Uranium-235, Uranium-238
U	natural uranium
uCi/ml	micro Curie per milliliter
UFP	Uniform Federal Policy
ug/l	microgram per liter
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VOC	volatile organic compound
$\mathbf{Z_{rep}}$	Replicate Z-score

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EXECUTIVE SUMMARY

Cabrera Services, Inc. (CABRERA) has been contracted by the U.S. Army Corps of Engineers (USACE) to conduct a Site Inspection (SI) at the Middlesex Municipal Landfill (MML) (hereafter referred to as the "Site" or MML) located within the Borough of Middlesex, New Jersey. The primary objective of the SI is to provide sufficient information to determine the need for additional remedial investigation (RI) activities or other actions in accordance with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), based on preliminary site data and field sampling for contamination.

The MML is a 37-acre site located approximately 16 miles southwest of Newark and consists of parcels belonging to the Borough of Middlesex and the Middlesex Presbyterian Church.

In 1984 and 1986, characterization, remedial action, and a final survey were conducted for a five-acre portion at the north end of MML. Between 2001 and 2003 additional investigations identified elevated radiation levels along the south boundary of the landfill as well as metals, pesticides, volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) in soil exceeding the NJDEP direct contact soil screening levels. A 2008 radiological survey of the Site identified small areas of low-level surface radiation leading it to be declared eligible for the FUSRAP in March 2009.

The MML Preliminary Assessment (PA) identified that there is evidence of an unpermitted release and/or threat of release into soil or air of radioactive materials resulting from work performed as part of the Nation's early atomic energy program. The PA also identified that while some materials were disposed of at the Site from the Middlesex Sampling Plant (MSP) any residual non radiological contaminants would be minor, comingled with radiological contamination, or indistinguishable from other landfill wastes. Given the available information and a review of the MML Site operational history, sampling results, and the operations history of the MSP, it is unlikely that chemical contamination at the site is related to the Nation's early atomic energy program. Therefore, chemical sampling as part of the SI was conducted only for waste characterization and health and safety purposes.

In order to investigate the nature and extent of radiological impacts at the Site, the project team implemented the following field tasks:

- Surface Gamma Scan Surveys
- Sampling of surface soils based on the reviews of historical records and the results of surface gamma scans
- Excavation and sampling of soils from test pits
- Biased sampling of subsurface soils based on the results of surface gamma scans and down-hole gamma logging
- Groundwater sampling

Gamma surveys were performed over accessible areas of the Site, including the landfill, municipal and church property as well as the wooded area to the north. The surveys identified four main areas of elevated radionuclide activity.

Prior to initiating field activities, soil investigation screening values (ISVs) were developed for ^{226}Ra, Thorium-232 (^{232}Th) and Uranium-238 (^{238}U) Comparison between the sampling results and the ISVs showed that ^{226}Ra concentrations were greater than the ^{226}Ra ISV for almost all of the surface and subsurface soil samples, and that ^{226}Ra is the more prominent isotope at the Site. Uranium-238 concentrations were also greater than the ^{238}U ISV at several locations common to elevated ^{226}Ra Eleven surface soil samples were analyzed for metals, VOCs, SVOCs, pesticides, herbicides and polychlorinated biphenyls (PCB). These samples were collected for waste characterization and health & safety purposes only. The TCLP results show that there were not any constituents exceeding the RCRA criteria and, thus, the soil would not be considered hazardous waste.

A groundwater sample collected from GP-10 was submitted for the analysis of gross alpha, gross beta, ^{226}Ra, Radium-228 (^{228}Ra), and Uranium. The results were compared to the New Jersey Department of Environmental Protection's standards, which are set at the Maximum Contaminant Limits (MCL) established under the federal Safe Drinking Water Act. Gross alpha, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{232}Th, ^{234}Th, ^{234}U and ^{235}U were not detected above their reporting limits. Previous investigations, however, indicate the potential for on-site shallow groundwater contamination. Groundwater will therefore be further investigated.

Based on the results of the gamma surveys and laboratory analysis of the soil samples, there are five areas of interest (AOIs) that warrant further investigation and are presented on Figure ES-1:

- The southeast portion of the Site parallel to Pershing Avenue (AOI 1)
- The wooded area between the landfill and Bound Brook (AOI 2)
- The interior and surrounding area of former 1984-1986 DOE excavation (AOI 3)
- The central portion of the landfill between AOIs 1 and 2 (AOI 4)
- The northwest portion of the site occupied by the church and municipal building (AOI 5)

The results of the SI identify areas of the MML that warrant further CERCLA investigations or additional data collection

1.0 INTRODUCTION

Cabrera Services, Inc. (CABRERA) has been contracted by the U.S. Army Corps of Engineers (USACE), under Contract No. W912DQ-08-D-0003, Delivery Order 0003, to conduct a Site Inspection (SI) at the Middlesex Municipal Landfill (MML) (hereafter referred to as the "Site" or MML) under the Formerly Utilized Sites Remedial Action Program (FUSRAP). The MML is a 37-acre former landfill located within the Borough of Middlesex, NJ (Figure 1-1). Detailed plans for the investigation activities discussed in this report are presented in the Project Work Plan (PWP) (USACE, 2010a). The PWP is part of the overall project plan, which includes the Field Sampling Plan (FSP) (USACE, 2010b). A stand-alone Quality Assurance Project Plan (QAPP) in accordance with the Uniform Federal Policy (UFP) for QAPPs (USACE, 2010c), Contractor Quality Control (CQC) Plan (USACE, 2010d), and an Accident Prevention Plan (APP)/Radiation Protection Plan (RPP) (USACE, 2010e) have been completed as parts of the overall PWP.

The MML Preliminary Assessment (PA) identified that there is evidence of an unpermitted release and/or threat of release into soil or air of radioactive materials resulting from work performed as part of the Nation's early atomic energy program. The PA also identified that while some materials were disposed of at the Site from Middlesex Sampling Plant any residual non radiological contaminants would be minor, comingled with radiological contamination, or indistinguishable from other landfill wastes. Given the available information and a review of the MML Site operational history, sampling results, and the operations history of the MSP, it is unlikely that chemical contamination at the site is related to the Nation's early atomic energy program. Therefore, chemical sampling as part of the SI was conducted only for waste characterization and health and safety purposes.

1.1 Objectives

The results of previous investigations have identified areas within the boundaries of the Site with elevated radiological contamination. The primary objective of the Site Inspection (SI), based on preliminary site data and field sampling for contamination, is to provide sufficient information to determine the need for a full Remedial Investigation (RI) or other actions in accordance with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The data will also be utilized to distinguish areas of elevated radiological activity compared to background conditions. The following tasks were performed to meet those objectives.

- Surface Gamma Scan Surveys
- Sampling of surface soils based on the reviews of historical records and the results of surface gamma scans
- Excavation and sampling of soils from test pits
- Biased sampling of subsurface soils based on the results of surface gamma scans and down-hole gamma logging
- Groundwater Sampling

1.2 Report Organization

This Site Inspection Report consists of the following sections:

- Section 1.0, Introduction – presents the purpose of the report and report organization
- Section 2.0, Site Description and Activity – contains a physical site, description of site contaminants, Site use history and regulatory status
- Section 3.0, Environmental Setting – summarizes land use and environmental setting for the Site and surrounding properties
- Section 4.0, Field Investigation – describes the sampling strategies and methods used for collecting and analyzing soil samples
- Section 5.0, Site Inspection Results – presents the results of site characterization activities
- Section 6.0, Data Quality Assessment – specifies field and lab documentations for quality assurance and quality control
- Section 7.0, Conceptual Site Model – discusses the fate of contaminants as well as their propensity for transport in environmental media
- Section 8.0, Summary – summarizes the results of the investigation and provides recommendations for future activities
- Section 9.0, References – lists citations

2.0 SITE DESCRIPTION AND ACTIVITY

The following subsections provide a physical description of the Site and immediate surroundings, including potential source areas. Additional sections discuss Site ownership and past and present processes, along with programmatic activities.

2.1 Location and Physical Description

The MML is located in the Borough of Middlesex, New Jersey, approximately 16 miles southwest of Newark (Figure 1-1). The Borough of Middlesex is located in the northwest corner of Middlesex County with the geographic coordinates of approximately 40º 34' 36" N latitude, 74 º 29' 43" W longitudes. Middlesex County is located in the center of New Jersey and stretches from the Rahway River south to Mercer and Monmouth Counties and from Raritan Bay on the Atlantic Ocean west to Somerset County.

The Site is bounded on the south by Mountain Avenue, on the southeast by Pershing Avenue, and on the west by the Municipal Building and Recycling Center. Bound Brook provides the northern boundary of the former landfill. Chain-link fencing delineates portions of the south and east perimeters. The Site consists of parcels belonging to the Borough of Middlesex and the Middlesex Presbyterian Church and occupies approximately 37 acres (Figure 2-1). The first lot, belonging to the Middlesex Presbyterian Church, is located at 1190 Mountain Avenue and is identified as Block 219, Lot 1. The second lot, which includes the remaining Municipal Landfill and the wooded area along Bound Brook, is located on Mountain Avenue and is identified as Block 219, Lot 2.

The Site surface is generally flat; however, depressions measuring up to 50 yards across have developed from differential settlement of the buried municipal waste. Along the Site's northern boundary, the elevation decreases towards Bound Brook where the flat flood plain is dominated by a mature forest. The flood plain contains several depressions that are intermittently flooded and range in size from 100 to 300 yards in length. Mature trees and other ground cover remain along the south and east perimeter fence, and there is heavy tree and ground vegetation along Bound Brook on the northern part of the Site. Individual trees and large bushes are also disbursed throughout the central and southern portions of the property. The presence of miscellaneous debris scattered across the Site indicates that local residents continue to use the Site for disposal of household trash.

The Site is readily accessible to unauthorized foot traffic and vehicles. Currently the Site is undeveloped.

2.2 Ownership

The Borough of Middlesex has been in possession of the Site as early as the 1930s. The property is listed as Block 219, Lots 1 and 2. In 1963, the approximately five acres of the landfill site sold to the Middlesex Presbyterian Church were used to construct a church on the property. The church property contains a church, playground, and parking lot.

Past/Present Processes

A review of 12 site aerial photographs was conducted during the preparation of a recent Preliminary Assessment (PA) (USACE, 2010f) in order to obtain a better historical understanding of onsite activities and to assist in determining areas for possible investigation.

Photographs from 1931, 1940, 1947, 1956, 1957, 1963, 1970, 1972, 1979, 1987, 1995, 2002, and 2006 were reviewed (NETR 2010). Based on this analysis, the review found that the Site has been open ground with apparent ground disturbances beginning around 1931 and continuing through the early 1970s, when most onsite activities were completed and where minor scarring was apparent. Ground disturbance or activity was not evident after 1979 with the exception of the Department of Energy DOE) removal action in 1987. Notable observations from this review include the following:

- 1931 – Rectangular area of soil disturbance in the north central portion and disturbance along the southern portion of the Site
- 1940 – Small area of fill activity evident in the central portion of Site
- 1947 – Notable large fill activities evident
- 1956 – Fill activities expanding to the north
- 1963 – Fill activities expanding to the south
- 1931, 1970, and 1972 – Ground scarring and possible fill activities along the Site's far southeast border and extending along Pershing Avenue
- 1979 – Revegetated Site with grasses, shrubs, and trees
- 1987 –DOE removal action evident in the area
- 1995 – Revegetated Site with grasses, shrubs, trees

The review of the aerial photographs indicated that the MML was operated as a landfill from approximately 1940 through approximately 1974. Much of the subsurface contains trash and various other waste products as well as significant levels of methane. The landfill was closed following the regulations of the time and maintained with a minimum cover of two feet and establishment of vegetation. Since its closure, the Site has not been developed.

2.3 Potential Contaminant Sources

Based on previous investigations it appears that there are potential source areas of radiological contamination across the Site. At least one of these source areas is a result of the use of potentially contaminated soil from the Middlesex Sampling Plant (MSP).

Between 1943 and 1955, the MSP in the Borough of Middlesex, New Jersey assayed uranium and thorium ores for the Manhattan Engineer District (MED) and the U.S. Atomic Energy Commission (AEC), which were predecessors of the DOE. The Middlesex Sampling Plant site is a current FUSRAP project of the USACE. Although the MML and the MSP are two separate sites designated under FUSRAP, their interrelationship dictates that the following brief history addresses both the MML and the MSP.

During its operational history, the MSP stored drums and ore containers on open ground. Occasionally, handling and transfer operations would result in spillage of small amounts of ore onto the ground surface. Consequently, this area became contaminated through the mixing of small pieces of ore into the soil. In 1948, the Atomic Energy Commission (AEC) decided that this storage area should be paved (Federal Register [FR] 89-10965). The area was graded level prior to being paved with asphalt. The excess soil from the grading operation was transported to the MML. Although there is not any documentation to indicate when the contamination of the

landfill occurred, a review of MSP files documenting operations conducted from 1946 to 1966 indicates the contaminated soil was probably shipped to the landfill between November 1947 and October 1948. This soil, contaminated by previous ore spillage, was dispersed over approximately three to five acres of the landfill and was used as fill or cover material for sanitary landfill operations (DOE, 1989). Based on historical data from the DOE and the location of previous actions at the MML, it is presumed that the soil from the MSP was dispersed within the northern and northwestern portions of the landfill.

Although the MSP actions are the only well documented source of contamination to the MML that are identified in this SI, additional sources are possible and will be evaluated further through the CERCLA process. DOE identified 22 sites within the vicinity of MML that had known radium use (DOE 2008). Additionally, radium was widely used by the medical profession into the 1940's. The site's existence as a publicly available municipal landfill makes it difficult to identify all of the sources of material that was disposed of there. Typical landfill operations that involved material placement and sorting could have resulted in the spread of contaminated materials across the site. Also near the MML Site is an Environmental Protection Agency (EPA) Superfund Site with known chemical contamination which may impact Bound Brook. The EPA has detected PCBs in the surface water and sediments of the Bound Brook, which crosses the site's southeast corner.

2.4 Previous Program Activities

AEC Removal Action

In 1961, the AEC removed the portion of the contaminated materials lying nearest the surface — approximately 650 cubic yards (cy) — and backfilled the excavation with approximately two feet of clean fill. This effort was done to provide two feet of clean barrier between contaminated soils, and was not based on clean up values. Contaminated materials still remained below the two feet of clean fill (AEC, 1961). The soil removed from the excavation was transported to the AEC New Brunswick Laboratory site in New Brunswick, New Jersey (FR, 1989). Additional landfill wastes were placed over the area addressed in 1961.

Bechtel FUSRAP Investigation/Remedial Action

In 1984 and 1986, Bechtel National, Inc. conducted characterization, a remedial action, and a final survey of the impacted portion of the landfill for DOE under FUSRAP (DOE, 1989). These remediation activities addressed about five acres at the north end of an approximately 20-acre site where soil was disposed from the MSP. During the 1984 remedial action, approximately 15,000 cubic yards (cy) of soil were removed from the Site. The volume of soil was greater than anticipated and required an additional removal action in 1986. During this second effort an additional 16,000 cy were removed. Excavated material was transported to an interim storage area at the MSP until final disposition in 1998 and 1999. The Site was then released to the Borough of Middlesex for future unrestricted use.

Middlesex Borough Investigation

In 2001 and 2002, New Jersey Department of Environmental Protection requested that the Borough conduct a radiological survey of the entire landfill. That survey identified elevated radiation levels along the southeast boundary. The source of these elevated radiation levels was not determined, and further characterization of the areas was not performed. The area of

elevated gamma activity was more than 800 feet south of the area remediated by DOE (1984-1986) and did not show up on an airborne radiological survey performed by DOE before the DOE remediation occurred.

Sadat Associates Site Investigation

During 2002 and 2003, RI activities were conducted at the Site on behalf of the Middlesex Borough by Sadat Associates, Inc. (Sadat, 2007). These activities included performance of an surface gamma survey, excavation of test pits, installation of test piezometers and soil gas points, advancing of soil borings, installation of temporary well points, surface water and sediment sampling, and installation and sampling of shallow and bedrock groundwater monitoring wells. The results of the 2002 RI activities were submitted to the NJDEP in May 2003; a final revised report was submitted in August 2007 (Sadat, 2007).

The soil quality data obtained in the investigation did not indicate any exceedances of the NJDEP Soil Screening Criteria (SSC) for volatile organic compounds (VOCs) or polychlorinated biphenyls (PCBs). A series of four composite samples of the landfill cover soil identified polycyclic aromatic hydrocarbons (PAHs) exceedances in two samples, a thallium exceedance in one sample and arsenic and pesticides in one sample.

Soil borings advanced around the Middlesex Municipal Building lot and Middlesex Presbyterian Church did not indicate any exceedances of NJDEP's SSC and delineated the extent of fill materials at the northwestern portion of the Site. The investigation report also stated that the site does not appear to be impacted by radiological constituents above NJDEP SSC. Soil borings advanced at the southern portion of the landfill did not indicate contamination in excess of the NJDEP soil screening criteria; however, two pesticides, aldrin and dieldrin, exceeded the residential and nonresidential soil screening criteria in one boring.

The additional groundwater sampling conducted as part of the 2003 RI activities confirmed exceedances of NJDEP's groundwater quality standards (GWQS) for ammonia, total dissolved solids, metals, and select VOCs in the shallow groundwater. The 2003 groundwater data also indicated significant decreases in concentrations of radiological parameters. While two wells, MW-6 and 81-16, exceeded the screening level for gross alpha and/or gross beta, they did not exceed limits for ^{226}Ra and ^{228}Ra.

For the deep groundwater sampling data, iron and manganese were confirmed to exceed NJDEP GWQS and are believed to be related to natural regional sources. From this data set, a single VOC, carbon tetrachloride, was detected at an estimated concentration which slightly exceeded the GWQS. Based on the 2002 and 2003 remedial investigations, radiological impacts to the deep groundwater at the MML property were not found. The conclusions of the RI indicated that shallow and deep groundwater quality, does not appear to be impacted by radiological constituents.

The results of the RI indicated one pesticide, α-chlordane, slightly exceeded the surface water quality criteria (SWQC) at the Site as well as at one upstream location. This pesticide was believed to be due to regional sources. Further action was not proposed.

Sediment sampling was conducted and results indicate sediments do not require further investigation. Section 7.2.5 provides a detailed explanation of the sediment investigations.

In March 2008, based on the information provided in the RI submitted by Sadat, NJDEP requested that DOE determine if USACE could perform a detailed gamma scan of the entire property in order to confirm site conditions and include, as appropriate, the property in FUSRAP for additional remediation.

DeNuke Survey

In September 2008, the DOE Office of Legacy Management contracted to have a radiological survey of the former MML site performed. DeNuke Contracting Services, Inc. performed a radiological survey of the former MML. The objective of the survey was to identify elevated surface radiation levels. The survey consisted of walkover gamma scans and limited soil sampling at locations identified by the scans.

Areas of concern were identified during the gamma scans in both the northern and southern portions of the former MML — with Radium-226 (^{226}Ra), Thorium-232 (^{232}Th), and uranium-238 (^{238}U) confirmed in both areas but in varying quantities relative to each other.

At the time of the survey, site-specific guideline concentrations for radionuclides in soil had not been developed for the Site. Therefore, it was not possible to compare radiological conditions with current DOE-derived volumetric guidelines. However, this evaluation in 2008 determined that, although small areas of residual radioactive contamination were found, the levels of contamination under conditions of current property use did not pose a health risk to members of the public on or in the vicinity of the MML. The survey demonstrated that there were several small areas of low-level surface radiation in other Site locations.

2.5 Site Regulatory Status

As a result of the March 2008 survey findings, the DOE declared in March of 2009 that the Site was eligible for inclusion into FUSRAP. The DOE then referred the Site to the USACE for appropriate action. The Site is currently identified in the U.S. Environmental Protection Agency (EPA) Superfund Information System by the CERCLIS ID# NJD980505499 and by the NJDEP as Site Number 5655 with Program Interest Number 024189.

In accordance with the Memorandum of Understanding executed between USACE and DOE in March 1999, DOE informed USACE that evaluation of MML may be required and referred the Site to USACE for appropriate action. The USACE has begun the CERCLA process by completing a Preliminary Assessment and this Site Inspection.

3.0 ENVIRONMENTAL SETTING

3.1 Land Use

Land use surrounding the Site includes a mix of residential and non-residential property (Figure 2-1). To the north, east, and south, the land use is predominantly residential with some small commercial use directly to the west, including the Middlesex Borough Police Department offices and an assisted living facility. Land use to the west includes the Middlesex Presbyterian Church (Lot 219-1), the Middlesex Borough Building recycling center (Lot 216-1), and a public library. The church occupies the land from Mountain Avenue northward to a point parallel with the Middlesex Recycling Center as well as land between Westminster Street and Monroe Street.

3.2 Population Estimates

The Borough of Middlesex, occupying an area of approximately four square miles, has seen an increase in population from 13,055 in 1990 to 13,654 in 2009 (U.S. Census Bureau 2010). In 2000, the population per square mile in the eastern portion of the borough (where the Site is located) was 3,759. The western portion of the borough had a population per square mile of 4,068.

Middlesex County encompasses an area of 323 square miles and has a total population of 790,738 based on 2009 data (US Census Bureau, 2010). Similar to the borough, the county has seen a population growth similar to the borough and had a population of 671,780 according to the 1990 census. Based on the 2009 census, the county population per square mile is 2,560.

3.3 Regional Geology

3.3.1 *Surficial Geology*

Middlesex County straddles two physiographic regions: the Piedmont and the Coastal Plain. The two regions are separated by the geologic feature referred to as the Fall Line , which delineates the contact between the older Piedmont soils and the younger Coastal Plain soils (DOE, 1989).

Soil borings performed during previous investigations (Sadat, 2007) reveal that layers of fill, including waste materials and cover, extend to depths up to 20 feet bgs within the landfill. The cover material generally consists of brown silty sand. Other materials observed in these layers include silt, clay and fine-grained sand. The colors of these materials range from black, red, and orange-brown to gray.

Underlying the fill material is Quaternary alluvium consisting primarily of gray, red and brown fine- to medium-grained sand. The alluvium contains occasional lenses of clay and silty clay. A one to five ft thick layer of red clay or dense red silt occurs at the bedrock interface discontinuously across the Site. The Quaternary alluvium consists primarily of sediments deposited in tidal flats and along stretches of non-tidal streams where the gradients are low, such as along the Bound Brook. These alluvial deposits have relatively low permeability, minimizing downward migration, and are generally considered of little to no importance as a source of water supply (DOE, 1989).

3.3.2 *Bedrock Geology*

Underlying the surficial deposits at the Site is the Brunswick Shale of the Passaic formation at depths of between 10 and 20 ft bgs across the Site. The Brunswick Shale is Triassic in age and

predominantly consists of reddish-brown shale interbedded with siltstone, sandstone and black, gray, or greenish shale. This unit weathers to a reddish clay. The shale is generally impermeable; however, it tends to be highly fractured, with many closely spaced joints and bedding planes. The intersecting fractures provide the principle means of storage and movement of groundwater (Sadat, 2007).

3.4 Groundwater Pathway

3.4.1 *Hydrogeology*

Shallow groundwater at MML ranges in depth from five to 21 feet bgs (Sadat, 2007). Groundwater level measurements collected from eight overburden and six bedrock onsite monitoring wells indicate a predominantly northeastern direction of groundwater flow in the overburden and a northern direction of flow in the bedrock.

The uppermost water-bearing zone in the overburden material (including the lower part of the landfill material) is separated from the underlying Passaic Formation bedrock by a layer of lower permeability clay (6.5×10^{-6} to 7.0×10^{-7} centimeter per second [cm/s]) formed from the weathering of the shale bedrock. Because the permeability of the clay layer is not extremely low and both water-bearing zones have nearly the same groundwater level, it is possible that the zones may be partially connected. However, the limited water quality data that are available for comparing the upper and lower aquifers at the Site indicate that there may not be much exchange between the two zones.

The Passaic Formation is the major bedrock aquifer throughout a large part of central and northeastern New Jersey. It is also classified as a Class II-A water supply source under EPA criteria. The shale portion of the Passaic Formation is used for domestic, municipal, and industrial water supply in Middlesex County. Groundwater in the Passaic Formation generally exists under unconfined to partially confined conditions in the upper 200 ft and confined at greater depths. Regionally, well depths range from 30 to 1,500 ft bgs. Common well yield rates of the formation are 10 to 500 gallons per minute (gpm). Well yields have been known to exceed 1,500 gpm. Water is generally hard and may have high concentrations of iron and sulfate (USGS, 1999).

Based on data collected from previous investigations, there is the possibility of shallow groundwater discharging to the surface and into Bound Brook. Groundwater elevation data from the Sadat 2007 report indicates the elevation of the shallow groundwater is close to the approximate elevation of Bound Brook in the area of Monitoring Well 81-11.

3.4.2 *Local Groundwater Use*

Off-site ground water in the area of the Site has been investigated as part of the MSP FUSRAP site both by USACE and Agency for Toxic Substances and Disease Registry (ATSDR). As part of the MSP Groundwater RI, USACE requested well completion permits on file with NJDEP Bureau of Water Allocation (BWA). This review determined that there were 316 wells within one mile of the MSP site (USACE, 2005). Since the MML and MSP sites are proximate to each other, this represents a rough estimate of the wells in a one and one half mile radius from the MML site.

Of the 316 BWA permitted wells, 81 were used for domestic consumption, six for industrial purposes, two for irrigation, and 227 for monitoring, remediation, gas venting, or other non-

consumption purposes. Completion depths of wells used for potable purposes in the vicinity of MML range from 70 to 400 feet bgs (USACE, 2005). Based on the permit review there are no drinking water wells at the Site. ATSDR sampled 17 private consumption wells as part of their Public Health Assessment of the MSP site. Radiological and non-radiological potential contaminant levels in private wells were below levels of concern or at background levels (ATSDR, 2000).

Nineteen municipal wells were identified within a four-mile radius of the Site. Of these 19 wells one is inactive, two were decommissioned and two require treatment due to contamination. The remaining 14 wells are listed as "authorized" indicating that a permit had been issued and are assumed to be active. Total depths of the wells range from 252 ft to 430 ft. The nearest public well field to the Site, the Elizabethtown Water Company's Sebring's Mills well field, is located approximately 0.6 miles northwest and roughly downgradient of the Site. Historically this well field withdrew groundwater from the unconfined Passaic Formation aquifer, but it has not operated since 1978 (ATSDR, 2000).

3.5 Surface Water Hydrology

Surface runoff from the Site generally flows north towards Bound Brook, which in turn flows northwest and discharges into Green Brook. Green Brook discharges into the Raritan River about 1.9 miles southwest of the Site. The river is classified by the EPA and the NJDEP as a source for public drinking water. The nearest potable surface water supply (l00 million gallons per day [mgd]) is drawn from the Raritan River at the confluence with the Millstone River, approximately 2.6 miles upstream of the confluence with Green Brook. (DOE, 1984) A private industry withdraws 4.6 million gallons per day (mgd) of water from the Raritan River about 0.5 miles downstream from the confluence with Green Brook.

The 100-year flood level at the Site is approximately 44 ft above Mean Sea Level (MSL) and intersects a portion of the northern and extreme southeastern portions of the Site (Figure 3-1). Therefore, during the 100-year flood, the northern edge of the Site would be flooded about two-thirds of the way up the slope (FEMA, 2010). The discharge associated with the 100-year flood is estimated to be about 4,050 cubic ft per second at the Site.

Based on drainage areas and stream-flow measurements on Bound Brook and Cedar Brook at South Plainfield, it is estimated that the low flow and mean flow of Bound Brook near the Landfill is approximately 8.8 and 110 cubic ft per second respectively during the month of August (DOE, 1989).

Two seeps were observed along the slope of the landfill during a previous investigation (Sadat, 2007). However, it was not determined if this seepage was landfill leachate or shallow groundwater.

3.6 Aquatic/Terrestrial Receptors

Middlesex is located within the glaciated area of the Appalachian oak forest section of the eastern deciduous forest. This forest section is characterized by oak, hickory, maple, basswood, elm, and ash, with alder, willow, ash, elm, and hygrophytic shrubs common in moist, poorly drained habitats. However, because the MML is located within an urban setting and was cleared for disposal of waste, limited forest habitat remains (DOE, 1984).

The New Jersey Department of Fish, Game, and Wildlife (NJDFGW) stocks the Raritan River (approximately two miles to the southeast) with adult trout for fishing. The NJDFGW has also identified other edible fish in the Raritan, including striped bass, American shad, and northern pike (NJDFGW, 2010).

The bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus),* piping plover (*Charadrius melodus),),* bog turtle *(Clemmys muhlenbergii),* Indiana bat *(Myotis sodalist)* and roseate tern (*Sterna dougallii)* may appear in the vicinity of the Site as occasional transients. The piping plover and roseate tern are on the federal endangered or threatened species list. A review of the U.S. Fish and Wildlife Service database indicates the peregrine falcon, bog turtle, and the plant, swamp pink (*Helonias bullata*), are also on the endangered and threatened species list for Middlesex County. However, there are not any known habitats critical for the survival of these species in the vicinity of the Site. Additionally there are not any federal lands managed for ecological protection within a two-mile radius of the Site (USFW, 2010). *Meteorology*

Middlesex County has a humid subtropical climate similar to other areas within the state of New Jersey. The climate is influenced greatly by its proximity to the Atlantic Ocean. The mean temperature for the site ranges from a low mean of 43 degrees Fahrenheit (ºF) to a high mean of 63 ºF. The lowest monthly mean temperatures occur in January (21 ºF), and the highest monthly mean temperatures occur in July (85 ºF). The State of New Jersey averages about 120 days of precipitation per year; average annual precipitation is 48 inches, which is slightly higher than the national average. The highest month of precipitation occurs in August, which experiences an average of 4.8 inches of rain measured at Somerville, New Jersey, approximately 7.8 miles west of Middlesex. The annual snowfall for Middlesex is 18 inches, which mostly occurs in the months of January and February. The prevailing winds are from the northwest during October through April and from the southwest during the summer months (DOE 1984).

4.0 FIELD INVESTIGATION

This section provides greater detail of activities and methods employed during the field investigation conducted at the Site. Field work began with the initial site preparation and mobilization on December 2, 2009 and finished with the demobilization on March 3, 2010.

4.1 Summary

In order to meet the project objective and confirm the presence of radiological and non-radiological impacts at the Site, the project team implemented the following field tasks:

- Surface Gamma Scan Surveys of approximately 35 acres. Two acres were inaccessible due to structures and standing pools of water mainly within the wooded area. These scans were completed to determine the extent of radiological contamination as well as to aid in determining location of soil samples.
- Collection of 49 surface soil samples based on the reviews of historical records and the results of surface gamma scans to determine nature and extent of radiological contamination.
- Excavation and selected sampling of soils from 14 test pits to identify the potential presence of nuggets of uranium ore.
- Advancement of 50 soil borings and the collection 103 biased subsurface soil samples based on the results of surface gamma scans and down-hole gamma logging (DGL). These samples were used to determine nature and extent of radiological contamination.
- Groundwater sampling to identify potential impacts to groundwater from site contaminants.

As gamma survey activities progressed, results were provided to the CABRERA-USACE project team on an almost daily basis to show project progress as well as to determine suitable biased sample locations. Near the completion of the drive-over gamma surveys, initial surface soil and test pit locations were determined based on review and discussion of the data. Follow-on data were used in plotting additional sample locations. Sample locations were determined using an iterative process as field survey data was collected and interpreted. The sampling approach involved placement of a portion of the total planned sample locations based on site history and the results from previous investigations. The remainder of the locations would be 'biased' according to the results of the surface scan and down-hole gamma count results.

Field activities were conducted in accordance with the Final Project Work Plan (USACE, 2010b) except as noted in Section 4.12. Results of the field activities are presented in Section 5.

The sections presented below describe each of these activities in greater detail.

4.2 Radionuclides of Potential Concern and Investigative Screening Values

Previous environmental investigations confirmed that the Site contained soil with the following radionuclides of potential concern (ROPCs): ^{226}Ra, ^{232}Th, and natural uranium consisting of ^{234}U ^{235}U, and ^{238}U in natural ratios. The surface and subsurface soil samples were analyzed for the appropriate ROPCs; the results were compared against soil investigative screening values (ISVs) in order to determine the nature and extent of radiological contamination at the Site. ISVs were developed based on background levels for ^{226}Ra, ^{232}Th and ^{238}U as determined by investigations

conducted at the MSP (USACE, 2004), previous MML site investigations (Sadat, 2007), and the definition of Uncontaminated Surface Soils in NJAC 7:28-12,: "Uncontaminated surface soil" means soil whose average natural background radionuclide total concentrations are less than the remediation standards for radionuclides, and cannot exceed the background established for the site by more than two standard deviations." Table 4-1 presents the background concentrations of the ROPCs as well as the derived corresponding ISVs**.**

In addition to the collection of samples for radiological analyses, 11 surface soil samples were analyzed for non-radiological constituents, including VOCs, semivolatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs). The additional samples were collected for health and safety purposes as well as determination of radiological and non-radiological contamination co-mingling. Six of the eleven soil samples were analyzed for VOCs, SVOCs, metals and PCBs via the Toxicity Characterization Leaching Procedure (TCLP) in order to determine if soils that may potentially be excavated in the future should be classified as a hazardous waste. The TCLP results show that there were not any constituents exceeding the RCRA criteria and, thus, the soil would not be considered hazardous waste. The limited chemical soil sampling included in this field investigation does not entirely preclude the possibility that RCRA hazardous wastes may exist at the site, however, and those wastes, if encountered in the future, would be managed in accordance with the appropriate Federal and state regulations.

4.3 Initial Site Preparation

Prior to performing any site characterization activities, brush-clearing activities were performed across the open area landfill cover as well as limited areas within the wooded section to the north. The brush was chipped/shredded and staged at a location within the boundaries of the MML. Clearing was performed using hand tools and tractor-equipped brush hogs; this activity was performed to allow for improved visual inspection of and access to the landfill surface and to facilitate proper gamma survey procedures. Mature trees (i.e. greater than 3 inches in diameter) were not removed.

4.4 Surface Gamma Surveys

Surface gamma surveys were performed over 100% of the accessible ground surfaces within the MML site boundary as presented on Figure 4-1. Surveys were conducted in order to identify potential areas of residual surface contamination and to determine locations for biased surface and subsurface soil sampling and test pits. Gamma drive-over scans, utilizing CABRERA's Large Area Scanning System (CLASS™) mounted on an all-terrain vehicle (ATV) with a Global Positioning System (GPS), were conducted over all areas accessible to wheeled vehicles. Traditional gamma walkover surveys (GWS) were performed in areas not accessible to wheeled vehicles and in wooded areas where a GPS signal was not available (primarily due to foliage interference). In these areas, a range of concentrations were documented, and marking flags were installed to delineate areas with elevated gamma readings. Each of those gamma surveys are summarized in the following sections. Graphic presentation of the gamma survey results are provided in Section 5.0.

4.4.1 *CLASS™ Surveys*

The CLASS™ survey was used to rapidly measure, spatially correlate, and map gamma radioactivity concentrations. The CLASS™ consists of a Radiation Solutions, Incorporated (RSI)

RS-701 integrated controller and data acquisition system, a digital gamma ray spectrometer/multi-channel analyzer (MCA), a data controller, two RSX-256 4-liter (256 cubic inch) sodium-iodide (thallium activated) (NaI(Tl)) gamma scintillation detectors, an integrated low-resolution GPS, and input for connection to an external high resolution Trimble Pro XH GPS receiver. Radiation and location information was collected by the system at a very high data transfer rate (nominally one data point every second) and stored in an onboard data file for real-time operator feedback as well as data validation post-processing. The drive-over survey was advanced at a speed of one meter/second (m/s) or slower to ensure that adequate data collection and survey coverage requirements were met. Graphic presentation of the gamma survey results are provided in Section 5.0. Raw data from the CLASS™ and walkover surveys are included on CD in Appendix A.

4.4.2 *Gamma Walkover Survey*

Traditional GWS was conducted in areas where tree cover, terrain, or obstacles prevented access by the ATV-mounted CLASS™ system. Surveys were conducted in the wooded area at the north end of the Site, around the Middlesex Municipal Building and the First Presbyterian Church, within the Middlesex recycling center, and around the Site perimeter. A Ludlum Model 2221 scaler/ratemeter and 3x3 NaI detector were utilized to scan the soil surface for elevated gamma emissions in gross count per minute (cpm). Surveys were performed by walking straight, parallel lines at a rate of approximately 0.5 meters per second while moving the 3x3 NaI detector in a serpentine motion of approximately one meter wide and a consistent distance (two to four inches) above the ground surface. GWS data were collected in gross cpm from the ratemeter/scaler and automatically logged into the GPS unit once per second. The data logging protocol allowed for a data density equivalent of two logged measurements per square meter of ground surface. Graphic presentation of the gamma survey results are provided in Section 5.

4.4.3 *Manual Gamma Walkover Survey*

The manual GWS was performed in areas where tree cover prevented access to the ATV-mounted CLASS™ and where a GPS signal could not be established in order to perform a traditional GPS-correlated GWS. The manual GWS was performed following the same technique as the traditional GWS; however, gross cpm and GPS positional data were not recorded. Instead, gross cpm ranges were hand recorded on survey forms/maps to correlate the survey measurements with their approximate horizontal location. Transects were marked in the field to divide the wooded area into approximately one-acre plots. These transects allowed lines of sight to aide in keeping parallel lines during the manual GWS, ensure complete coverage, and provide increased accuracy of data measurement locations. A field investigation screening value of 20,000 cpm was determined for use during the manual survey per the Multi-Agency Radiation Survey and Site Inspection (MARSSIM) specifications which follow:

The minimum detectable number of net source counts in the interval is given by s_i. Therefore, for an ideal observer, the number of source counts required for a specified level of performance can be arrived at by multiplying the square root of the number of background counts by the detectability value associated with the desired performance (as reflected in d') as shown in MARSSIM Equation 6-8 as follows:

$$s_i = d'\sqrt{b_i}$$

Where the value of d' is selected from MARSSIM Table 6.5 based on the required true positive and false positive rates and b_i is the number of background counts in the interval. The value of d' represents the rate of detections at 95% and a very low false positive rate of 5%, and is set at 3.28.

The minimum detectable count rate (MDCR) is calculated from a background of 15000 cpm (250 counts per second [cps]) as:

$$MDCR = (d')(b_i)^{0.5}(60sec/1min)$$

$$MDCR = (3.28)(250)^{0.5}(60) = 3112 \text{ cpm}$$

The MDCR for the surveyor is given as:

$$MDCR_{surveyor} = MDCR / (P)^{0.5}$$

Where P is the surveyor efficiency equal to 0.5 to 0.75 as given by NUREG-1507. P = 0.5 was chosen as a conservative estimate and

$$MDCR_{surveyor} = 3{,}112 / (0.5)^{0.5} = 4{,}402 \text{ cpm}$$

To ensure that elevated scanning measurements were actually higher than background levels of 15,000 cpm and not reflecting false positives, an investigation level was set at 20,000 cpm. This rate exceeds three standard deviations of background averages and is just above the MARSSIM defined minimum detectable count rate for a 5% false positive proportion.

Locations identified during the manual survey as having gross gamma emissions greater than the established screening value were pin-flagged in the field. One-minute static measurements were taken at these locations using the 3x3 NaI detector, and readings were recorded at each location. GPS coordinates were also recorded utilizing cell phone signals, in lieu of a Trimble GPS receiver, due to the heavy tree canopy blocking the line of sight satellite signals. Graphic presentation of the gamma survey results are provided in Section 5.

4.5 Determination of Sample Locations

Soil sampling locations were determined using an iterative process during gamma survey data collection and interpretation. The sampling approach involved placement of a portion of the total planned sample locations based on site history and the results from previous investigations. The remainder of the locations would be 'biased' according to the results of the surface scan and down-hole gamma count results. As GWS activities progressed, survey results (cpm plots, Z-score plots and Regions of Interest [ROI] figures, and down-hole log sheets) were provided to the CABRERA-USACE project team on an almost daily basis in order to show project progress as well as to evaluate suitable biased sample locations. Near the completion of the CLASS™ gamma surveys, the initial surface soil and test pit locations were determined based on analysis of the data. As more data were received from the field, these observations were used in plotting additional sample locations.

As with the surface soil locations, test pit and soil boring locations were also based on the results of the field surveys. Field observations from the test pits (both visual and scans of spoils) were used to locate soil borings for the purpose of 'bounding' the limits of elevated radiological activity. CABRERA's Field Site Manager was in constant communication with the project manager and USACE staff; this manager provided updates and recommendations for the next set of sample locations. These updates were discussed in weekly conference calls within the project team, focused on the data, and led to the determination of the most likely locations for sampling. This iterative process continued until the last samples were collected by the field team.

4.6 Surface Soil Sampling

A total of 49 systematic and biased soil samples were taken to characterize surface contaminant distribution. Surface samples were collected using a trowel up to a depth of 0.5 ft bgs. All samples were homogenized in a clean stainless steel bowl. The exception was samples for VOC analysis that were collected in compliance with Standard Operating Procedure (SOP) OP-052 (USACE, 2010b). GPS coordinates for each surface sample location were recorded. Sample analyses were performed using gamma spectroscopy for detecting the ROPCs listed in Table 4-2 and alpha spectroscopy for detecting isotopic uranium. The gamma spectroscopy samples were sealed and stored for a minimum of 21-days to allow full in-growth of the ^{226}Ra daughter progeny (lead-214 [^{214}Pb] and Bismuth-214 [^{214}Bi]). EPA Method 901.1M via gamma spectroscopy was then used to count the daughter progeny; thus the result was reported as ^{226}Ra without interference from the collocated ^{235}U gamma line (within 0.5 kilo-electron volts [keV] of ^{226}Ra's 186 gamma emissions). Eleven of the samples were collected and submitted for metals, VOCs, SVOCs, pesticides, herbicides and PCBs, using the analytical procedures outlined in Table 4-2. As discussed in Section 2.3 these 11 samples were collected only for waste characterization and health and safety purposes. Six of the eleven samples to support waste characterization were analyzed for the full Toxicity Characterization Leaching Procedure (TCLP). Quality Assurance/Quality Control (QA/QC) samples included 10% field duplicates and 5% matrix spike/matrix spike duplicates. One-minute gross gamma, static measurements were also recorded with a 3x3 NaI detector at each surface sample location.

4.7 Test Pits

Test pits were utilized as a means of screening for the presence of high-activity ore "nuggets" that may have been buried as part of a waste stream from the former MSP FUSRAP site. A total of 14 test pits were excavated during this SI. Some locations were predetermined and some were decision-based. The project team worked together to determine the locations of all 14 test pits; location was based on the gamma survey data (surface scans and down-hole counts) in conjunction with the site historical data.

Each test pit was excavated with a Mini-Excavator (John Deere Model 50D) that had a two-foot wide bucket attachment. Soil was excavated in 0.5 ft lifts and spread uniformly on polyethylene sheeting placed on the ground adjacent to the excavation. Care was taken to separate the top soil from subsurface layers that were more likely to be associated with waste burials. A manual GWS was conducted on the excavated spoils to screen for elevated radioactivity. Prior to excavating the next lift, soil also was inspected visually for sources of radioactivity and soil lithology. All observations were recorded in the Field Log Book and Test Pit Logs (provided in Appendix B). Test pits were excavated to a depth of eight ft bgs over a length up to eight ft. All excavations and soil sampling were performed using real-time air quality monitoring due to the

known presence of underground methane within the landfill zone. In the exclusion zone, continuous organic vapor and methane monitoring was conducted using a photoionization detector (PID) and a multi-gas meter (MGM).

4.8 Subsurface Soil Sampling

To characterize potential subsurface contaminant distribution, 103 subsurface soil samples were collected at predetermined systematic locations and at biased locations determined by surface gamma survey results. A track-mounted GeoProbe 7720 in a direct-push, macro-core sampling configuration was utilized to collect incremental core soil samples in four-foot sections to a maximum depth of 12 ft bgs or refusal. A Ludlum™ Model 44-20 3x3 NaI detector was used to screen each core for gross gamma radiation and identify areas of elevated count rates. Results were documented in the Core Scan Field Form. Also, the soil lithology was logged to Uniform Soil Classification System standards, and all significant conditions, including the presence of groundwater, were noted. Soil boring logs and gamma scans are presented in Appendix C. Core samples were direct frisked; biased samples were taken from the depth interval that exhibited the highest direct reading. Soil sample analysis for determining ROPCs relied on gamma spectroscopy. Alpha spectroscopy analysis was used to determine the isotopic concentrations of all three uranium isotopes present in natural uranium.

4.9 Down-hole Gamma Logging

If refusal or groundwater were not encountered, down-hole gamma logging was performed in each borehole to 12 ft bgs. Prior to down-hole logging, each borehole was sleeved with capped, polyvinyl chloride (PVC) riser pipe in order to prevent collapse and prevent groundwater intrusion to the extent practicable. Gross gamma down-hole measurements were performed in six-inch increments starting from the bottom of each hole and proceeding toward the ground surface. A Bicron Model G-1 ½”x1” environmentally-sealed NaI detector was suspended from a nylon cord with depth markings in order to ensure that accurate depth interval measurements were recorded. Count rates were recorded using a coupled Ludlum Model 2221 scaler/ratemeter. Down-hole gamma logging was conducted at each of the 50 soil borings advanced during this investigation.

4.10 Groundwater Sampling

A single groundwater sample was collected from soil boring GP-10 during this SI after consultation with USACE technical personnel and based on the ROI data for uranium. GP-10 was positioned within an area with a uranium Z-score of between two and three. Once the soil boring had been advanced to its final depth (maximum 12 ft below ground surface), a one-inch outside diameter PVC casing that was coupled to a five-foot long, machined screen was installed. This action prevented borehole collapse and facilitated sample collection. The borehole was purged using low-flow techniques via a peristaltic pump and clean tubing. The field logbook provided information collected and recorded on the parameters of temperature, pH, and specific conductance. Purging continued until the field parameters had stabilized. The sample was analyzed to determine gross alpha, gross beta, ^{226}Ra,,^{228}Ra, and uranium drinking water constituents. Alpha spectroscopy analysis was used to determine the isotopic concentrations of all three uranium isotopes present in natural uranium.

4.11 Investigation Derived Waste

Minimal investigation derived waste (IDW) was generated during this investigation and mainly comprised of spent personal protective equipment (PPE) including tyveks and nitrile gloves. Soil or liquid IDW was not generated, since excavated test pit soil as well as discarded soil boring cores were placed back into their place of origin as backfill. PPE was double bagged and a release survey, allowing for the release of the PPE, was conducted on each bag. The release survey for the bagged PPE was conducted in a similar manner as the release survey for equipment used onsite by collecting readings from the sides, top and bottom of the bags. The bags were transported to the Middlesex County Landfill.

Two samples with very high count rates including an apparent uranium ore nugget and a soil sample from the wooded area were placed in a 7A Type A container and sent to the laboratory for analysis (refer to the Daily Quality Control Report for March 2, 2010 in Appendix D).

4.12 Work Plan Deviations

Overall, the activities conducted in the field followed the procedures outlined in the FSP and QAPP. As noted above, methane gas was detected in some of the test pits and the majority of soil borings. Continuous organic vapor and methane monitoring using a PID and MGM was conducted at each boring location. Drilling was suspended when either: 1) 10% of the LEL was reached on the MGM at 12 inches above the borehole; and/or 2) when readings above background were observed for a duration greater than 10 minutes on the PID at 12 inches above the borehole. If either or both of these conditions were encountered, drilling activities were suspended; all non-explosion proof equipment was shut-down; and non-essential personnel were evacuated from the exclusion zone until the organic vapors or combustible gas levels were below action levels. Due to the high number of borings exhibiting conditions well above action levels for methane, CABRERA personnel in cooperation with technical staff from USACE adapted field methods to mitigate these conditions. Field personnel utilized two methods to mitigate the high levels of methane within the boreholes: 1) the addition of dry ice pellets mixed with a small amount of water; and 2) nitrogen gas purging. CABRERA prepared a Field Change Request that was accepted by the USACE outlining the methods for use of the dry ice and nitrogen gas. Both of these methods proved to be successful in mitigating methane gas from the boreholes.

The intent of the groundwater sampling in the workplans was to sample groundwater as it was encountered in boreholes. Contract limitations prevented this from occurring and resulted in only a single groundwater sample to be taken.

5.0 INVESTIGATION RESULTS

Discussions of the SI sampling results are presented in the following sections. The sampling methodologies and the equipment used to perform each type of survey were described previously in Section 4.0.

5.1 Surface Gamma Surveys

Gamma methodologies were previously discussed in Section 4.4. The following sections provide a description and interpretation of those surveys.

5.1.1 *Measurement of Gross Gamma Radiation*

The surface gamma surveys provided position-correlated gross gamma-count rate data proportional to the gross gamma-fluence rate at a particular location. The data collected during the surveys were of sufficient number and quality for use in deciding suitable locations for collecting biased soil samples. Table 5-1 presents the summary statistics of the data collected using the CLASS™ and Traditional GWS methods.

The gamma survey results were evaluated in order to generate geospatial imaging for visual trend analysis and calculation of Z-scores. The Z-score method was used to provide the statistical evaluation of a data population for purposes of identifying data points that fall outside of the population mean and are within a specific confidence interval. In this usage, the Z-score method readily identifies small areas of elevated gamma activity (fluence) within a one-sided 99.5% confidence interval. Z-scores were calculated by comparing each data point against the mean and standard deviation of the data set as a whole. The following equation was used to calculate the Z-scores:

$$Z = \frac{(L_{cr}) - (M_{ds})}{(STDEV)}$$

where: Z = Z-score

L_{cr} = Location count rate, in gross cpm

M_{ds} = Mean of the data set, in gross cpm

STDEV= Standard Deviation of the data set

Data was reviewed to determine whether individual data points exceeded three times the standard deviation of the set (or Z-score $\geq$ 3.0-sigma) in order to discover any identifiable spatial patterns or trends that might indicate elevated activity and their corresponding locations (Appendix A). A Z-score greater than 3.0 does not necessarily indicate contamination greater than the ISV. Figure 5-1 presents the Z-score results of surveys using the CLASS™ system. Figure 5-2 presents the Z-Score results of surveys using traditional GWS. Some overlap of surveys exists because the walk-over survey was conducted along the interior side of the perimeter fence while later additional CLASS™ surveys were conducted along the outside of the perimeter fence.

The CLASS™ and GWS identified three areas exhibiting elevated gamma readings. The first area extends a distance of approximately 200 feet along Pershing Avenue (see Figures 5-1 and 5-2),

along the eastern boundary of the Site. The second area is situated within the portion of the landfill north-northwest of the first area and the third area encompasses the perimeter of the former DOE excavation.

5.1.2 *Measurement of Radionuclide-Specific Gamma Radiation*

The CLASS™ is equipped with a multichannel analyzer, which allows for collection and analysis of nuclide-specific scan data using defined regions of interest (ROI) that correspond to specific gamma ray energies for each ROPC. The uranium progeny, including radium, that emit gamma radiation can be identified in many cases by their characteristic spectrum, if the gamma intensity is sufficiently high. Uranium-238 itself emits a single very low-energy, low-intensity gamma photon when it decays; thus it cannot be measured directly by field gamma spectrometry. Most gamma detectors measure the radiation from nuclides that are far down the decay chain; thus uranium activity can only be inferred by assuming the sample or sample site is in secular isotopic equilibrium. To identify and track specific gamma radiation emissions from the site ROPCs, the CLASS™ digital interface was pre-set to ROIs within the energy spectrum. The RSI-700 controller comes pre-installed with International Atomic Energy Agency (IAEA) standard energy windows for thorium (based on 2614 keV photon from its thallium-208 [^{208}Tl] daughter). An ROI was also established for ^{226}Ra at the ^{226}Ra 186 keV photon. However, since the Site was contaminated with ^{226}Ra , the natural correlation of ^{214}Bi to ^{238}U could not be utilized and an ROI for uranium was not established. An ROI was also made for the entire energy spectrum. Setting ROPC-specific ROIs during field scanning is advantageous as it reduces the detector background as well as the scan detection limits. In addition, the CLASS™ utilizes internal energy-gain stabilization to ensure that the ROIs remain centered on the corresponding energy peaks.

Following collection and in order to determine areas of elevated activity, the data were converted from instrument response in counts per second (cps) to Z-scores. Z-score calculations were computed for each individual scanning dataset. Locations with Z-scores greater than three were identified as requiring additional investigation.

Figures 5-3 and 5-4 display summary statistics and results of Z-scores for the thorium and radium ROIs, respectively. Figure 5-3 identified a number of isolated elevated areas for thorium adjacent to the wooded areas and around the former DOE excavation. However, the soil sampling results at those locations were comparable to the site background concentration for thorium. Therefore, those locations may not necessarily be indicative of residual contamination for thorium. The results of the Z-scores for the radium ROI (Figure 5-4) confirmed that the elevated radium count rates were concentrated along Pershing Avenue and other locations as well.

Figure 5-5 presents the results of the GWS conducted within the wooded area. These results are based on total cpm. There are three areas of interest, including one northeast of the former DOE excavation; one east of the former excavation (central part of the wooded area); and one near the northeast corner of the Site. During the GWS of the wooded area, CABRERA personnel located a surface rock approximately 10 inches by six inches and described as sandstone that exhibited elevated radioactivity and gamma readings up to 62,910 cpm using a 3x3 detector. This rock was encountered near the northeast corner of the wooded area adjacent to the open field. Following discussions with USACE technical personnel, CABRERA personnel collected a surface soil sample (MML-SW01) from a point directly beneath the rock (Figure 5-6).

5.2 Surface Soil Sample Results

Forty-nine systematic and biased surface soil samples were collected from a depth of zero to six inches bgs, based on the results of the gross gamma radiation and gamma radiation emitted by individual ROPC collected during GWS. Seventeen of these 49 surface soil samples were collected at a depth of zero to six inches bgs in the wooded areas at biased locations based on the manual scan surveys. Figure 5-6 shows the locations of surface soil samples collected from the Site.

Samples were submitted to Analytical Laboratory Services, Inc. (ALS) of Fort Collins, CO, for radiological analyses. ALS is an Environmental Laboratory Accreditation Program (ELAP)-certified laboratory as well as being NJDEP certified. A total of 16 surface soil samples were submitted to the laboratory for non-radiological testing. Ten of these samples were submitted for health and safety purposes. These 10 samples were analyzed for metals, VOCs, SVOCs, pesticides, herbicides and PCBs via the methods presented in Table 4-2. In order to assist in the determination of whether surface soil may be considered a hazardous waste, six separate soil samples were analyzed according to the full TCLP. The radiological and non-radiological sampling results are presented in Appendix E and summarized in Tables 5-1 through 5-10. The following sub-sections summarize the data evaluations performed for the radiological and non-radiological sampling results.

5.2.1 *Radiological Screening Criteria*

The ROPCs are being reported via their short-lived decay progeny; it is assumed that the daughter products are in secular equilibrium with their parent nuclides for the sources of radioactivity in question at MML. Therefore, the sampling results for Actinium-228 (^{228}Ac) were assumed to be equal to the concentrations of ^{232}Th. Similarly, ^{234}Th is a daughter product of ^{238}U, and it is assumed to be in secular equilibrium with ^{238}U. Thus, the measured concentrations for ^{228}Ac and ^{234}Th were used to represent the concentration of their parent ^{232}Th and ^{238}U, respectively. Both of these constituents along with ^{226}Ra were determined via gamma spectroscopy. Alpha spectroscopy analyses for determining uranium isotopes were also performed on these samples. Both gamma spectroscopy and alpha spectroscopy were used to calculate the sampling results for ^{238}U. Since alpha spectroscopy analysis provides a more detailed result, alpha spectroscopy analysis results for ^{238}U was used throughout the data evaluation processes. Evaluation of the data was conducted based on the following:

Data Evaluation based on ISVs: The soil ISVs were based on the background levels for ^{226}Ra , ^{232}Th , and ^{238}U obtained from the MSP FUSRAP investigation (USACE, 2004), previous MML site investigations (Sadat, 2007), and the definition of Uncontaminated Surface Soils presented in the New Jersey Administrative Code (NJAC) 7:28-12, regardless of depth.

The individual sampling results for each ROPC were compared with respect to their corresponding ISV, thus defining areas where radiological contamination may be present. When the individual sampling result was found to be in excess of a corresponding ISV, that specific area was noted for follow-up. Based on the follow-up decision, the area either may require no further action or may warrant additional investigation in order to delineate the known radiological contamination. Table 5-2 presents the results of each sample for each ROPC and its corresponding ISV. The sampling results are bolded where the results are greater than their corresponding ISVs.

5.2.2 *Surface Soil Sample Results*

5.2.2.1 Radium-226

Based on a review of Table 5-2, it is apparent that the sampling results for ^{226}Ra are greater than the ^{226}Ra ISV in 43 samples, including 14 samples from the wooded area. Overall, concentrations ranged from 1.61 pCi/g in sample MML-SSW03 to 79.6 pCi/g in sample MML-SSC28.

Sample results along the southeast perimeter parallel with Pershing Avenue indicate several locations with ^{226}Ra concentrations above the ISV of 1.46 pCi/g (Figure 5-7). Samples MML-SSC01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 28, 29 and 30 each exceeded the ISV with concentrations ranging from 5 pCi/g at MML-SSC07 to 79.6 pCi/g at MML-SSC28. These sample results support the findings of the Z-score ROI for radium as presented in Figure 5-4.

Twelve surface soil samples were collected from the perimeter of the former DOE excavation, based on the ROI for radium, including MML-SSC16, 17, 19, 20, 22, 23, 26, 27, 38, 39, MML-SSCM01 and MML-SSCM03 with each sample exceeding the ISV of 1.46 pCi/g (Figure 5-7). Concentrations ranged from 1.54 pCi/g at MML-SSC23 to 17.1 pCi/g at MML-SSC27. Again, there is a strong correlation between the GWS indicating a Z-score greater than three and the laboratory results.

A total of 17 samples were collected from the wooded area at the Site. Of those samples, 14 had concentrations exceeding the ^{226}Ra ISV as shown on Figure 5-7. Each of the eight samples with the MML-SSW prefix exceeded the ISV with concentrations ranging from 1.61 pCi/g at MML-SSW03 to 19.9 pCi/g at MML-SSW06. As previously stated in Section 5.1.2, a small surface rock was encountered that exhibited a high cpm (62,910). Based on discussions with the project team, a single surface soil sample from beneath the rock was collected and submitted for analysis. This sample, MML-SSW01, had a ^{226}Ra concentration of 2.2 pCi/g. Each of the nine remaining soil samples from the wooded area, including MML-SSC-14, 15, 31 through 35, 37 and 40 exceeded the ISV for ^{226}Ra. Concentrations ranged from 1.55 pCi/g at MML-SSC14 to 52.5 pCi/g at MML-SSC37. Samples MML-SSC35, MML-SW05 and MML-SSW04 were collected in an attempt to bound an area of elevated activity based on the GWS conducted in the wooded area.

5.2.2.2 Thorium-232 (Measured ^{228}Ac)

Except for two locations (MML-SSC22 and MML-SSC27), the sampling results for ^{232}Th were below the ISV concentration at all locations. MML-SSC22 exhibited a ^{232}Th concentration of 3.05 pCi/g, while MML-SSC27 had a concentration of 9 pCi/g. These exceedances are collocated with ^{226}Ra concentrations that were also greater than the radium ISV. Both samples were collected from within the limits of the former DOE excavation (Figure 5-7). These locations were chosen based on the ROI results from the CLASS™ survey (Figure 5-3). As described in Section 5.1.1, z-scores greater than 3.0 on this figure do not necessarily represent areas of contamination elevated above the ISV.

5.2.2.3 Uranium-238 (Measured ^{238}U)

The reported sampling results for ^{238}U are greater than the uranium ISV at 24 locations and with concentration ranges from 1.15 pCi/g at MML-SSW03 to 20.6 pCi/g at MML-SSC27. These exceedances are collocated with ^{226}Ra concentrations that are also greater than the radium ISV.

5.2.2.4 Summary of Radiological Results

Based on the surface soil analytical results discussed above, plots of individual isotopes in excess of their corresponding ISVs were prepared and compared to each other in an attempt to distinguish if separate areas of individual isotopes exist. Plots were prepared for uranium, thorium and radium (Figures 5-8, 5-9 and 5-10, respectively). A comparison of the figures indicates that uranium and radium are collocated along the eastern and southwest perimeter of the former DOE excavation and along portions of the Pershing Avenue (Figures 5-8 and 5-10). With the exception of sample location MML-SSC-35 in the wooded area, the majority uranium concentrations across most of the landfill area are below the ISV of 1.11 pCi/g.

Two elevated concentrations of thorium were located adjacent to each other near the southwest corner of the former DOE excavation (Figure 5-9). The MML-SSC22 and MML-SSC27 locations also exceeded the ISV for radium.

Radium had the highest number of detections above its ISV of 1.46 pCi/g. Radium stands out as the sole radionuclide along the southern edge of the former DOE excavation area, with the exception of sample MML-SSC38, and across most of the landfill itself (Figure 5-10). Radium and uranium were collocated in the wooded area at two locations, MML-SC37 and MML-SSC35, as noted above. The area along Pershing Avenue also had sample locations where radium and uranium concentrations exceeded their ISVs. The exception to this location was the uranium concentration in sample MML-SSC11, which did not exceed its ISV.

5.2.2.5 Non-Radiological Results

In addition to the radiological testing, 11 samples were analyzed for metals, VOCs, SVOCs, pesticides, herbicides and PCBs. These samples were collected for waste characterization and health and safety purposes. Tables 5-3, 5-4, 5-5 and 5-6 present the detected surface soil sampling results for VOCs, SVOCs, pesticides and PCBs, and metals, respectively. Six of the eleven samples to support waste characterization were analyzed for the full Toxicity Characterization Leaching Procedure (TCLP). The TCLP results show that there were not any constituents exceeding the RCRA criteria and, thus, the soil would not be considered hazardous waste.

As a conservative approach for health and safety purposes, each non radiological constituent was compared against NJDEP SSC residental, direct contact land use criteria. Table 5-7 and Figure 5-11 provide a summary of the exceedances for each non-radiological constituent present at the Site. A review of the data reveals that VOCs or pesticides were not detected at concentrations exceeding NJDEP SSCs. For SVOCs, the sampling results for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k) fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded their corresponding NJDEP SSCs at five sampling locations (Table 5-4). Among those five sampling locations, surface soil sample MML-SSC08 exhibited the highest concentrations of those SVOCs. As mentioned in the previous sub-section, potential radiological contamination is also present at that location. Sample MML-SSC37 generally exhibited the fewest exceedances and lower concentrations. The sampling results for one PCB (Aroclor 1260) and two metals (arsenic and lead) at sampling location MML-SSC37 exceeded their corresponding soil SSCs. Six soil samples were analyzed for VOCs, SVOCs, metals and PCBs via TCLP to determine if soils that may potentially be excavated in the future should be classified as a hazardous waste. Sample results were compared to the federal Resource

Conservation and Recovery Act (RCRA) hazardous waste criteria. The results of these comparisons are presented in Table 5-8 and show that none of the criteria were exceeded.

Analysis of the surface soil samples for non-radiological constituents showed that five locations exceeded the NJDEP SSC for several SVOCs and lead; however, there was not any discernable pattern. Although these constituents have been detected at concentrations exceeding the NJDEP SSC across the Site during previous investigations (Sadat, 2007), evidence does not indicate these materials are FUSRAP related.

5.3 Subsurface Soil Sample Results

A total of 103 systematic and biased subsurface soil samples were collected during this SI. Samples were obtained from a combination of 14 test pits and 50 soil borings. The test pits were excavated to evaluate for the presence of high activity or "nuggets" of uranium ore that may have been buried as part of a waste stream from the former MSP FUSRAP site. Surface scans of the pit spoils were conducted to identify areas of elevated contamination at depth. Based on the results of elevated surface scan readings, biased soil samples were collected and analyzed for radiological ROPCs as described in Section 4. The evaluation for those sampling results is presented in Table 5-9.

In conjunction with the surveying of the excavated soil from the test pits, each soil boring was surveyed both as down-hole and core scans as described in Section 4. The intent of the soil borings was to characterize potential subsurface contaminant distribution. Field screening and laboratory results were used to 'bound' surface soil or test pit locations where gamma survey results indicated elevated activity. The evaluations of the test pits and soil borings are summarized below as well as in Tables 5-9 and 5-10, respectively.

5.3.1 *Test Pits*

Figure 5-12 presents the locations of the 14 test pits excavated at the Site, while analytical results are presented in Table 5-9. Test pits TP-01 through TP-10 were excavated within the main body of the landfill and were based on the results of the CLASS™ survey. Test pits TP-01, 06 and 14 were excavated within the limits of the former DOE excavation. Based on the results of the CLASS™ survey, test pits TP-02 through TP-05 were excavated along the southern perimeter of the former DOE area. Test pits, TP-08 through TP-10 and TP-12 were excavated along the perimeter parallel with Pershing Avenue. TP-07 and TP-13 were excavated within the main body of the landfill, and TP-11 was excavated within the wooded area. The intent of the test pits was to screen for high-activity ore "nuggets." While the test pits did not encounter any "nuggets," they did identify subsurface material that did exhibit elevated activity. These areas are discussed in more detail below.

The cover material encountered generally consisted of brown silty sand, although layers also included silt, clay and fine-grained sand. The colors of these materials ranged from black, red and orange-brown to gray. Depths to waste ranged from two to five ft bgs. Zones of saturated waste and soil were encountered at depths ranging between two and seven ft bgs. Petroleum odors were noted in TP-04 from 5.5 to 7.5 ft bgs. Photoionization readings of organic vapors ranged from 0.4 to 3.8 parts per million. Methane gas was not an issue at the majority of the test pits. TP-06 and 07 exhibited methane levels at or exceeding the 10% lower explosive limit safety criteria at depths of 6.5 and seven ft bgs, respectively.

Soil excavated from TP-01 through TP-08 exhibited cpm data within the threshold range of 14,000 to 21,000. A threshold of greater than 20,000 cpm was used as a screening value based on the CLASS™ survey. TP-14 excavated near the northeast corner of the former DOE excavation, exhibited gamma readings ranging from 19,000 to 35,000 cpm to a depth of seven ft bgs. Following discussions with USACE technical personnel, CABRERA personnel collected four soil samples; results are presented in Table 5-9. One sample was collected from the surface (zero to one ft bgs); two samples from 4.5 to 5.5 ft bgs; and one sample from 5.5 to 6.0 ft bgs. Each sample had ROPC concentrations above their corresponding ISV for ^{226}Ra, ^{232}Th, and ^{238}U. The exception to this was ^{228}Ac in the samples from zero to 0.5 ft bgs and 5.5 to 6.0 ft bgs which were below the ISV. The subsurface soil sample from TP-14 was shipped to the laboratory in a Class 7A Type A container in accordance with Department of Transportation (DOT) and U.S. Nuclear Regulatory Commission (NRC) regulations.

During the excavation of TP-09, an instrument dial was encountered within the landfill waste at a depth of 6.5 ft bgs. This item had a reading of approximately 70,000 cpm, was documented on the test pit log, photographed, and placed back into the excavation. Soil scanning results of the soil immediately above and below the dial ranged from 18,000 to 19,000 cpm which is below the threshold value of 20,000 cpm. TP-09 is located along the southeast perimeter parallel with Pershing Avenue (Figure 5-12). TP-10 was excavated north of TP-09 with gamma scan readings of the spoils between 12,000 and 16,000 cpm. TP-12 was later excavated as a biased location closer to the southeast perimeter along Pershing Avenue. This location was selected based on the results from the soil boring GP-18 (discussed below) and surrounding surface soil samples. This test pit hit refusal at a depth of six ft bgs from encounters with large blocks of concrete. Soil scans of the excavated material down to a depth of six ft bgs showed readings ranging from 16,000 to 80,000 cpm. Scans of the concrete blocks showed readings in the 92,000 to 225,000 cpm range. Following discussions with the project team, a single soil sample, MML-SBT12, was obtained from a depth of 4.5 to 5.5 ft bgs. Results of this sample, presented in Table 5-9, indicated that ^{226}Ra, ^{232}Th, and ^{238}U each exceeded its ISVs with concentrations of 209, 26.6 and 39.2 pCi/g, respectively.

Test pit TP-11 was excavated in an area of elevated GWS readings within the wooded area adjacent to surface soil samples MML-SSW04 and 05; see Figures 5-6 and 5-7. Three surface soil samples were collected at this location. With the exception of ^{228}Ac, each of the ROPCs exceeded its ISV in all three samples. Ra-226 was the most prevalent isotope with concentrations ranging from 2.8 to 53.7 pCi/g. These results are significantly higher than those for the two surrounding surface soil samples.

TP-13 was excavated within the main body of the landfill in the vicinity of and based on the observations from TP-07, GP-10 and GP-11 (Figure 5-12). Surface soil scans showed readings of 17,000 to 20,000 cpm, while the deeper soil showed much lower readings. The single surface sample (MML-SBT13) had ROPC concentrations below its corresponding ISV as presented in Table 5-9.

5.3.2 *Soil Borings*

As previously stated, the soil borings were used to characterize potential subsurface contaminant distribution as well as 'bound' areas where gamma survey results indicated elevated activity.

The frisking of the core samples in conjunction with the down-hole gamma surveys were used to determine which soil interval to sample. Ancillary to the above, frisking of the core samples and down-hole logging were used as a means of determining if any "nuggets" of uranium ore existed in the subsurface. A "nugget" was encountered in soil boring GP-46 and is discussed in greater detail below. Soil boring logs' results of the down-hole logging are presented in Appendix C.

As discussed previously in Section 4.12, methane gas was encountered during borehole advancement. Methane was encountered in three areas across the Site as presented in Figure 5-13 One area is located at the northeast corner of the former DOE excavation, a large area encompassing the central and southeast portions of the Site and the area at the northeast corner of the landfill. Two smaller areas were encountered along Pershing Avenue at borings GP-17 and GP-37.

Several borings were advanced within the limits of the former DOE excavation and included GP-03, 04, 12, 14, 34 and 47. From these locations a total of 12 soil samples from varying depths were submitted for laboratory analysis. The results presented in Table 5-10 indicate that ^{226}Ra was above the ISV of 1.46 pCi/g in 10 samples. Concentrations ranged from 1.62 at GP-12 (0.0-2.0 ft bgs) to 2.55 pCi/g at GP-03 (8.5-9.5 ft bgs). The remaining ROPCs were exceeded sporadically with the exception of ^{228}Ac which was above its ISV in only the surface soil sample at GP-46. Based on the CLASS™ survey, additional soil borings were advanced around the perimeter of the former DOE excavation. One of these locations, GP-46 was advanced along the eastern edge of the former DOE excavation (Figure 5-12). Based on the gamma scans, three samples were submitted for laboratory analysis. The uppermost sample contained a small rock believed to be a "nugget" of uranium ore. Readings, from the 3x3 NaI detector, of ~2.5 millirem per hour (mR/hr) were observed by holding the meter near contact with the core. Deeper samples were collected from 7.5 to 9.5 ft bgs and 10 to 12 ft bgs. All three samples exceeded the ^{226}Ra ISV with concentrations ranging from 1.7 pCi/g (10.0-12.0 ft bgs) to 30,300 pCi/g (0.0-1.0 ft bgs). Based on these results, this particular material is thought to be uranium ore. The surface soil sample from MML-GP-46 was shipped to the laboratory in a Class 7A Type A container in accordance with Department of Transportation (DOT) and U.S. Nuclear Regulatory Commission (NRC) regulations.

One area that stands out is the southeast portion of the Site parallel to Pershing Avenue. Considerable investigation activities took place here based on the gamma survey, test pit, and surface soil results. As many as 14 soil borings were advanced with the intent to determine the nature of possible radiological contamination. Location selection was based on communication among the project team. Through these communications and data received from the field, it was possible to collectively determine suitable locations. As a result, several soil borings were placed along the edge of the municipal property. Table 5-10 and Figure 5-15 presents the results of the analytical testing of the soil from these borings. A total of 29 samples from 14 locations were analyzed for the ROPCs. Nearly all samples exceeded at least one ISV.

Similar to the comparison of isotopes detected in the surface soil, Figures 5-16 and 5-17 were prepared for depicting subsurface soil concentrations of uranium and radium, respectively. Thorium was not detected above its ISV in the subsurface soil samples analyzed. Uranium concentrations in excess of their ISV were detected at the north, northeast and central portions of the former DOE excavation. Additionally, a single location in the wooded area (TP-11) and six locations along Pershing Avenue also exceeded the ISV for uranium. Radium is the more

prominent isotope evidenced in the subsurface soil (Figure 5-17). While uranium was detected in six samples directly adjacent to Pershing Avenue, radium was detected at 10 locations above its ISV. Within this area, radium was detected at concentrations ranging from one to four times greater than uranium. The exception to this is boring, GP-42, in the sample from 3.0 to 4.5 ft bgs where uranium exceeded the radium concentration by approximately 16 times.

A subsurface cross section along Pershing Avenue, Figure 5-18, presents those samples along the section that exceed the radium and/or uranium ISV. The upper portion of the figures presents a representation of the soil encountered along the cross sectional line and with the results compared to the ISVs. The lower portion of the figures presents the results of the core scans conducted during the advancement of the soil borings. There is strong correlation between the core scans and the sample results especially at borings MML-GP-18, 41 and 42.

5.4 Groundwater Sample Results

Groundwater was encountered in 23 of the 50 borings in perched zones across the Site. Wet or saturated soil was encountered above, within and underlying the municipal waste. Groundwater sampling was intended to evaluate the presence of ROPCs. A single groundwater sample was collected from the soil boring GP-10 (Figure 5-13) and was analyzed for gross alpha, gross beta, ^{226}Ra, ^{228}Ra, and uranium via mass spectroscopy. The results were compared to the Maximum Contaminant Limits (MCLs). Gross alpha, ^{226}Ra and ^{228}Ra were not detected above the method detection limits. The sample had a gross beta concentration of 8.7 (picoCuries per liter (pCi/L) which is below the MCL screening value of 50 pCi/L. The total uranium concentration of 0.11 micrograms per liter (µg/L) was below the MCL of 30 micrograms per liter (µg/L). Laboratory results are presented in Table 5-11 and Appendix E.

6.0 SURVEY INSTRUMENT QUALITY CONTROL

Survey and sampling activities were performed in accordance with the QA and QC procedures presented in the MML project *QAPP* (USACE, 2010c) to ensure consistent and repeatable results. The personnel performing the activities were trained in the technical, QC, and health and safety aspects of the project, as well as in calibration, maintenance, and operating procedures for their assigned tasks. This section documents the results of QA/QC activities performed during this investigation effort.

Based on the information presented in this section, the survey data are deemed authentic, appropriately documented, and technically defensible. The survey methods used to collect the data are appropriate for the types of media and contaminants being measured; the field and laboratory instrumentation meets the required performance and sensitivity requirements; and the data generated are representative of the areas and materials of interest. The laboratory instrumentation meets the project-specific requirements.

6.1 Survey Instrument QC

The survey instruments specified in the *FSP* (USACE, 2010b) were used to collect investigation data for the MML site. Instrumentation was used in accordance with written procedures and was subject to daily QC requirements, as specified in the *QAPP*. Instruments used to obtain radiological and non-radiological data, including differential global positioning system (DGPS) equipment, were inspected for physical damage, current calibration, and erroneous readings in accordance with applicable procedures and/or protocols. Results of QC checks were recorded in field logbooks and summarized on a computerized spreadsheet. Instrumentation that did not meet the specified requirements of calibration, inspection, or response check was removed from service, and replacement instruments were procured when the items were necessary to complete the work.

6.1.1 *Instrument Calibration*

Instruments used during the investigation survey were inspected prior to use for ensuring satisfactory operation and current calibration traceable to the National Institute of Standards and Technology (NIST). Calibration records were shipped with the equipment and maintained onsite for review and inspection. Copies of the calibration certificates are included in Appendix F-1.

6.1.2 *Instrument QC Checks*

Prior to use, project instrumentation underwent initial QC checks by comparing instrument responses to benchmark values. QC checks of radiation detectors and meters included source checks to ensure consistent responses when exposed to known radiation sources. QC checks of DGPS units included checks for satellite availability and positional accuracy. In accordance with CABRERA SOPs, records of initial and daily performance checks are included in Appendix F-2.

QC source checks consisted of a one-minute integrated count performed with the designated source positioned in a reproducible geometry. This procedure was repeated ten times to establish average instrument response for each detector. The initial averages and control limits calculated for each instrument provided the respective benchmark values for subsequent QC checks.

For quantitative instruments (i.e., those used to report activity concentrations), an acceptance criterion of +/- 3σ was used. For qualitative instruments (i.e., dose rate meters and friskers), an

acceptance criterion of +/- 20% of the source check true value was used. If any daily QC check was found to be outside of its acceptance criteria, the QC check was repeated. If the second QC check was also outside the acceptance criteria, the instrument was examined to check for external contamination or damage, and a third QC check was performed. If the third QC check was outside of its acceptance criteria range, the instrument was taken out of service and not used until it was evaluated and approved by the Radiation Safety Officer (RSO).

6.2 Sampling and Analysis QC

Analytical test methods and sample volume, preservation, holding time, and quality control requirements were met, as presented in the *QAPP*. Standard methodology was used for sample collection, identification, documentation, handling, packaging, shipping, and chain-of-custody. Assessment of the data for quality and usability is presented in Appendix F-3.

To confirm the quality of sampling and analysis techniques used for this investigation, precision and accuracy of data were evaluated and described below.

6.2.1 *Precision and Representativeness*

Precision is defined as the degree to which two or more measurements are in agreement. Field precision is measured by comparing field duplicate results, and analytical precision is measured by comparing laboratory duplicate results.

6.2.1.1 Field Precision

Precision and representativeness for radionuclide results was evaluated by calculating the normalized absolute difference (NAD), which accounts for uncertainty in the laboratory results. NAD is calculated as follows:

$$NAD = \frac{|Sample - Duplicate|}{\sqrt{\sigma^2_{Sample} + \sigma^2_{Duplicate}}}$$

Where:

Sample = Original sample result,

Duplicate = Duplicate sample result,

σ_{Sample} = Total propagated uncertainty of the sample, and

$\sigma_{Duplicate}$ = Total propagated uncertainty of the duplicate.

The calculated NAD results were compared to a performance criteria of less than or equal to 1.96. Calculated NAD values less than 1.96 were considered acceptable. Values greater than 1.96 were investigated for possible discrepancies in analytical precision or sources of disagreement with the following assumptions of the test:

- The sample measurement and duplicate or replicate measurement are of the same normally distributed population; and
- The standard deviations represent the true standard deviation of the measured population.

NADs for all field duplicates analyzed during this effort were less than 1.96 thus meeting the requirement of the *QAPP*.

6.2.1.2 Laboratory Precision

Laboratory precision was evaluated through laboratory duplicates, laboratory control sample (LCS)/laboratory control sample duplicate (LCSD), and matrix spike (MS)/matrix spike duplicate (MSD) analyses. Laboratory duplicates, LCS/LCSDs, and MS/MSDs were analyzed at a rate of one per 20 samples for each analysis performed on each matrix. The results of each set of paired samples (i.e., target/duplicate, LCS/LCSD, and MS/MSD) were in agreement within the laboratory's internal acceptance criteria, as described in the laboratory quality assurance plan (LQAP) as well as the project-specific *QAPP*.

Based on the evaluation of the laboratory duplicate data, laboratory precision was deemed adequate for the data generated for this characterization effort (Appendix F-3).

6.2.2 *Accuracy*

Accuracy is defined as the degree to which the reported measurement represents the true value. Analytical accuracy is assessed through the evaluation of laboratory blanks, LCSs, tracer recoveries, surrogate recoveries, and spike recoveries. Based on the evaluation of these samples, the overall analytical accuracy was deemed adequate for the data generated during this characterization effort.

Laboratory Method Blanks – Laboratory blanks are analyzed to evaluate the potential contamination of samples due to preparation and analytical procedures. Laboratory method blanks are digested/extracted/analyzed exactly like the field samples and are designed to represent the matrix of interest as closely as possible. Laboratory method blanks were prepared and analyzed with each digestion/extraction/analysis batch. In addition, initial and continuing calibration blanks were analyzed for the metals analysis at a rate of one per ten samples. Laboratory blank results were less than the laboratory MDCs or reporting limits (RLs) in all analyses associated with the data generated for this characterization effort.

Laboratory Control Samples – The LCS is a laboratory spike sample that originates from a source other than the source of the calibration standards and serves as a zero-blind check on the laboratory's accuracy. The LCSs were prepared and analyzed along with each digestion, extraction, and analysis batch. For this characterization effort, all LCS results were within the QAPP acceptance criteria of 85% to 115 % recovery.

Tracer Recoveries – A tracer is an isotope of the radionuclide of interest that is added to the samples prior to analysis in order to assess potential bias from the chemical separation or other processes employed in the analysis on a sample-by-sample basis. Uranium-232 was added as a tracer to all samples undergoing isotopic uranium analysis for this characterization effort. All tracer recoveries were within the QAPP acceptance criteria of 30% to 110%.

Surrogate Recoveries – Surrogates are compounds that are not commonly found in the natural environment that have similar chemical structures and similar chemical behavior as the compounds of interest. The surrogates dechachlorobiphenyl (DCB) and tetrachloro-meta-xylene (TMX) were added to PCB samples prior to extraction to assess extraction efficiency and analytical bias on a sample-by-sample basis. All surrogate recoveries were within the QAPP acceptance criteria of 74 to 123%.

Matrix Spike and Matrix Spike Duplicates – MS/MSD analyses are performed by the laboratory to estimate the extent of bias in the analytical measurements of chemical constituents. The analytical laboratory performed MS/MSDs for the metals analyses by adding a known quantity of each analyte to representative media, and analyzing the spiked media. Bias in the results was quantified by determining the percent recovery of the spike amount. Percent recoveries were compared to a performance criterion of 70 to 130. Percent recoveries outside this range were investigated for possible discrepancies in measurement bias. For the spiked analytes (organic, inorganic and radiological) samples analyzed during this characterization effort, the percent recoveries were within the laboratory's and *QAPP* acceptance criteria.

6.2.3 *Representativeness*

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. The representativeness criteria are best satisfied by making certain that sampling locations are properly selected and a sufficient number of samples are collected. Representativeness is addressed by describing sampling techniques and rationale used to select sampling locations. Representativeness is also evaluated through the review of the field precision as described in Section 6.2.1.1. The SI performed at the MML was designed using guidance in MARSSIM (NRC, 2000). Additionally, EPA-approved and American Society for Testing and Materials (ASTM)-approved and standardized sampling procedures were used where practical, and considered as guidance in other cases, to ensure the representativeness of sample data. Data collected during this SI followed each of the guidance and standards discussed above and are representative of conditions found at the Site.

6.2.4 *Comparability*

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The comparability of the data, a relative measure, is influenced by sampling and analytical procedures. By providing specific protocols to be used for obtaining and analyzing samples, data sets should be comparable regardless of who obtains the sample or performs the analysis.

The analytical laboratory was responsible for enhancing comparability using the following controls:

- Use of current, standard EPA-approved methodology for sample preservation, holding, and analysis
- Consistent reporting units for each parameter in similar matrices
- EPA- or NIST-traceable standards, when available
- Analysis of EPA QC samples, when available
- Participation in inter-laboratory performance evaluation studies

By following these controls the data obtained during this SI has met the objectives outlined in the *QAPP*.

6.2.5 *Completeness*

Completeness is a measure of the degree to which the amount of sample data collected meets the scope and a measure of the relative number of analytical data points that meet the acceptance criteria, including accuracy, precision, and any other criteria required by the specific analytical method used. Completeness is defined as a comparison of the actual numbers of valid data points and expected numbers of points expressed as a percentage.

The QA objectives for completeness will be based upon a project goal of 90%. If data cannot be reported without qualifications, project completion goals may still be met if the qualified data, i.e., data of known quality even if not perfect, are suitable for the specified project goals. The completeness for this project was 94% which exceeded the goal of 90% as specified in the *QAPP*.

6.3 Data Management and Documentation

Management of the field and analytical data generated during the characterization effort was conducted in accordance with the general requirements of the Project Work Plan (USACE, 2010b).

6.3.1 *Field Data*

Field and QC data was recorded in logbooks and/or field sheets, scanned, and uploaded to the project computer. Data collected each day was summarized on computerized spreadsheets, as appropriate. Electronic copies of the field sheets and data spreadsheets were reviewed by the CABRERA Field Site Manager (FSM) and transmitted to the CABRERA Project Manager (PM) by email on a daily basis. In addition, a backup copy of each electronic file was maintained on compact disc (CD) or memory stick to prevent data loss.

During the field investigation, a DQCR was prepared daily. The DQCRs were entered electronically so that they could be transferred through email more efficiently to the USACE. Each original paper copy was dated and signed by the FSM. Copies of the DQCRs are included in Appendix D.

DQCRs served to document the daily activities occurring on the project, including the weather for each day and any additional environmental conditions or observations pertinent to field activities. The level of PPE worn at the Site for that day was recorded. Also recorded were team members' presence onsite and their role on the project, as well as visitors to the immediate investigation area. Any changes or delays in the project were discussed and recorded, as well as any safety issues that arose.

6.3.2 *Analytical Data*

Samples collected during the characterization effort were identified by a unique number code that accompanied the sample from collection through analysis and data review. Standardized chain-of-custody procedures were followed from sample collection through sample analysis. The condition of shipping coolers and enclosed sample containers was documented upon receipt at the analytical laboratory. The laboratory transmitted the completed chain-of-custody form and cooler receipt checklist to the PM to confirm each sample shipment.

Analytical data reports containing results of the requested analyses were transmitted to the CABRERA PM. Each data package contained an electronic data deliverable (EDD) spreadsheet

summarizing the analytical results, as well as an electronic file containing the entire case narrative and supporting data. The electronic files were uploaded to the corporate server and backed up on CD. Laboratory data reports are included in Appendix E.

7.0 CONCEPTUAL SITE MODEL

The following section addresses the fate of contaminants in the environment as well as their modes and propensity for transport in environmental media. Potential source areas across the Site are a result of potentially contaminated soil being transported to the MML for use as fill or cover material for sanitary landfill operations. These potentially contaminated soils were disbursed across the landfill. The soil will be evaluated as potential environmental media. A summarization of the Conceptual Site Model is presented in Section 7.3.

7.1 Potential Routes of Migration

There are a number of mechanisms by which contaminants may migrate from contaminated areas at the Site to onsite and off-site receptors. The potential migration pathways applicable to the Site may include the following:

- Migration of contaminants from surface soil to air can occur via fugitive dust emissions.
- Precipitation infiltration can leach residual contaminants from vadose zone soil to groundwater.
- Storm water runoff or groundwater discharge can lead to contamination of surface water bodies.
- Contaminants can be found in Sediments via surface water transport and flooding.

The potential for site contaminants to migrate from soil to other media via these mechanisms are evaluated in the following subsections.

7.1.1 *Migration into Air*

Transport of contaminants from surface soil to air can occur via dust generation or volatilization. Contaminants adsorbed to surface soils may be released to the atmosphere as particles transported by near-surface winds in the form of airborne contaminated dust. Soil particles containing contaminants may be eroded from areas containing little vegetative cover and transported to areas downwind of these sites. Because most of the soil surfaces at the Site have vegetative cover, the potential for the contaminants in surface soil to be released to air via fugitive dust emission is significantly minimized.

7.1.2 *Migration to Groundwater*

Surface and subsurface soil contamination at the Site could serve as sources of potential groundwater contamination. The most important soil properties that affect the transport of contaminants through the soil into the groundwater include infiltration capacity (i.e., permeability), cation exchange capacity (CEC), and organic carbon content. Site soil was not specifically analyzed for CEC or organic carbon. Because of the presence of fill materials in the soil, surface and subsurface, soils contain relatively high organic carbon content, which would also be expected to contribute to slowing constituent migration.

Infiltration capacity is a measure of the rate at which soil material can absorb precipitation. Soil permeability is a measure of the ability of soil to permit gas or liquid to pass through. Both properties are based largely upon the texture and structure of the soil material. In general,

coarse-grained soils like loose sand will transmit water more readily than fine-grained soils such as clay. Based on "Pathway Analysis for a Contaminated landfill in Middlesex, New Jersey" (ANL 1985), three types of materials identified at the Site are overburden, weathered bedrock, and bedrock. The overburden consists of the landfill materials; the weathered bedrock materials are predominantly clayey layers; and the bedrock is a very thick layer of shale. The presence of clay layers in the intermediate zone would reduce the migration of contaminants into the underlying bedrock groundwater.

Percolation of both rainfall and snowmelt through the unsaturated, contaminated soil and fill can dissolve certain constituents, transporting them to the underlying groundwater. The rates of migration by this process vary greatly for different constituents, depending upon the rate of transfer between the soil and water and the amount of precipitation. Site-specific distribution coefficient for the contaminants were not determined as part of this SI. Chemicals that are the most susceptible to leaching to groundwater are those with high water solubility and a low partition coefficient, K_{oc}. Among ROPCs present at the Site, ^{226}Ra may be more soluble than uranium or thorium. This is dependent on multiple factors, such as pH. Thorium typically has a very low solubility.

Precipitation falling on the Site may run off and accumulate as surface water, return to the atmosphere through evaporation or through plant uptake and evapotranspiration, or may also infiltrate the soil, where it can remain fixed in the (unsaturated) vadose zone soils or percolate to the water table. Water percolating through contaminated soil may result in the dissolution of water-soluble compounds that eventually reach the groundwater. Runoff and evapotranspiration rates are not known. However, the soils present at the Site are characterized by layers of fill, including waste materials and cover, extending to depths of up to 20 ft bgs. The cover soils consist primarily of brown silty sand. Other materials observed in these layers included silt, clay and fine grained sand. Therefore, runoff for the Site most likely ranges from medium to rapid.

7.1.3 *Migration into Surface Water and Sediment,*

Transport mechanisms that could potentially lead to migration of contaminants in soil to surface water and sediment are surface runoff, groundwater discharge, and flooding. The degree and direction of surface runoff is determined mainly by the surface topography and the relative proximity of nearby receiving surface waters. Surface water runoff from precipitation can erode soil from contaminated areas and carry dissolved and suspended contaminants to local surface water features.

The MML has a gentle slope near the western edge and increases to a steep slope near Bound Brook. For MML, surface runoff generally flows towards Bound Brook, which in turn flows northwest and discharges into Green Brook. Green Brook discharges into the Raritan River. The river is classed by the EPA and the NJDEP as a supply for public drinking water. In addition, during the 100-year flood, the area adjacent to Bound Brook would be flooded about two-thirds of the way up the slope (ANL, 1985). The general direction of shallow groundwater flow at the landfill is northeast toward Bound Brook. Groundwater elevation data from the Sadat 2007 report indicates the elevation of the shallow groundwater is close to the approximate elevation of Bound Brook.

7.2 Medium-Specific Investigation Findings

The following section of the report summarizes the media–specific impact caused by the residual contaminants present at the site.

7.2.1 *Soil*

A number of soil investigations have been conducted over the years at MML with this SI being the most recent. Section 5 presented the results of soil investigations performed under this SI indicating that the soil sampling results for various ROPCs exceeded their corresponding ISVs . In addition, the sampling results for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k) fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded their corresponding NJDEP's SSCs at five surface soil sampling locations.

7.2.2 *Air*

Occupational and effluent air monitoring were conducted as a part of the SI to ensure that the worker and general public were not exposed to any radiological hazards during SI activities. The following subsections summarize the results of each air monitoring process.

Occupational Monitoring

Breathing zone (BZ) air samplers were used during intrusive activities for occupational air monitoring. The BZ was worn by the personnel who had the longest exposure time and also worked closest to the exposed subsurface soils. Filters from the BZ were counted after a 24-hour period using a Ludlum 2929/43-10-1 alpha/beta scintillator (Appendix G). Samples were analyzed to ensure compliance with the occupational derived air concentrations (DAC) values, as listed in Table 7-1 of the US NRC Appendix B of 10 CFR Part 20. It has been established that the Site's most limiting ROPC Occupational DAC value is ^{232}Th. None of the air samples that were collected and analyzed exceeded the project's occupational limits of 5E-13 micro-curries per milliliter (µCi/ml).

Table 7-1: Occupational DAC Values for Site ROPCs

ROPC	Class	10 CFR 20 App B DAC (µCi/ml)
^{226}Ra	W	3E-10
^{232}Th	W	5E-13[1]
^{234}U	Y	2E-11
^{235}U	Y	2E-11
^{238}U	Y	2E-11

[1] Most limiting for primary alpha emitting ROPC
W – Radionuclide retention of 10 to 100 days
Y – Radionuclide retention of > 100 days

Effluent Monitoring

Effluent monitoring was conducted to ensure that the general public was not exposed to any radiological hazards during SI activities. As mentioned in the RPP (USACE, 2010e), air samplers were used during all intrusive activities. Hi-volume air samplers were placed within 20 ft of the established restricted area, in both upwind and downwind directions. The results of the air sample data was compared to the project action levels of 8E-16 µCi/ml. This value was determined by using 20 percent (%) of the values published in Table 2 of the NRC Appendix B

of 10 CFR Part 20, and choosing the most limiting radionuclide. For the MML project the most effluent concentration action limit, was that of ^{232}Th. When analyzed all sample results were lower than the action level limit.

Table 7-2: Project Effluent Action Levels for Site ROPCs

ROPC	Class	10 CFR 20 App B Effluent Concentration [µCi/mL]	Project Effluent Action Limit [µCi/mL]
^{226}Ra	W	9E-13	**1.8E-13**
^{232}Th	W	4E-15[1]	**8E-16[2]**
^{234}U	Y	5E-14	**1E-14**
^{235}U	Y	6E-14	**1.2E-14**
^{238}U	Y	6E-14	**1.2E-14**

[1] Most limiting for primary alpha emitting ROPC
[2] The Action Limit reductions of 20% of the10CFR20 Appendix B values only applies to the Effluent Concentrations
W – Radionuclide retention of 10 to 100 days
Y – Radionuclide retention of > 100 days

7.2.3 *Groundwater*

A groundwater sample was collected from soil boring GP-10. The results were compared to the NJDEP's MCLs. Gross alpha ^{226}Ra and ^{228}Ra were not detected. Gross beta concentration was 8.7 pCi/L compared to the MCL screening value of 50 pCi/L, and The uranium concentration was 0.11 ug/L, which was below the MCL of 30 ug/L.

Four groundwater sampling events were conducted from August 2002 through November 2003 as part of remedial investigation activities conducted by Sadat Associates, Inc (SADAT, 2006). Sixteen groundwater samples were collected in August 2002 and eight additional samples were collected for radiological parameters in October 2002. The analytical results of the water samples collected in August 2002 indicated that three samples exceeded the NJDEP standard of 5 pCi/L for combined ^{226}Ra and ^{228}Ra, five samples exceeded the MCL of 15 pCi/L for gross alpha radiation, and four samples exceeded the screening value of 50 pCi/L for gross beta radiation. Only two samples in the October 2002 sampling event exceeded the gross alpha MCL. One sample exceeded the screening value for gross beta radiation. None of the samples exceeded the limit set for radium in groundwater. Differences in results between the August 2002 and October 2002 sampling efforts do not demonstrate a consistent pattern of radiological impacts to groundwater.

Additional groundwater samples were collected in September, October and November, 2003 (Sadat, 2007). The results were observed to be much lower than the samples collected in 2002. The analytical results of the shallow groundwater samples collected in 2003 indicated that no samples exceeded the NJDEP MCL for combined ^{226}Ra and ^{228}Ra, and two wells exceeded the MCL for gross alpha radiation. However, the results for ^{226}Ra, ^{228}Ra, uranium and thorium were all below the NJDEP criteria. Further investigation of radiological contamination in shallow groundwater was not recommended by Sadat. Based on the 2002 and 2003 remedial investigations, radiological impacts to the deep groundwater at the MML property were not

found. Furthermore, based on the deep groundwater quality, Sadat determined that it does not appear that the deep groundwater is being impacted by the shallow groundwater.

The low-flow sampling method was used to obtain samples for the analysis of metals, PCBs, and pesticides during the September through November 2003 groundwater sampling events. The analytical results of the water samples collected in 2003 confirmed exceedances of NJDEP's GWQS for ammonia, TDS, metals, and select VOCs in the shallow groundwater. Based on the additional deep groundwater sampling data, iron and manganese were confirmed to exceed NJDEP GWQS. These are believed to be due to natural regional sources. In addition, one VOC, carbon tetrachloride, was detected at an estimated value which slightly exceeds the new GWQS.

7.2.4 *Surface Water*

Surface water samples were not collected during this SI. However, surface water samples were collected during 2002 and 2003 sampling events. The analytical results for surface water samples collected during 2002 sampling events did not find any exceedance of the NJDEP/EPA radiological criteria. Therefore, further investigation of radiological contamination in surface water was not performed as part of the 2003 RI.

The results of the 2002 RI indicated one pesticide, α-chlordane, slightly exceeded the NJDEP's SWQC. The results of the 2003 event confirmed the presence of α-chlordane at concentrations above the applicable SWQC including the upstream samples. This pesticide is believed to be due to regional sources. Further action is not proposed for surface water.

7.2.5 *Sediment*

Sediment sampling was not completed as part of the USACE SI. Results from previous sediment sampling efforts conducted by Sadat Associates are included in this report. Sadat collected sediment samples during 2002 and 2003 sampling events. Sediment samples were collected from surface sediment areas within the MML and analyzed for radiological parameters. Radiological analyses of sediment samples from the Bound Brook indicated no samples exceed the NJDEP criterion of 2 pCi/g for ^{226}Ra nor did any sample exceed the Sum of Fractions rule based on the presence of multiple isotopes.

Sadat developed screening criteria based on the NJDEP Freshwater Sediment Screening Guidelines (FSSG). Results were compared to the Lowest Effects Level (LEL) which represents the level that can be tolerated by the majority of benthic organisms. The Severe Effects Level (SEL) represents the contaminant concentrations in sediment that could potentially eliminate most of the benthic organisms. Sadat's 2002 analytical results for sediment indicated that the sampling results for one PCB (Aroclor 1254), four metals (chromium, copper, nickel and zinc), one PAH (benzo[g,h,i]perylene) were above their corresponding Lowest Effects Limit. The 2003 analytical results for sediment indicated that the sampling results for one PCB (Aroclor 1254), one pesticide (endrin), two metals (arsenic and nickel), one PAH (benzo[g,h,i]perylene) were above their corresponding LEL. None of the compounds analyzed exceeded any of the SEL during both sampling events. A delineation sampling event was performed during 2004. The additional sediment sampling performed did not indicate any exceedances of the LEL for PCB and endrin. Therefore, further investigation for PCBs and pesticides was not proposed.

Since, the exceedance for two metals and PAHs were found at upstream locations, further investigation for metals and PAH was not proposed.

7.3 Conceptual Site Model

A Conceptual Site Model (CSM) is a graphic representation of exposure pathways and intake routes identified for potential receptor populations at a contaminated site. A CSM has been developed for the MML site and included as Figure 7-1 and summarized in Table 7-3. The CSM summarizes the pathways that chemicals may take to reach potential receptors. A complete exposure pathway for a receptor includes all of the following elements:

1) Identifying a source of the contaminants
2) Identifying media through which contaminants may come in contact with the receptors, including soils, groundwater, sediment and surface water, and air
3) Identifying the routes of exposure or pathways through which the receptors may be exposed (i.e. external gamma radiation, ingestion, dermal contact, and inhalation)
4) Identifying current and future potential receptors.

Table 7-3: Summary of Conceptual Site Model

Media	Pathway Complete	Contamination Exceeding ISVs	Additional Evaluation Necessary
Groundwater	No	No	Yes
Surface Water	Yes	NE	Yes
Sediment	Yes	NE	Yes
Soil	Yes	Yes	Yes
Air	Yes	NE	Yes

ISVs – Investigation Screening Values
NE – not evaluated

The absence of any one of the above elements results in an incomplete exposure pathway. Where there is no exposure, there is no risk. In addition, EPA's risk assessment and risk characterization guidance does not require that all plausible exposure scenarios and exposure pathways be assessed. Pathways that are incomplete or only potentially complete, but deemed to be negligible, do not require evaluation. Potentially complete but negligible pathways are identified in the CSM but will not be evaluated quantitatively because these pathways would be unlikely to measurably impact risk estimates or risk management decisions. Some pathways cannot be quantified even if they are potentially complete and significant because key information is lacking.

An exposure pathway is the physical course a contaminant takes from the source to the exposed receptor. The sources evaluated in this assessment include soil, groundwater, surface water, and sediments. Potential source areas across the Site are a result of potentially contaminated soil being transported to the MML for use as fill or cover material for sanitary landfill operations. These soils were dispersed over the landfill. The soil was evaluated both as source and potential environmental media in the CSM. Two routes of exposure - soil ingestion and dermal contact are associated with soil exposure pathways and, therefore, were considered in the CSM.

The results of limited groundwater sampling conducted during previous investigations and SI did not find any consistent pattern of radiological impacts to both shallow and deep groundwater at the MML property. Furthermore, based on the deep groundwater quality, it does not appear that the deep groundwater is being impacted by the shallow groundwater. Groundwater will be further delineated in future work. Currently there is no human exposure to shallow groundwater immediately beneath the Site, as there are not any domestic or municipal supply wells on the Site.

ATSDR sampled 17 off-site private consumption wells as part of their Public Health Assessment of the MSP site. Radiological and non-radiological potential contaminant levels in private wells were below levels of concern or at background levels (ATSDR, 2000). Although the use of private drinking water wells in the area represents a potential for a completed groundwater pathway, onsite groundwater data does not indicate any radiological contamination as described in Section 7.2.3. Based on the above limited data and a review of the Site operational history, it is unlikely that there has been a release or threat of release into off-site groundwater of radioactive materials

As mentioned earlier, surface runoff generally flows north towards Bound Brook, which in turn flows northwest and discharges into Green Brook. Green Brook discharges into the Raritan River which is classed by the EPA and the NJDEP as a supply for public drinking water. Available flood zone maps show that the 100-year flood would inundate the northern and far southeastern portions of the Site. Based on the above data, there is evidence for potential human and ecological exposure of contaminants through flooding and seeping. Both surface water and sediment pathways were evaluated as potential exposure pathways in the CSM. Like soil, both ingestion and dermal contact were considered as the routes of exposure for both surface water and sediment.

For radiological constituents, external gamma is an important pathway of exposure and, therefore, it was quantified in this evaluation. This pathway is not applicable for chemical constituents.

Inhalation exposure may result from inhaling chemicals, which have volatilized, as well as radiological contaminated soil particles, and radon. Soil particles can be emitted into the air either by wind erosion or as a result of mechanical disturbance. Therefore, inhalation of air was evaluated in the CSM.

The CSM also identifies all human receptor populations that are reasonably anticipated to be exposed to the contaminants present at the Site. Even though the Site is an inactive landfill, the surrounding land use includes a mix of residential and non-residential properties. Therefore, receptors that may come in contact with contaminated media while working at the Site include an adult future site worker, an adult construction worker/remediation worker, a present time maintenance worker and a trespasser/visitor. In addition, due to surrounding land uses, a residential receptor is also considered during this CSM.

The CSM did not identify any ecological receptors that are reasonably anticipated to be exposed to the contaminants present at the Site. Potential terrestrial receptors include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus),* piping plover (*Charadrius melodus),* roseate tern (*Sterna dougallii),* bog turtle *(Clemmys muhlenbergii), and* Indiana bat *(Myotis sodalist)* and may appear in the vicinity of the Site as occasional transients. The piping

plover and roseate tern are on the Federal Endangered or Threatened Species List. A review of the U.S. Fish and Wildlife Service database indicates the peregrine falcon, bog turtle, and the plant, swamp pink (*Helonias bullata*), are also on the endangered and threatened species list for Middlesex County. However, there are not any known habitats critical for the survival of these species in the vicinity of the Site. Thus, impacts to the species discussed above would not be anticipated from wastes currently contained at the Site or from any additional remedial actions that may be taken at the Site.

The Department of the Army U.S. Army Biological Technical Assistance Group developed a Checklist for Important Ecological Places to determine whether or not further ecological evaluation is necessary for an affected property (USABTAG, 2005). This checklist was addressed as part of the SI and results indicated that further information is required to adequately complete the worksheet. This information will be gathered in future phases of the CERCLA process. If the affected property meets the exclusion criteria, further evaluation of ecological risk will not be required. If the affected property does not meet the exclusion criteria, then a screening level ecological risk assessment will be performed for the Site.

Overall the potential pathways include the ingestion or dermal contact with contaminated surface water, sediment and soil and the inhalation from particulate/gaseous emissions. Available data was used to evaluate the potential for completed pathways from direct contact with contaminated soil and the inhalation of particulate/gaseous emissions. The pathway for surface water and sediment exposure were not evaluated since these media were not investigated during this SI.

8.0 SUMMARY

The following sections present a summary of the data collected during this SI, conclusions based on the data, and finally recommendations for further investigative activities at the Site.

8.1 Summary of Findings

In order to meet the project objectives, as well as confirm the presence of radiological and non-radiological impacts at the Site, the following field tasks were implemented:

- Surface Gamma Scan Surveys of approximately 35 acres
- Collection of 49 surface soil samples based on the reviews of historical records and the results of surface gamma scans
- Excavation and selected sampling of soils from 14 test pits
- Advancement of 50 soil borings and the collection 103 biased subsurface soil samples based on the results of surface gamma scans and DGL
- Groundwater sampling
- Review of previous investigations at the Site

8.1.1 *Gamma Survey Results*

Evaluation of the CLASS™ gamma survey was used in the development of the ROI data (Figures 5-3 and 5-4). Figure 5-3 shows what appears to be a number of isolated elevated areas for thorium across the Site. The results of the Z-scores for the ^{226}Ra ROI (Figure 5-4) identifying elevated areas along Pershing Avenue confirm that the elevated radium count rates are concentrated along this road. This data coupled with the manual surveys led to the identification of three areas of elevated activity. These areas included

- The portion of the southeast perimeter along Pershing Avenue
- Various spots in the wooded area
- An area along the northern, eastern, and southern perimeter of the former DOE excavation

8.1.2 *Surface Soil Radiological Results*

A total of 49 surface soil samples were submitted for radiological analysis. Results of these analyses indicate the following:

- Results for ^{226}Ra are greater than the radium ISV or background in 43 samples. Of the 43 exceedances, 14 were located along Pershing Avenue, 11 were located around the perimeter of the former DOE excavation, 14 samples were located in the wooded area and the remaining four samples were distributed across the landfill area
- Thorium results for two samples located within the southwest boundary of the former DOE excavation exceeded the thorium ISV. These locations are collocated with ^{226}Ra concentrations that also exceeded the radium ISV
- A total of 24 surface soil samples exceeded the uranium ISV. The majority of these exceedances occurred along Pershing Avenue, along the southwest boundary of the

former DOE excavation, and at six locations within the wooded area. With the exception of one sample, MML-SW08, these locations were also collocated with ^{226}Ra concentrations that exceeded the radium ISV

- During the GWS of the wooded area, a rock was encountered that exhibited a total count of 62,910 cpm. It was approximately 10 inches by six inches and described as sandstone. A surface soil sample that was collected from directly below the rock exhibited results exceeding the ISV for ^{226}Ra and ^{234}Th.

8.1.3 *Surface Soil Non-Radiological Results*

Eleven surface samples were analyzed for metals, VOCs, SVOCs, pesticides, herbicides, and PCBs for waste characterization and health and safety purposes. Six additional samples were collected and analyzed via TCLP to determine if the soil may be considered hazardous waste. Health and safety sample results were compared against NJDEP SSC for residential, direct contact land use criteria, and the TCLP results were compared to the RCRA hazardous waste criteria. Results of the sample analyses indicated the following:

- For SVOCs, the sampling results for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded their corresponding NJDEP SSCs at five sampling locations (Figure 5-11).
- Six additional samples were submitted for analysis via TCLP to determine if onsite soil could be classified as hazardous. Each of the six sample results were below the RCRA criteria.

8.1.4 *Subsurface Soil Radiological Results*

A total of 103 systematic and biased subsurface soil samples were collected from a combination of 14 test pits and 50 soil borings. The test pits were excavated to evaluate for the presence of high activity or “nuggets” of uranium ore. Surface scan results of the pit spoils were used to identify biased soil sample locations or intervals. Soil borings were used to characterize potential subsurface contaminant distribution, to ‘bound’ areas of elevated activity, and to determine if any “nuggets” of uranium ore existed in the subsurface. Results of the test pit and soil boring activities indicated the following:

- The cover material encountered generally consisted of black to orange-brown silty sand, although layers also included silt, clay and fine-grained sand. Depths to waste ranged from two to five ft bgs.
- TP-14 excavated near the northeast corner of the former DOE excavation, exhibited gamma readings ranging from 19,000 to 35,000 cpm to a depth of seven ft bgs. Four soil samples were collected at various depths up to six ft bgs and had ROPC concentrations above their corresponding ISV for ^{226}Ra, ^{232}Th, and ^{238}U.
- During the excavation of TP-09 along the southeast perimeter parallel with Pershing Avenue, an instrument dial was encountered at a depth of 6.5 ft bgs and within the landfill waste. This item had a reading of approximately 70,000 cpm, was documented and placed back into the excavation.

- TP-12 was excavated adjacent to the southeast perimeter along Pershing Avenue. This test pit hit refusal at a depth of six ft bgs from encounters with large blocks of concrete. Results of a single soil sample from TP-12 indicated that ^{226}Ra, ^{232}Th, and ^{238}U each exceeded their respective ISVs.
- TP-11 was excavated in an area of elevated GWS readings within the wooded area adjacent to surface soil samples MML-SSW04 and 05 (Figures 5-12). Three surface soil samples collected at this location exceeded the radium and uranium ISVs.
- Based on the CLASS™ survey, GP-46 was advanced along the eastern edge of the former excavation with three samples submitted for laboratory analysis. The uppermost sample contained a small rock believed to be a "nugget" of uranium ore. Analysis indicated a ^{226}Ra concentration of 30,300 pCi/g. The remaining two samples also exceeded the ^{226}Ra ISVs.
- Approximately 14 soil borings were advanced along Pershing Avenue at the edge of the municipal property at locations based on the gamma surveys and test pits. Twenty-nine samples from the 14 locations were analyzed with nearly all samples exceeding at least one ROPC ISV.
- Methane gas was encountered in three areas across the Site including the northeast corner of the former DOE excavation, a large area encompassing the central and southeast portions of the Site, and an area at the northeast corner of the landfill (Figure 5-14).

Radiological data generated from the test pits and soil borings indicate that there are areas of elevated activity across the Site. Consistent with the surface soil results, radium is the dominant ROPC followed by uranium. Uranium concentrations in excess of its ISV were detected at the north, northeast and central portions of the former DOE excavation. Additionally, two locations in the wooded area (TP-11 and GP-45) and nine along Pershing Avenue also exceeded the ISV for uranium.

Six soil samples were analyzed for VOCs, SVOCs, metals and PCBs via the TCLP to determine if excavated soil could be classified as a hazardous waste. Sample results were compared to the RCRA hazardous waste criteria and showed that none of the criteria were exceeded. Surface soil samples MML-SSC08 and 24 were analyzed for both the non-radiological constituents as well as the TCLP. While both samples exceeded the NJDEP SSC and MSP ROD cleanup objectives, neither sample results were classified as hazardous.

8.1.5 *Groundwater Radiological Results*

A groundwater sample was collected from GP-10 (Figure 5-13) in order to evaluate the presence of ROPCs and was analyzed for gross alpha, gross beta, ^{226}Ra, ^{228}Ra, and uranium via mass spectroscopy. The results were compared to the NJDEP MCLs. Gross alpha ^{226}Ra and ^{228}Ra were not detected above the method detection limit. The sample had a gross beta concentration of 8.7 picoCuries per liter (pCi/L) whereas ^{234}U, ^{235}U and ^{238}U were not detected. The total uranium concentration of 0.011 micrograms per liter (µg/L) was below the NJDEP MCL of 30 (µg/L).

8.2 Conclusions

The objective of this SI was to obtain data of sufficient quality and quantity to facilitate USACE decisions regarding future work at the Site. This data included various gamma surveys, surface soil sampling and subsurface soil sampling through the excavation of test pits and advancement of soil borings. The data collected indicates that additional CERCLA actions such as a Remedial Investigation are warranted to further define the horizontal and vertical extent of radiological contamination.

Conclusions drawn from Site data and the CSM suggest that the preferential pathway for exposure to radiological contamination would be through direct contact with contaminated soil. The data indicates that exposure via fugitive dust is minimal given the current vegetative cover over the landfill; however, external gamma exposure should be considered. Exposure via groundwater is also minimal due to the alluvial deposits underlying the landfill waste, an incomplete pathway for onsite groundwater, and lack of radiological contaminants in the bedrock groundwater. Previous investigations, however, indicate the potential for on-site shallow groundwater contamination. Groundwater should be further investigated.

The non-radiological results of the samples collected for waste characterization and health & safety purposes show that there were not any constituents exceeding the RCRA criteria and, thus, the soil would not be considered hazardous waste.

While ecological receptors are not reasonably anticipated to be exposed to radiological contaminants, further ecological evaluation is necessary. Based on the results of the gamma surveys, laboratory analysis of the soil samples, five AOIs have been identified (Figure 8-1 and Table 8-1) as warranting further investigation or additional data for radiological release and include

- AOI 1 - The southeast portion of the Site along Pershing Avenue
- AOI 2 - The wooded portion of the Site between the landfill and Bound Brook
- AOI 3 - The area within and surrounding the former DOE excavation
- AOI 4 – The area within the central portion of the landfill between AOIs 1 and 2
- AOI 5 – The northwest portion of the site adjacent to AOI 3 occupied by the church and municipal building

8.3 Recommendations

A more detailed analysis such as a CERCLA Remedial Investigation is recommended.

9.0 REFERENCES

AEC 1961, AEC Memorandum from J.C. Clark (Manager New York Office) to S.H. Sapirio (Manager ORO), RE: *Borough Dump Middlesex New Jersey*, 02/13/1961

ATSDR 2000, *Public Health Assessment for Middlesex Sampling Plant*. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, 2000.

DeNuke 2008, *Radiological Survey Report Former Middlesex Municipal Landfill,* DeNuke Contracting Services, Inc., 2008.

DOE 1984, DOE Memorandum from Franklin F. Coffman (Director, Office of Terminal Waste Disposal and Remedial Action, Office of Nuclear Energy) to File, RE: *Action Description Memorandum (ADM) Review: Proposed 1984 Remedial Actions at Middlesex, New Jersey*, dated 09/07/1984.

DOE 1989, *Certification Docket for the Remedial Action Performed at the Middlesex Municipal Landfill in Middlesex, New Jersey in 1984 and 1986*, Department of Energy, May 1989.

DOE 2008, Email on behalf of DOE; from Mike Widdop, SM Stoller Corp, to Jenny Goodman, NJDEP; Subject MML DVP, Dated 24 December 2008 with attachments, Radium source figure title S0496200.pdf dated 12/23/08.

EPA 2000, *Data Quality Objectives Process for Hazardous Waste Site Investigations*, EPA QA/G-4HW Final, EPA/600/R-00/007, January 2000.

EPA 2000a, *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, EPA/600/R-96/055, Quality Assurance Management Staff, Washington, D.C., August 2000.

EPA 2000b, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, EPA 402-R-97-016, Rev. 1, August 2000.

FEMA 2010, Website, fema.gov, Federal Emergency Management Agency, September 2010.

Federal Register, 1989, *Certification of the Radiological Condition of Middlesex Municipal Landfill in Middlesex, NJ*. Federal Register Volume 54, No. 87 page 19603. 8 May 1989.

NETR 2010, Website, HistoricalAerials.com, National Environmental Title Research, LLC, May 2010.

NJDFGW 2010, Website, state,nj.us/dep/fgw, New Jersey Department of Fish, Game and Wildlife, August 2010.

NRC (U. S. Nuclear Regulatory Agency) 1998, *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*, NUREG-1507, June 1998.

Sadat 2007, *Revised Remedial Investigation Report Addendum/Remedial Action Work Plan,* Sadat Associates, Inc., 2001.

USABTAG (U.S. Army Biological Technical Assistance Group) 2005, *Document for Ecological Risk Assessment: A Guide to Screening Level Ecological Risk Assessment,* April 2005.

USACE 2005, *Soils of Operable Unit: Record of Decision - Middlesex Sampling Plant*, Middlesex, New Jersey, September 2005.

USACE, 2010a, *Accident Prevention Plan, Middlesex Municipal Landfill FUSRAP Site*, Cabrera Services, Inc., January 2010.

USACE 2010b, *Project Work Plan, Middlesex Municipal Landfill FUSRAP Site, Appendix A – Field Sampling Plan*, Cabrera Services, Inc., January 2010.

USACE 2010c, *Quality Assurance Project Plan, Middlesex Municipal Landfill FUSRAP Site*, Cabrera Services, Inc., January 2010.

USACE 2010d, *Contractor Quality Control Plan, Middlesex Municipal Landfill FUSRAP Site,* Cabrera Services, Inc., January 2010.

USACE 2010e, *Radiation Protection Plan, Middlesex Municipal Landfill FUSRAP Site*, Cabrera Services, Inc., January 2010.

USACE 2010F, *Preliminary Assessment,* Middlesex Municipal Landfill FUSRAP Site, September 2010.

US Census Bureau 2010, Website, Census.gov, US Census Bureau Fact Finder, August 2010.

USFWS 2010, Website, fws.gov, US Fish and Wildlife Service, August 2010.

USGS 1999, *Aquifer and Well Characteristics in New Jersey*, United States Geological Survey, 1999.

Tables

TABLE 4-1: INVESTIGATION SCREENING VALUES

Radionuclide of Potential Concern	**Ra-226 (pCi/g)**	**U-238 (pCi/g)**	**Th-232 (pCi/g)**
Average Background Concentration	0.91	0.72	1.24
Standard Deviation	0.28	0.19	0.47
Investigation Screening Values	1.46	1.11	2.18

Ra-226 = Radium-226
U-238 = Uranium-238
Th-232 = Thorium-232
pCi/g = picoCurie per gram

TABLE 4-2: SUMMARY OF LABORATORY ANALYTICAL PROGRAM

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP
Radionuclides of Potential Concern			
Surface and Subsurface Soil	Alpha Spectroscopy – Iso U	Low/ Medium/ High	ASTM 3972-90m
	Gamma Spectroscopy- Ra-226, Pb -214, Bi-214, K-40, Ac-228, and Th-234		EPA 901.1
Groundwater	Gross Alpha and Beta	Low/ Medium/ High	EPA 900
	Ra-226, Ra-228		USEPA 903.1
	Thorium - Isotopic (228, 230, 232)		ASTM D3972-90M
	Uranium - Isotopic (233/234, 235, 238)		ASTM D3972-90M
Soil	Volatile Organic Compounds (VOCs)	Low/ Medium	EPA 8260B
	Semivolatile Organic Compounds (SVOCs)		EPA 8270D
	Pesticides (PEST)		EPA 8081A
	Herbicides (Herb)		EPA 8151A
	PCBs		EPA 8082
	Metals		EPA 6010/700
Soil TCLP	Volatile Organic Compounds (VOCs)	Low/ Medium	EPA 8260B
	Semi-volatile Organic Compounds (SVOCs)		EPA 8270D
	Pesticides (PEST)		EPA 8081A
	Herbicides (Herb)		EPA 8151A
	PCBs		EPA 8082
	RCRA 8 Metals		EPA 6010/7000
	Flash Points		EPA 9045
	pH		EPA 9045
	Reactive Cyanide/Sulfide		SW 846 7.3.1/ 7.3.2

TABLE 5-1: SUMMARY STATISTICS FOR SURFACE GAMMA SURVEY RESULTS MML SITE INVESTIGATION

Statistics	Unit	Gamma Survey Results		
		CLASS System	Traditional GWS	
Dates Survey Conducted		12/08/09 to 01/17/10	12/04/09 to 1/26/10	
Number of Data Points	-	328,627	18,238	3,215
Average	cpm	3,833	14,760	42,874
Maximum	cpm	25,061	26,494	243,014
Minimum	cpm	1,229	6,763	10,545
Standard Deviation	cpm	835	1,863	47,558

Footnotes
CLASS = Cabrera Large Area Survey System
GWS = Gamma Walk Over Survey
cpm = counts per minute

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SSC01				MML-SSC02				MML-SSC03			
		Date	1/21/2010				1/21/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.73	G	0.26	0.15	1.09	G	0.4	0.23	1.11	G	0.37	0.21
Ra-226	1.46	pCi/g	**4.4**	G,TI	1.4	1	**16.9**	G,TI	1.7	2.3	**9.7**	G,TI	1.6	1.6
Th-234	1.11	pCi/g	**1.7**	U,G	3.6	2.2	**8.8**	M3,G	4.5	3.1	**5.1**	G	3.6	2.4
U-234	NA	pCi/g	2.59	M3	0.12	0.57	8.5	M3	0.2	1.5	5.5	M3	0.1	1.1
U-235	NA	pCi/g	0.27	U,G	0.28	0.16	0.63	M3	0.51	0.26	0.38	M3	0.38	0.2
U-238	1.11	pCi/g	**2.93**	M3	0.13	0.63	**9.4**	M3	0.1	1.7	**5.1**		0.09	0.99

		Sample ID	MML-SSC04				MML-SSC05				MML-SSC06			
		Date	1/21/2010				1/21/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.08	M3,G	0.58	0.3	1.16	M3,G	0.69	0.36	1.55	M3,G	0.96	0.45
Ra-226	1.46	pCi/g	**37.1**	G,TI	3.5	5.1	**6**	G,TI	2.6	1.9	**43.5**	G,TI	4	6
Th-234	1.11	pCi/g	**8.6**	G	3.5	2.5	0.3	U,G	2	1.2	**10.4**	G	3.4	2.5
U-234	NA	pCi/g	6.9		0.1	1.3	1.66		0.08	0.4	15.2	M3	0.1	2.7
U-235	NA	pCi/g	1.01	M3	0.91	0.58	0.33	U,G	0.6	0.37	1.82	G	1.25	0.76
U-238	1.11	pCi/g	**6.6**	M3	0.1	1.3	**1.55**		0.07	0.38	**14.2**		0.1	2.5

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SSC07				MML-SSC08				MML-SSC09			
		Date	1/21/2010				1/21/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.26	G	0.35	0.21	0.97	G	0.43	0.23	0.85	M3,G	0.52	0.22
Ra-226	1.46	pCi/g	**5**	G,TI	1.6	1.2	**30.5**	G,TI	2.2	3.9	**2.4**	G,TI	1.6	1.1
Th-234	1.11	pCi/g	**1.4**	U,G	3.6	2.2	**6.9**	M3,G	5.8	3.7	0.7	U,G	3.7	2.2
U-234	NA	pCi/g	1.53		0.07	0.33	5.7		0.1	1.1	0.9		0.1	0.26
U-235	NA	pCi/g	0.18	U,G	0.31	0.19	0.75	G,TI	0.62	0.39	0.04	U,G	0.43	0.25
U-238	1.11	pCi/g	**1.36**		0.06	0.3	**5.5**		0.1	1.1	0.77		0.07	0.24

		Sample ID	MML-SSC10				MML-SSC11				MML-SSC12			
		Date	1/21/2010				1/21/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.85	M3,G	0.56	0.26	1.04	G	0.34	0.2	1.32	G	0.48	0.3
Ra-226	1.46	pCi/g	**10**	G,TI	2.6	2.2	**2.74**	G,TI	1.36	0.92	0.3	U,G,SI	2.4	1.4
Th-234	1.11	pCi/g	**1.3**	U,G	2.5	1.5	**3.5**	LT,G,TI	2.6	1.7	0.7	U,G	1.9	1.2
U-234	NA	pCi/g	2.34		0.08	0.51	1.24		0.07	0.32	0.98		0.1	0.28
U-235	NA	pCi/g	0.5	U,G	0.63	0.39	0.23	U,G	0.28	0.18	0.49	U,G	0.67	0.42
U-238	1.11	pCi/g	**2.71**		0.03	0.57	1.02		0.08	0.28	1.06		0.07	0.3

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SSC13				MML-SSC14				MML-SSC15			
		Date	1/21/2010				1/21/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.23	G	0.49	0.29	1.31	G	0.23	0.21	1.2	G	0.4	0.23
Ra-226	1.46	pCi/g	**2.1**	G,TI	1.7	1.1	**1.55**	G,TI	1.22	0.79	**1.7**	U,G,SI	1.8	1.1
Th-234	1.11	pCi/g	0.56	U,G	1.49	0.9	1	U,G	3.3	2	0.52	U,G	1.49	0.9
U-234	NA	pCi/g	1.14		0.09	0.32	0.74		0.08	0.22	0.95		0.03	0.26
U-235	NA	pCi/g	0.078	U,G	0.42	0.24	0.11	U,G	0.25	0.15	0.01	U,G	0.33	0.19
U-238	1.11	pCi/g	0.73		0.1	0.24	0.76		0.08	0.23	0.96		0.08	0.27

		Sample ID	MML-SSC16				MML-SSC17				MML-SSC18			
		Date	1/21/2010				1/21/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.3	G	0.25	0.19	1.21	G	0.22	0.18	1.1	G	0.37	0.21
Ra-226	1.46	pCi/g	**2.13**	G,TI	1.13	0.74	**2.26**	G,TI	1.21	0.8	0.9	U,G,SI	1.6	1
Th-234	1.11	pCi/g	-0.2	U,G	2.2	1.3	**1.5**	U,G	3.3	2	**2.22**	LT,G,TI	0.9	0.65
U-234	NA	pCi/g	0.92		0.07	0.26	1.01		0.07	0.27	0.77		0.05	0.18
U-235	NA	pCi/g	0.078	U,G	0.23	0.14	0.054	U,G	0.21	0.11	0.15	U,G	0.28	0.17
U-238	1.11	pCi/g	1.01		0.08	0.27	1.09		0.07	0.29	0.77		0.06	0.19

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SSC19				MML-SSC20				MML-SSC22			
		Date	1/21/2010				1/21/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.45	G	0.23	0.22	0.97	G	0.35	0.19	**3.05**	G	0.38	0.42
Ra-226	1.46	pCi/g	**2.39**	G,TI	1.31	0.87	**2.64**	G,TI	1.37	0.92	**7.4**	G,TI	1.7	1.4
Th-234	1.11	pCi/g	**2.4**	LT,G,TI	2	1.3	**3.6**	LT,G,TI	2.4	1.6	**2.33**	LT,G	1.3	0.87
U-234	NA	pCi/g	0.9		0.05	0.2	1.79		0.09	0.43	3.79	M3	0.12	0.77
U-235	NA	pCi/g	0.068	U,G	0.21	0.12	0.13	U,G	0.26	0.16	0.36	M3	0.32	0.2
U-238	1.11	pCi/g	1.01		0.05	0.22	**1.81**		0.09	0.43	**4.28**	M3	0.11	0.86

		Sample ID	MML-SSC23				MML-SSC24				MML-SSC25			
		Date	1/21/2010				1/21/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.14	G	0.22	0.17	0.59	G	0.28	0.13	0.66	G	0.19	0.13
Ra-226	1.46	pCi/g	**1.54**	G,TI	0.99	0.64	1.22	G,TI	1.19	0.75	1.18	G,TI	1.16	0.73
Th-234	1.11	pCi/g	-0.4	U,G	3	1.8	0.6	U,G	2.7	1.6	-0.1	U,G	2.8	1.6
U-234	NA	pCi/g	0.83	M3	0.14	0.25	0.49	M3	0.12	0.18	0.56		0.08	0.15
U-235	NA	pCi/g	0.15	U,G	0.2	0.12	0.038	U,G	0.35	0.21	0.03	U,G	0.24	0.14
U-238	1.11	pCi/g	0.54		0.03	0.19	0.33		0.08	0.14	0.57		0.06	0.15

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SSC26				MML-SSC27				MML-SSC28			
		Date	2/24/2010				2/24/2010				3/2/2010			
		Depth (Feet)	0-0.5				0-1				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.82	M3,G	0.51	0.28	**9**	M3,G	0.9	1.2	0.9	M3,G	0.69	0.33
Ra-226	1.46	pCi/g	**15.1**	G,TI	2.5	2.6	**17.1**	G,TI	4.1	3.6	**79.6**	G,TI	3.2	9.7
Th-234	1.11	pCi/g	**4.5**	G	1.9	1.3	**6**	G	3.3	2.3	**15.6**	G	2.2	2.4
U-234	NA	pCi/g	3.66		0.04	0.65	20.3		0	3.3	16.5	M3	0.2	2.8
U-235	NA	pCi/g	0.32	U,G	0.7	0.43	1	U,G	0.69	0.42	1.95	M3	0.89	0.52
U-238	1.11	pCi/g	**4.07**		0.02	0.72	**20.6**		0.1	3.3	**15.6**	M3	0.2	2.7

		Sample ID	MML-SSC29				MML-SSC30				MML-SSC31			
		Date	3/2/2010				3/2/2010				3/2/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.01	M3,G	0.67	0.36	0.95	M3,G	0.85	0.44	1.08	G	0.34	0.2
Ra-226	1.46	pCi/g	**63.7**	G,TI	3.1	7.9	**61.8**	G,TI	4.6	8	**1.69**	G,TI	1.42	0.9
Th-234	1.11	pCi/g	**9.9**	G	2.6	2	**12.2**	M3,G	4.6	3.2	**1.5**	U,G	3.6	2.2
U-234	NA	pCi/g	16.8	M3	0.6	3.2	10.6	M3	0.4	2.1	0.66		0.04	0.16
U-235	NA	pCi/g	2.16	M3	1.08	0.72	1.54	M3	1.19	0.76	0.03	U,G	0.4	0.24
U-238	1.11	pCi/g	**17.5**	M3	0.4	3.3	**10.9**	M3	0.3	2.1	0.8		0.04	0.18

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SSC32				MML-SSC33				MML-SSC34			
		Date	3/2/2010				3/2/2010				3/2/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.23	M3,G	0.73	0.4	1.46	M3,G	0.55	0.32	1.58	G	0.3	0.24
Ra-226	1.46	pCi/g	**1.7**	U,G,SI	2.2	1.4	**2.5**	G,TI	2.5	1.6	**2.34**	G,TI	1.18	0.8
Th-234	1.11	pCi/g	1	U,G	2.5	1.5	0.8	U,G	1.9	1.2	**2.3**	U,G	2.6	1.6
U-234	NA	pCi/g	0.86		0.07	0.2	0.94		0.05	0.21	1		0.07	0.22
U-235	NA	pCi/g	0.101	U,G	0.66	0.38	0.061	U,G	0.55	0.32	0.2	U,G	0.23	0.14
U-238	1.11	pCi/g	0.96		0.06	0.22	0.9		0.05	0.2	**1.16**		0.07	0.25

		Sample ID	MML-SSC35				MML-SSC37				MML-SSC38			
		Date	3/2/2010				3/2/2010				3/2/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.02	M3,G,TI	0.64	0.38	0.68	G	0.42	0.21	0.91	G	0.24	0.15
Ra-226	1.46	pCi/g	**45**	G,TI	2.8	5.8	**52.5**	G,TI	2.5	6.4	**10.9**	G,TI	1.2	1.5
Th-234	1.11	pCi/g	**16.2**	G	2.4	2.6	**16.1**	M3,G	5.6	4	**5.4**	G	3.6	2.3
U-234	NA	pCi/g	11.3		0.1	1.9	10		0.1	1.6	4.75		0.07	0.81
U-235	NA	pCi/g	1.3	G	0.78	0.44	1.4	G	0.62	0.34	0.34	U,G	0.38	0.23
U-238	1.11	pCi/g	**11.5**		0	1.9	**9.9**		0.1	1.6	**4.75**		0.04	0.81

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SSC39				MML-SSC40				MML-SSCM01			
		Date	3/2/2010				3/2/2010				1/21/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.87	G	0.47	0.25	1.23	M3,G	0.61	0.36	0.91	G	0.35	0.19
Ra-226	1.46	pCi/g	**2.1**	G,TI	1.6	1.1	**2.5**	G,TI	2.5	1.6	**1.7**	G,TI	1.34	0.86
Th-234	1.11	pCi/g	**1.18**	U,G	1.47	0.92	-0.2	U,G	1.9	1.1	0.9	U,G	1.1	0.68
U-234	NA	pCi/g	1.18		0.06	0.26	1.12		0.05	0.24	0.7		0.09	0.18
U-235	NA	pCi/g	0.11	U,G	0.34	0.21	0.081	U,G	0.64	0.37	0.12	U,G	0.24	0.14
U-238	1.11	pCi/g	**1.19**		0.08	0.26	0.99		0.04	0.22	0.79		0.08	0.19

		Sample ID	MML-SSCM02				MML-SSCM03				MML-SSW01			
		Date	1/21/2010				1/21/2010				2/2/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.61	G	0.33	0.16	1.3	G	0.34	0.22	0.91	G	0.44	0.27
Ra-226	1.46	pCi/g	1.33	G,TI	1.2	0.76	**1.73**	G,TI	1.28	0.82	**2.2**	G,TI	2	1.3
Th-234	1.11	pCi/g	**1.7**	U,G	2	1.3	**2.5**	U,G	2.6	1.6	**1.5**	U,G	2.2	1.4
U-234	NA	pCi/g	0.62		0.09	0.21	0.88		0.08	0.26	0.9		0.06	0.21
U-235	NA	pCi/g	0.2	U,G	0.21	0.13	0.14	U,G	0.27	0.16	0.14	U,G	0.52	0.31
U-238	1.11	pCi/g	0.65	M3	0.12	0.22	0.93		0.1	0.27	1.03		0.04	0.23

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

Parameter	ISV	Sample ID	MML-SSW02				MML-SSW03			
		Date	2/2/2010				2/2/2010			
		Depth (Feet)	0-0.5				0-0.5			
		Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	1.34	G	0.31	0.21	1.44	G	0.3	0.23
Ra-226	1.46	pCi/g	**1.96**	G,TI	1.35	0.87	**1.61**	G,TI	1.23	0.79
Th-234	1.11	pCi/g	1.1	U,G	3.1	1.9	0.1	U,G	3.4	2
U-234	NA	pCi/g	0.93		0.08	0.21	1.07		0.05	0.23
U-235	NA	pCi/g	0.12	U,G	0.25	0.16	0.055	U,G	0.37	0.22
U-238	1.11	pCi/g	1.08		0.08	0.24	**1.15**		0.03	0.24

Parameter	ISV	Sample ID	MML-SSW04				MML-SSW05			
		Date	2/2/2010				2/2/2010			
		Depth (Feet)	0-0.5				0-0.5			
		Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.92	G	0.21	0.16	0.72	G	0.39	0.2
Ra-226	1.46	pCi/g	**3.8**	G,TI	1.4	1	**6.2**	G,TI	1.9	1.4
Th-234	1.11	pCi/g	**2.1**	U,G	3.6	2.2	**3**	LT,G	1.8	1.2
U-234	NA	pCi/g	1.8		0.05	0.35	2.47		0.05	0.46
U-235	NA	pCi/g	0.14	U,G	0.27	0.16	0.18	U,G	0.39	0.24
U-238	1.11	pCi/g	**1.82**		0.07	0.35	**2.52**		0.08	0.47

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-2
SUMMARY OF SURFACE SOIL
RADIOLOGICAL RESULTS

Parameter	ISV	Sample ID	MML-SSW06				MML-SSW07			
		Date	2/2/2010				2/2/2010			
		Depth (Feet)	0-0.5				0-0.5			
		Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.59	G	0.4	0.18	0.86	G	0.34	0.18
Ra-226	1.46	pCi/g	**19.9**	G,TI	1.9	2.7	1.41	G,TI	1.38	0.87
Th-234	1.11	pCi/g	**6**	M3,G	4.6	2.9	**2.6**	U,G	2.8	1.8
U-234	NA	pCi/g	5.62		0.05	0.96	0.74		0.05	0.18
U-235	NA	pCi/g	0.61	G,TI	0.53	0.34	0.06	U,G	0.29	0.17
U-238	1.11	pCi/g	**5.52**		0.06	0.95	0.77		0.05	0.18

Parameter	ISV	Sample ID	MML-SSW08			
		Date	2/2/2010			
		Depth (Feet)	0-0.5			
		Units	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	1.91	G	0.22	0.26
Ra-226	1.46	pCi/g	**2.08**	G,TI	1.3	0.85
Th-234	1.11	pCi/g	0.6	U,G	3.3	2
U-234	NA	pCi/g	0.87		0.07	0.2
U-235	NA	pCi/g	0.09	U,G	0.21	0.13
U-238	1.11	pCi/g	0.95		0.02	0.21

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

Notes:
U = Result is less than the sample specific MDC or less than the associated TPU
G = Sample density differs by more than 15% of LCS density: sample results may be biased
TI = Nuclide identification is tentative
M3 = Requested MDC was not met, but the reported activity is greater than the reported MDC.
J = the value is estimated
SI = Nuclide identification and/or quantitation is tentative

TABLE 5-3
DETECTED CONCENTRATIONS OF
VOCs IN SURFACE SOIL

				Sample ID	MML-SSC01		MML-SSC08		MML-SSC19		MML-SSC23	
				Sample Date	1/21/2010		1/21/2010		1/21/2010		1/21/2010	
				Depth (ft)	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1,1,2-TETRACHLOROETHANE	ug/kg	170000	310000	1000	6.2	U	6.2	U	6.8	U	5.9	U
1,1,1-TRICHLOROETHANE	ug/kg	210000	100000	50000	6.2	U	6.2	U	6.8	U	5.9	U
1,1,2,2-TETRACHLOROETHANE	ug/kg	34000	70000	1000	6.2	U	6.2	U	6.8	U	5.9	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
1,1,2-TRICHLOROETHANE	ug/kg	22000	420000	1000	6.2	U	6.2	U	6.8	U	5.9	U
1,1-DICHLOROETHANE	ug/kg	570000	1000000	10000	6.2	U	6.2	U	6.8	U	5.9	U
1,1-DICHLOROETHENE	ug/kg	8000	150000	10000	6.2	U	6.2	U	6.8	U	5.9	U
1,1-DICHLOROPROPENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
1,2,3-TRICHLOROBENZENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
1,2,3-TRICHLOROPROPANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
1,2,4-TRICHLOROBENZENE	ug/kg	68000	1200000	100000	6.2	U	6.2	U	6.8	U	5.9	U
1,2,4-TRIMETHYLBENZENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	-	-	-	12	U	12	U	14	U	12	U
1,2-DIBROMOETHANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
1,2-DICHLOROBENZENE	ug/kg	5100000	10000000	50000	6.2	U	6.2	U	6.8	U	5.9	U
1,2-DICHLOROETHANE	ug/kg	6000	24000	1000	6.2	U	6.2	U	6.8	U	5.9	U
1,2-DICHLOROPROPANE	ug/kg	10000	43000	-	6.2	U	6.2	U	6.8	U	5.9	U
1,3,5-TRIMETHYLBENZENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
1,3-DICHLOROBENZENE	ug/kg	5100000	10000000	100000	6.2	U	6.2	U	6.8	U	5.9	U
1,3-DICHLOROPROPANE	ug/kg	4000	5000	1000	6.2	U	6.2	U	6.8	U	5.9	U
1,4-DICHLOROBENZENE	ug/kg	570000	10000000	100000	6.2	U	6.2	U	6.8	U	5.9	U
1-CHLOROHEXANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
2,2-DICHLOROPROPANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
2-BUTANONE	ug/kg	1000000	1000000	50000	25	U	25	U	27	U	24	U
2-CHLOROTOLUENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
2-HEXANONE	ug/kg	-	-	-	25	U	25	U	27	U	24	U
4-CHLOROTOLUENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
4-METHYL-2-PENTANONE	ug/kg	1000000	1000000	50000	25	U	25	U	27	U	24	U
ACETONE	ug/kg	1000000	1000000	100000	25	U	25	U	27	U	24	U
BENZENE	ug/kg	3000	13000	1000	6.2	U	6.2	U	6.8	U	5.9	U
BROMOBENZENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
BROMOCHLOROMETHANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
BROMODICHLOROMETHANE	ug/kg	11000	46000	1000	6.2	U	6.2	U	6.8	U	5.9	U
BROMOFORM	ug/kg	86000	370000	1000	6.2	U	6.2	U	6.8	U	5.9	U
BROMOMETHANE	ug/kg	79000	1000000	1000	6.2	U	6.2	U	6.8	U	5.9	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-3
DETECTED CONCENTRATIONS OF
VOCs IN SURFACE SOIL

				Sample ID	MML-SSC01		MML-SSC08		MML-SSC19		MML-SSC23	
				Sample Date	1/21/2010		1/21/2010		1/21/2010		1/21/2010	
				Depth (ft)	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag	Result	Flag
CARBON DISULFIDE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
CARBON TETRACHLORIDE	ug/kg	2000	4000	1000	6.2	U	6.2	U	6.8	U	5.9	U
CHLOROBENZENE	ug/kg	37000	680000	1000	6.2	U	6.2	U	6.8	U	5.9	U
CHLOROETHANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
CHLOROFORM	ug/kg	19000	28000	1000	6.2	U	6.2	U	6.8	U	5.9	U
CHLOROMETHANE	ug/kg	520000	1000000	10000	6.2	U	6.2	U	6.8	U	5.9	U
CIS-1,2-DICHLOROETHENE	ug/kg	79000	1000000	1000	6.2	U	6.2	U	6.8	U	5.9	U
CIS-1,3-DICHLOROPROPENE	ug/kg	4000	5000	1000	6.2	U	6.2	U	6.8	U	5.9	U
DIBROMOCHLOROMETHANE	ug/kg	110000	1000000	1000	6.2	U	6.2	U	6.8	U	5.9	U
DIBROMOMETHANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
DICHLORODIFLUOROMETHANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
ETHYLBENZENE	ug/kg	1000000	1000000	100000	6.2	U	6.2	U	6.8	U	5.9	U
HEXACHLOROBUTADIENE	ug/kg	1000	21000	100000	6.2	U	6.2	U	6.8	U	5.9	U
IODOMETHANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
ISOPROPYLBENZENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
METHYL TERTIARY BUTYL ETHER	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
METHYLENE CHLORIDE	ug/kg	49000	210000	1000	6.2	U	6.2	U	6.8	U	5.9	U
NAPHTHALENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
N-BUTYLBENZENE	ug/kg	-	-	-	6.2	U	10		6.8	U	5.9	U
N-PROPYLBENZENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
P-ISOPROPYLTOLUENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
SEC-BUTYLBENZENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
STYRENE	ug/kg	23000	97000	100000	6.2	U	8.7		6.8	U	5.9	U
TERT-BUTYLBENZENE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
TETRACHLOROETHENE	ug/kg	4000	6000	1000	6.2	U	6.2	U	6.8	U	5.9	U
TOLUENE	ug/kg	1000000	1000000	500000	6.2	U	6.2	U	6.8	U	5.9	U
TRANS-1,2-DICHLOROETHENE	ug/kg	1000000	1000000	50000	6.2	U	6.2	U	6.8	U	5.9	U
TRANS-1,3-DICHLOROPROPENE	ug/kg	4000	5000	1000	65.3		71.4		73.7		60.2	
TRICHLOROETHENE	ug/kg	23000	54000	1000	6.2	U	6.2	U	6.8	U	5.9	U
TRICHLOROFLUOROMETHANE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
VINYL ACETATE	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U
VINYL CHLORIDE	ug/kg	2000	7000	10000	6.2	U	6.2	U	6.8	U	5.9	U
XYLENE (M+P)	ug/kg	-	-	-	25	U	25	U	27	U	24	U
XYLENE (O)	ug/kg	-	-	-	6.2	U	6.2	U	6.8	U	5.9	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-3
DETECTED CONCENTRATIONS OF
VOCs IN SURFACE SOIL

				Sample ID	MML-SSC24		MML-SSC30		MML-SSC32		MML-SSC37	
				Sample Date	1/21/2010		3/2/2010		3/2/2010		3/2/2010	
				Depth (ft)	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1,1,2-TETRACHLOROETHANE	ug/kg	170000	310000	1000	6.2	U	6.4	U	6.5	U	6.8	U
1,1,1-TRICHLOROETHANE	ug/kg	210000	100000	50000	6.2	U	6.4	U	6.5	U	6.8	U
1,1,2,2-TETRACHLOROETHANE	ug/kg	34000	70000	1000	6.2	U	6.4	U	6.5	U	6.8	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
1,1,2-TRICHLOROETHANE	ug/kg	22000	420000	1000	6.2	U	6.4	U	6.5	U	6.8	U
1,1-DICHLOROETHANE	ug/kg	570000	1000000	10000	6.2	U	6.4	U	6.5	U	6.8	U
1,1-DICHLOROETHENE	ug/kg	8000	150000	10000	6.2	U	6.4	U	6.5	U	6.8	U
1,1-DICHLOROPROPENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
1,2,3-TRICHLOROBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
1,2,3-TRICHLOROPROPANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
1,2,4-TRICHLOROBENZENE	ug/kg	68000	1200000	100000	6.2	U	6.4	U	6.5	U	6.8	U
1,2,4-TRIMETHYLBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	-	-	-	12	U	13	U	13	U	14	U
1,2-DIBROMOETHANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
1,2-DICHLOROBENZENE	ug/kg	5100000	10000000	50000	6.2	U	6.4	U	6.5	U	6.8	U
1,2-DICHLOROETHANE	ug/kg	6000	24000	1000	6.2	U	6.4	U	6.5	U	6.8	U
1,2-DICHLOROPROPANE	ug/kg	10000	43000	-	6.2	U	6.4	U	6.5	U	6.8	U
1,3,5-TRIMETHYLBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
1,3-DICHLOROBENZENE	ug/kg	5100000	10000000	100000	6.2	U	6.4	U	6.5	U	6.8	U
1,3-DICHLOROPROPANE	ug/kg	4000	5000	1000	6.2	U	6.4	U	6.5	U	6.8	U
1,4-DICHLOROBENZENE	ug/kg	570000	10000000	100000	6.2	U	6.4	U	6.5	U	6.8	U
1-CHLOROHEXANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
2,2-DICHLOROPROPANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
2-BUTANONE	ug/kg	1000000	1000000	50000	25	U	26	U	26	U	27	U
2-CHLOROTOLUENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
2-HEXANONE	ug/kg	-	-	-	25	U	26	U	26	U	27	U
4-CHLOROTOLUENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
4-METHYL-2-PENTANONE	ug/kg	1000000	1000000	50000	25	U	26	U	26	U	27	U
ACETONE	ug/kg	1000000	1000000	100000	25	U	26	U	16	J	27	U
BENZENE	ug/kg	3000	13000	1000	6.2	U	6.4	U	6.5	U	6.8	U
BROMOBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
BROMOCHLOROMETHANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
BROMODICHLOROMETHANE	ug/kg	11000	46000	1000	6.2	U	6.4	U	6.5	U	6.8	U
BROMOFORM	ug/kg	86000	370000	1000	6.2	U	6.4	U	6.5	U	6.8	U
BROMOMETHANE	ug/kg	79000	1000000	1000	6.2	U	6.4	U	6.5	U	6.8	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-3
DETECTED CONCENTRATIONS OF
VOCs IN SURFACE SOIL

				Sample ID	MML-SSC24		MML-SSC30		MML-SSC32		MML-SSC37	
				Sample Date	1/21/2010		3/2/2010		3/2/2010		3/2/2010	
				Depth (ft)	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag	Result	Flag
CARBON DISULFIDE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
CARBON TETRACHLORIDE	ug/kg	2000	4000	1000	6.2	U	6.4	U	6.5	U	6.8	U
CHLOROBENZENE	ug/kg	37000	680000	1000	6.2	U	6.4	U	6.5	U	6.8	U
CHLOROETHANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
CHLOROFORM	ug/kg	19000	28000	1000	6.2	U	6.4	U	6.5	U	6.8	U
CHLOROMETHANE	ug/kg	520000	1000000	10000	6.2	U	6.4	U	6.5	U	6.8	U
CIS-1,2-DICHLOROETHENE	ug/kg	79000	1000000	1000	6.2	U	6.4	U	6.5	U	6.8	U
CIS-1,3-DICHLOROPROPENE	ug/kg	4000	5000	1000	6.2	U	6.4	U	6.5	U	6.8	U
DIBROMOCHLOROMETHANE	ug/kg	110000	1000000	1000	6.2	U	6.4	U	6.5	U	6.8	U
DIBROMOMETHANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
DICHLORODIFLUOROMETHANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
ETHYLBENZENE	ug/kg	1000000	1000000	100000	6.2	U	6.4	U	6.5	U	6.8	U
HEXACHLOROBUTADIENE	ug/kg	1000	21000	100000	6.2	U	6.4	U	6.5	U	6.8	U
IODOMETHANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
ISOPROPYLBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
METHYL TERTIARY BUTYL ETHER	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
METHYLENE CHLORIDE	ug/kg	49000	210000	1000	6.2	U	6.4	U	6.5	U	6.8	U
NAPHTHALENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
N-BUTYLBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
N-PROPYLBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
P-ISOPROPYLTOLUENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
SEC-BUTYLBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
STYRENE	ug/kg	23000	97000	100000	6.2	U	6.4	U	6.5	U	6.8	U
TERT-BUTYLBENZENE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
TETRACHLOROETHENE	ug/kg	4000	6000	1000	6.2	U	6.4	U	6.5	U	6.8	U
TOLUENE	ug/kg	1000000	1000000	500000	6.2	U	6.4	U	6.5	U	6.8	U
TRANS-1,2-DICHLOROETHENE	ug/kg	1000000	1000000	50000	6.2	U	6.4	U	6.5	U	6.8	U
TRANS-1,3-DICHLOROPROPENE	ug/kg	4000	5000	1000	66.5		69.2		71.8		70.6	
TRICHLOROETHENE	ug/kg	23000	54000	1000	6.2	U	6.4	U	6.5	U	6.8	U
TRICHLOROFLUOROMETHANE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
VINYL ACETATE	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U
VINYL CHLORIDE	ug/kg	2000	7000	10000	6.2	U	6.4	U	6.5	U	6.8	U
XYLENE (M+P)	ug/kg	-	-	-	25	U	26	U	26	U	27	U
XYLENE (O)	ug/kg	-	-	-	6.2	U	6.4	U	6.5	U	6.8	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-3
DETECTED CONCENTRATIONS OF
VOCs IN SURFACE SOIL

				Sample ID	MML-SSC38		MML-SSC39		MML-SSW04	
				Sample Date	3/2/2010		3/2/2010		2/2/2010	
				Depth (ft)	0.0 - 0.5		0.0 - 0.5		0.0-0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag
1,1,1,2-TETRACHLOROETHANE	ug/kg	170000	310000	1000	7.2	U	6.6	U	7.4	U
1,1,1-TRICHLOROETHANE	ug/kg	210000	100000	50000	7.2	U	6.6	U	7.4	U
1,1,2,2-TETRACHLOROETHANE	ug/kg	34000	70000	1000	7.2	U	6.6	U	7.4	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
1,1,2-TRICHLOROETHANE	ug/kg	22000	420000	1000	7.2	U	6.6	U	7.4	U
1,1-DICHLOROETHANE	ug/kg	570000	1000000	10000	7.2	U	6.6	U	7.4	U
1,1-DICHLOROETHENE	ug/kg	8000	150000	10000	7.2	U	6.6	U	7.4	U
1,1-DICHLOROPROPENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
1,2,3-TRICHLOROBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
1,2,3-TRICHLOROPROPANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
1,2,4-TRICHLOROBENZENE	ug/kg	68000	1200000	100000	7.2	U	6.6	U	7.4	U
1,2,4-TRIMETHYLBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	-	-	-	14	U	13	U	15	U
1,2-DIBROMOETHANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
1,2-DICHLOROBENZENE	ug/kg	5100000	10000000	50000	7.2	U	6.6	U	7.4	U
1,2-DICHLOROETHANE	ug/kg	6000	24000	1000	7.2	U	6.6	U	7.4	U
1,2-DICHLOROPROPANE	ug/kg	10000	43000	-	7.2	U	6.6	U	7.4	U
1,3,5-TRIMETHYLBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
1,3-DICHLOROBENZENE	ug/kg	5100000	10000000	100000	7.2	U	6.6	U	7.4	U
1,3-DICHLOROPROPANE	ug/kg	4000	5000	1000	7.2	U	6.6	U	7.4	U
1,4-DICHLOROBENZENE	ug/kg	570000	10000000	100000	7.2	U	6.6	U	7.4	U
1-CHLOROHEXANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
2,2-DICHLOROPROPANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
2-BUTANONE	ug/kg	1000000	1000000	50000	29	U	26	U	30	U
2-CHLOROTOLUENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
2-HEXANONE	ug/kg	-	-	-	29	U	26	U	30	U
4-CHLOROTOLUENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
4-METHYL-2-PENTANONE	ug/kg	1000000	1000000	50000	29	U	26	U	30	U
ACETONE	ug/kg	1000000	1000000	100000	13	J	25	J	9.9	J
BENZENE	ug/kg	3000	13000	1000	7.2	U	6.6	U	7.4	U
BROMOBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
BROMOCHLOROMETHANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
BROMODICHLOROMETHANE	ug/kg	11000	46000	1000	7.2	U	6.6	U	7.4	U
BROMOFORM	ug/kg	86000	370000	1000	7.2	U	6.6	U	7.4	U
BROMOMETHANE	ug/kg	79000	1000000	1000	7.2	U	6.6	U	7.4	U

Notes:
ug/kg = micrograms per kilogram
ft = Feet
Flag = Laboratory data qualifier code
U = Not detected above the noted method detection limit
J = Estimated value (result less than limit of Quantitation but greater than MDL)
E = Concentration exceeds upper level of the calibration range
Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-3
DETECTED CONCENTRATIONS OF
VOCs IN SURFACE SOIL

				Sample ID	MML-SSC38		MML-SSC39		MML-SSW04	
				Sample Date	3/2/2010		3/2/2010		2/2/2010	
				Depth (ft)	0.0 - 0.5		0.0 - 0.5		0.0-0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag
CARBON DISULFIDE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
CARBON TETRACHLORIDE	ug/kg	2000	4000	1000	7.2	U	6.6	U	7.4	U
CHLOROBENZENE	ug/kg	37000	680000	1000	7.2	U	6.6	U	7.4	U
CHLOROETHANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
CHLOROFORM	ug/kg	19000	28000	1000	7.2	U	6.6	U	7.4	U
CHLOROMETHANE	ug/kg	520000	1000000	10000	7.2	U	6.6	U	7.4	U
CIS-1,2-DICHLOROETHENE	ug/kg	79000	1000000	1000	7.2	U	6.6	U	7.4	U
CIS-1,3-DICHLOROPROPENE	ug/kg	4000	5000	1000	7.2	U	6.6	U	7.4	U
DIBROMOCHLOROMETHANE	ug/kg	110000	1000000	1000	7.2	U	6.6	U	7.4	U
DIBROMOMETHANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
DICHLORODIFLUOROMETHANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
ETHYLBENZENE	ug/kg	1000000	1000000	100000	7.2	U	6.6	U	7.4	U
HEXACHLOROBUTADIENE	ug/kg	1000	21000	100000	7.2	U	6.6	U	7.4	U
IODOMETHANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
ISOPROPYLBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
METHYL TERTIARY BUTYL ETHER	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
METHYLENE CHLORIDE	ug/kg	49000	210000	1000	7.2	U	6.6	U	7.4	U
NAPHTHALENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
N-BUTYLBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
N-PROPYLBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
P-ISOPROPYLTOLUENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
SEC-BUTYLBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
STYRENE	ug/kg	23000	97000	100000	7.2	U	6.6	U	7.4	U
TERT-BUTYLBENZENE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
TETRACHLOROETHENE	ug/kg	4000	6000	1000	7.2	U	6.6	U	7.4	U
TOLUENE	ug/kg	1000000	1000000	500000	7.2	U	6.6	U	7.4	U
TRANS-1,2-DICHLOROETHENE	ug/kg	1000000	1000000	50000	7.2	U	6.6	U	7.4	U
TRANS-1,3-DICHLOROPROPENE	ug/kg	4000	5000	1000	77.9		71.6		81.6	
TRICHLOROETHENE	ug/kg	23000	54000	1000	7.2	U	6.6	U	7.4	U
TRICHLOROFLUOROMETHANE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
VINYL ACETATE	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U
VINYL CHLORIDE	ug/kg	2000	7000	10000	7.2	U	6.6	U	7.4	U
XYLENE (M+P)	ug/kg	-	-	-	29	U	26	U	30	U
XYLENE (O)	ug/kg	-	-	-	7.2	U	6.6	U	7.4	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-4
DETECTED CONCENTRATIONS OF
SVOCs IN SURFACE SOIL

				Sample ID	MML-SSC01		MML-SSC08		MML-SSC19		MML-SSC23	
				Sample Date	1/21/2010		1/21/2010		1/21/2010		1/21/2010	
				Depth	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,2,4-TRICHLOROBENZENE	ug/kg	68000	1200000	-	410	U	830	U	450	U	390	U
1,2-DICHLOROBENZENE	ug/kg	5100000	10000000	50000	410	U	830	U	450	U	390	U
1,3-DICHLOROBENZENE	ug/kg	5100000	10000000	100000	410	U	830	U	450	U	390	U
1,4-DICHLOROBENZENE	ug/kg	570000	10000000	100000	410	U	830	U	450	U	390	U
1-METHYLNAPHTHALENE	ug/kg	-	-	-	410	U	1800		450	U	390	U
2,3,4,6-TETRACHLOROPHENOL	ug/kg	-	-	-	410	U	830	U	450	U	390	U
2,4,5-TRICHLOROPHENOL	ug/kg	5600000	10000000	50000	410	U	830	U	450	U	390	U
2,4,6-TRICHLOROPHENOL	ug/kg	62000	270000	10000	410	U	830	U	450	U	390	U
2,4-DICHLOROPHENOL	ug/kg	170000	31000000	10000	410	U	830	U	450	U	390	U
2,4-DIMETHYLPHENOL	ug/kg	1100000	10000000	50000	410	U	830	U	450	U	390	U
2,4-DINITROPHENOL	ug/kg	110000	2100000	10000	820	U	1700	U	910	U	790	U
2,4-DINITROTOLUENE	ug/kg	1000	4000	10000	410	U	830	U	450	U	390	U
2,6-DINITROTOLUENE	ug/kg	1000	4000	10000	410	U	830	U	450	U	390	U
2-CHLORONAPHTHALENE	ug/kg	-	-	-	410	U	830	U	450	U	390	U
2-CHLOROPHENOL	ug/kg	280000	5200000	10000	410	U	830	U	450	U	390	U
2-METHYLNAPHTHALENE	ug/kg	-	-	-	410	U	2100		450	U	390	U
2-METHYLPHENOL	ug/kg	2800000	10000000	-	410	U	830	U	450	U	390	U
2-NITROANILINE	ug/kg	-	-	-	820	U	1700	U	910	U	790	U
2-NITROPHENOL	ug/kg	-	-	-	410	U	830	U	450	U	390	U
3,3'-DICHLOROBENZIDINE	ug/kg	2000	6000	100000	410	U	830	U	450	U	390	U
3+4-METHYLPHENOL	ug/kg	2800000	10000000	-	410	U	240	J	450	U	390	U
3-NITROANILINE	ug/kg	-	-	-	820	U	1700	U	910	U	790	U
4,6-DINITRO-2-METHYLPHENOL	ug/kg	-	-	-	820	U	1700	U	910	U	790	U
4-BROMOPHENYL PHENYL ETHER	ug/kg	-	-	-	410	U	830	U	450	U	390	U
4-CHLORO-3-METHYLPHENOL	ug/kg	10000000	10000000	100000	410	U	830	U	450	U	390	U
4-CHLOROANILINE	ug/kg	230000	4200000	-	410	U	830	U	450	U	390	U
4-CHLOROPHENYL PHENYL ETHER	ug/kg	-	-	-	410	U	830	U	450	U	390	U
4-NITROANILINE	ug/kg	-	-	-	820	U	1700	U	910	U	790	U
4-NITROPHENOL	ug/kg	-	-	-	820	U	1700	U	910	U	790	U
ACENAPHTHENE	ug/kg	3400000	10000000	100000	410	U	2600		450	U	390	U
ACENAPHTHYLENE	ug/kg	3400000	10000000	-	410	U	410	J	450	U	390	U
ANILINE	ug/kg	-	-	-	410	U	830	U	450	U	390	U
ANTHRACENE	ug/kg	10000000	10000000	100000	410	U	14000	E	450	U	390	U
AZOBENZENE	ug/kg	-	-	-	410	U	830	U	450	U	390	U
BENZO(A)ANTHRACENE	ug/kg	900	4000	500000	250	J	**39000**	E	390	J	390	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-4
DETECTED CONCENTRATIONS OF
SVOCs IN SURFACE SOIL

				Sample ID	MML-SSC01		MML-SSC08		MML-SSC19		MML-SSC23	
				Sample Date	1/21/2010		1/21/2010		1/21/2010		1/21/2010	
				Depth	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag	Result	Flag
BENZO(A)PYRENE	ug/kg	660	660	100000	290	J	**25000**	E	420	J	390	U
BENZO(B)FLUORANTHENE	ug/kg	900	4000	50000	440		**26000**	E	580		110	J
BENZO(G,H,I)PERYLENE	ug/kg	-	-	-	130	J	13000	E	210	J	390	U
BENZO(K)FLUORANTHENE	ug/kg	900	4000	500000	170	J	**13000**	E	220	J	390	U
BENZOIC ACID	ug/kg	-	-	-	2100	U	4200	U	2300	U	2000	U
BENZYL ALCOHOL	ug/kg	10000000	10000000	50000	410	U	830	U	450	U	390	U
BIS(2-CHLOROETHOXY)METHANE	ug/kg	-	-	-	410	U	830	U	450	U	390	U
BIS(2-CHLOROETHYL)ETHER	ug/kg	660	3000	10000	410	U	830	U	450	U	390	U
BIS(2-CHLOROISOPROPYL)ETHER	ug/kg	-	-	-	410	U	830	U	450	U	390	U
BIS(2-ETHYLHEXYL)PHTHALATE	ug/kg	49000	210000	100000	410	U	3100		450	U	390	U
BUTYL BENZYL PHTHALATE	ug/kg	1100000	10000000	100000	410	U	830	U	450	U	390	U
CARBAZOLE	ug/kg	-	-	-	410	U	2100		450	U	390	U
CHRYSENE	ug/kg	9000	40000	500000	230	J	**30000**	E	370	J	390	U
DIBENZO(A,H)ANTHRACENE	ug/kg	660	660	100000	410	U	**4000**		450	U	390	U
DIBENZOFURAN	ug/kg	-	-	-	410	U	3700		450	U	390	U
DIETHYL PHTHALATE	ug/kg	10000000	10000000	50000	410	U	830	U	450	U	390	U
DIMETHYL PHTHALATE	ug/kg	10000000	10000000	50000	410	U	830	U	450	U	390	U
DI-N-BUTYL PHTHALATE	ug/kg	5700000	10000000	100000	410	U	830	U	450	U	390	U
DI-N-OCTYL PHTHALATE	ug/kg	1100000	10000000	100000	410	U	830	U	450	U	390	U
FLUORANTHENE	ug/kg	2300000	10000000	100000	470		28000	E	740		130	J
FLUORENE	ug/kg	2300000	10000000	100000	410	U	9000		450	U	390	U
HEXACHLOROBENZENE	ug/kg	660	24000	100000	410	U	830	U	450	U	390	U
HEXACHLOROBUTADIENE	ug/kg	1000	21000	100000	410	U	830	U	450	U	390	U
HEXACHLOROCYCLOPENTADIENE	ug/kg	400000	7300000	100000	410	U	830	U	450	U	390	U
HEXACHLOROETHANE	ug/kg	6000	100000	100000	410	U	830	U	450	U	390	U
INDENO(1,2,3-CD)PYRENE	ug/kg	900	4000	500000	120	J	**13000**	E	200	J	390	U
ISOPHORONE	ug/kg	1100000	10000000	50000	410	U	830	U	450	U	390	U
NAPHTHALENE	ug/kg	230000	4200000	100000	410	U	1500		450	U	390	U
NITROBENZENE	ug/kg	28000	520000	10000	410	U	830	U	450	U	390	U
N-NITROSODIMETHYLAMINE	ug/kg	-	-	-	410	U	830	U	450	U	390	U
N-NITROSO-DI-N-PROPYLAMINE	ug/kg	660	660	100000	410	U	830	U	450	U	390	U
N-NITROSODIPHENYLAMINE	ug/kg	140000	600000	100000	410	U	830	U	450	U	390	U
PENTACHLOROPHENOL	ug/kg	6000	24000	100000	820	U	1700	U	910	U	790	U
PHENANTHRENE	ug/kg	-	-	-	220	J	33000	E	320	J	390	U
PHENOL	ug/kg	10000000	10000000	50000	410	U	830	U	450	U	390	U
PYRENE	ug/kg	1700000	10000000	100000	470		**130000**	E	740		110	J
PYRIDINE	ug/kg	-	-	-	410	U	830	U	450	U	390	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-4
DETECTED CONCENTRATIONS OF
SVOCs IN SURFACE SOIL

				Sample ID	MML-SSC24		MML-SSC30		MML-SSC32		MML-SSC37	
				Sample Date	1/21/2010		3/2/2010		3/2/2010		3/2/2010	
				Depth	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,2,4-TRICHLOROBENZENE	ug/kg	68000	1200000	-	410	U	410	U	430	U	440	U
1,2-DICHLOROBENZENE	ug/kg	5100000	10000000	50000	410	U	410	U	430	U	440	U
1,3-DICHLOROBENZENE	ug/kg	5100000	10000000	100000	410	U	410	U	430	U	440	U
1,4-DICHLOROBENZENE	ug/kg	570000	10000000	100000	410	U	410	U	430	U	440	U
1-METHYLNAPHTHALENE	ug/kg	-	-	-	410	U	410	U	430	U	440	U
2,3,4,6-TETRACHLOROPHENOL	ug/kg	-	-	-	410	U	410	U	430	U	440	U
2,4,5-TRICHLOROPHENOL	ug/kg	5600000	10000000	50000	410	U	410	U	430	U	440	U
2,4,6-TRICHLOROPHENOL	ug/kg	62000	270000	10000	410	U	410	U	430	U	440	U
2,4-DICHLOROPHENOL	ug/kg	170000	31000000	10000	410	U	410	U	430	U	440	U
2,4-DIMETHYLPHENOL	ug/kg	1100000	10000000	50000	410	U	410	U	430	U	440	U
2,4-DINITROPHENOL	ug/kg	110000	2100000	10000	820	U	830	U	860	U	880	U
2,4-DINITROTOLUENE	ug/kg	1000	4000	10000	410	U	410	U	430	U	440	U
2,6-DINITROTOLUENE	ug/kg	1000	4000	10000	410	U	410	U	430	U	440	U
2-CHLORONAPHTHALENE	ug/kg	-	-	-	410	U	410	U	430	U	440	U
2-CHLOROPHENOL	ug/kg	280000	5200000	10000	410	U	410	U	430	U	440	U
2-METHYLNAPHTHALENE	ug/kg	-	-	-	410	U	89	J	430	U	440	U
2-METHYLPHENOL	ug/kg	2800000	10000000	-	410	U	410	U	430	U	440	U
2-NITROANILINE	ug/kg	-	-	-	820	U	830	U	860	U	880	U
2-NITROPHENOL	ug/kg	-	-	-	410	U	410	U	430	U	440	U
3,3'-DICHLOROBENZIDINE	ug/kg	2000	6000	100000	410	U	410	U	430	U	440	U
3+4-METHYLPHENOL	ug/kg	2800000	10000000	-	410	U	410	U	430	U	440	U
3-NITROANILINE	ug/kg	-	-	-	820	U	830	U	860	U	880	U
4,6-DINITRO-2-METHYLPHENOL	ug/kg	-	-	-	820	U	830	U	860	U	880	U
4-BROMOPHENYL PHENYL ETHER	ug/kg	-	-	-	410	U	410	U	430	U	440	U
4-CHLORO-3-METHYLPHENOL	ug/kg	10000000	10000000	100000	410	U	410	U	430	U	440	U
4-CHLOROANILINE	ug/kg	230000	4200000	-	410	U	410	U	430	U	440	U
4-CHLOROPHENYL PHENYL ETHER	ug/kg	-	-	-	410	U	410	U	430	U	440	U
4-NITROANILINE	ug/kg	-	-	-	820	U	830	U	860	U	880	U
4-NITROPHENOL	ug/kg	-	-	-	820	U	830	U	860	U	880	U
ACENAPHTHENE	ug/kg	3400000	10000000	100000	410	U	410	U	430	U	440	U
ACENAPHTHYLENE	ug/kg	3400000	10000000	-	410	U	410	U	430	U	440	U
ANILINE	ug/kg	-	-	-	410	U	410	U	430	U	440	U
ANTHRACENE	ug/kg	10000000	10000000	100000	410	U	360	J	430	U	370	J
AZOBENZENE	ug/kg	-	-	-	410	U	410	U	430	U	440	U
BENZO(A)ANTHRACENE	ug/kg	900	4000	500000	570		**2700**		140	J	**1800**	

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-4
DETECTED CONCENTRATIONS OF
SVOCs IN SURFACE SOIL

				Sample ID	MML-SSC24		MML-SSC30		MML-SSC32		MML-SSC37	
				Sample Date	1/21/2010		3/2/2010		3/2/2010		3/2/2010	
				Depth	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag	Result	Flag
BENZO(A)PYRENE	ug/kg	660	660	100000	590		**2600**		140	J	**1600**	
BENZO(B)FLUORANTHENE	ug/kg	900	4000	50000	**930**		**2900**		180	J	**2500**	
BENZO(G,H,I)PERYLENE	ug/kg	-	-	-	230	J	2200		430	U	2000	
BENZO(K)FLUORANTHENE	ug/kg	900	4000	500000	420		**1500**		130	J	840	
BENZOIC ACID	ug/kg	-	-	-	2100	U	2100	U	2200	U	2200	U
BENZYL ALCOHOL	ug/kg	10000000	10000000	50000	410	U	410	U	430	U	440	U
BIS(2-CHLOROETHOXY)METHANE	ug/kg	-	-	-	410	U	410	U	430	U	440	U
BIS(2-CHLOROETHYL)ETHER	ug/kg	660	3000	10000	410	U	410	U	430	U	440	U
BIS(2-CHLOROISOPROPYL)ETHER	ug/kg	-	-	-	410	U	410	U	430	U	440	U
BIS(2-ETHYLHEXYL)PHTHALATE	ug/kg	49000	210000	100000	180	J	860		160	J	1500	
BUTYL BENZYL PHTHALATE	ug/kg	1100000	10000000	100000	410	U	410	U	430	U	440	U
CARBAZOLE	ug/kg	-	-	-	410	U	410	U	430	U	440	U
CHRYSENE	ug/kg	9000	40000	500000	590		2800		150	J	1900	
DIBENZO(A,H)ANTHRACENE	ug/kg	660	660	100000	410	U	610		430	U	550	
DIBENZOFURAN	ug/kg	-	-	-	410	U	410	U	430	U	89	J
DIETHYL PHTHALATE	ug/kg	10000000	10000000	50000	410	U	410	U	430	U	440	U
DIMETHYL PHTHALATE	ug/kg	10000000	10000000	50000	410	U	410	U	430	U	440	U
DI-N-BUTYL PHTHALATE	ug/kg	5700000	10000000	100000	410	U	410	U	430	U	980	
DI-N-OCTYL PHTHALATE	ug/kg	1100000	10000000	100000	410	U	410	U	430	U	440	U
FLUORANTHENE	ug/kg	2300000	10000000	100000	1200		3700		280	J	2000	
FLUORENE	ug/kg	2300000	10000000	100000	410	U	110	J	430	U	180	J
HEXACHLOROBENZENE	ug/kg	660	24000	100000	410	U	410	U	430	U	440	U
HEXACHLOROBUTADIENE	ug/kg	1000	21000	100000	410	U	410	U	430	U	440	U
HEXACHLOROCYCLOPENTADIENE	ug/kg	400000	7300000	100000	410	U	410	U	430	U	440	U
HEXACHLOROETHANE	ug/kg	6000	100000	100000	410	U	410	U	430	U	440	U
INDENO(1,2,3-CD)PYRENE	ug/kg	900	4000	500000	230	J	**2100**		430	U	**1800**	
ISOPHORONE	ug/kg	1100000	10000000	50000	410	U	410	U	430	U	440	U
NAPHTHALENE	ug/kg	230000	4200000	100000	410	U	110	J	430	U	440	U
NITROBENZENE	ug/kg	28000	520000	10000	410	U	410	U	430	U	440	U
N-NITROSODIMETHYLAMINE	ug/kg	-	-	-	410	U	410	U	430	U	440	U
N-NITROSO-DI-N-PROPYLAMINE	ug/kg	660	660	100000	410	U	410	U	430	U	440	U
N-NITROSODIPHENYLAMINE	ug/kg	140000	600000	100000	410	U	410	U	430	U	440	U
PENTACHLOROPHENOL	ug/kg	6000	24000	100000	820	U	830	U	860	U	880	U
PHENANTHRENE	ug/kg	-	-	-	430		1700		100	J	2200	
PHENOL	ug/kg	10000000	10000000	50000	410	U	410	U	430	U	440	U
PYRENE	ug/kg	1700000	10000000	100000	1200		10000	E	270	J	6100	E
PYRIDINE	ug/kg	-	-	-	410	U	410	U	430	U	440	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-4
DETECTED CONCENTRATIONS OF
SVOCs IN SURFACE SOIL

				Sample ID	MML-SSC38		MML-SSC39		MML-SSW04	
				Sample Date	3/2/2010		3/2/2010		2/2/2010	
				Depth	0.0 - 0.5		0.0 - 0.5		0.0-0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag
1,2,4-TRICHLOROBENZENE	ug/kg	68000	1200000	-	480	U	440	U	490	U
1,2-DICHLOROBENZENE	ug/kg	5100000	10000000	50000	480	U	440	U	490	U
1,3-DICHLOROBENZENE	ug/kg	5100000	10000000	100000	480	U	440	U	490	U
1,4-DICHLOROBENZENE	ug/kg	570000	10000000	100000	480	U	440	U	490	U
1-METHYLNAPHTHALENE	ug/kg	-	-	-	480	U	440	U	490	U
2,3,4,6-TETRACHLOROPHENOL	ug/kg	-	-	-	480	U	440	U	490	U
2,4,5-TRICHLOROPHENOL	ug/kg	5600000	10000000	50000	480	U	440	U	490	U
2,4,6-TRICHLOROPHENOL	ug/kg	62000	270000	10000	480	U	440	U	490	U
2,4-DICHLOROPHENOL	ug/kg	170000	31000000	10000	480	U	440	U	490	U
2,4-DIMETHYLPHENOL	ug/kg	1100000	10000000	50000	480	U	440	U	490	U
2,4-DINITROPHENOL	ug/kg	110000	2100000	10000	950	U	880	U	970	U
2,4-DINITROTOLUENE	ug/kg	1000	4000	10000	480	U	440	U	490	U
2,6-DINITROTOLUENE	ug/kg	1000	4000	10000	480	U	440	U	490	U
2-CHLORONAPHTHALENE	ug/kg	-	-	-	480	U	440	U	490	U
2-CHLOROPHENOL	ug/kg	280000	5200000	10000	480	U	440	U	490	U
2-METHYLNAPHTHALENE	ug/kg	-	-	-	480	U	440	U	490	U
2-METHYLPHENOL	ug/kg	2800000	10000000	-	480	U	440	U	490	U
2-NITROANILINE	ug/kg	-	-	-	950	U	880	U	970	U
2-NITROPHENOL	ug/kg	-	-	-	480	U	440	U	490	U
3,3'-DICHLOROBENZIDINE	ug/kg	2000	6000	100000	480	U	440	U	490	U
3+4-METHYLPHENOL	ug/kg	2800000	10000000	-	480	U	440	U	490	U
3-NITROANILINE	ug/kg	-	-	-	950	U	880	U	970	U
4,6-DINITRO-2-METHYLPHENOL	ug/kg	-	-	-	950	U	880	U	970	U
4-BROMOPHENYL PHENYL ETHER	ug/kg	-	-	-	480	U	440	U	490	U
4-CHLORO-3-METHYLPHENOL	ug/kg	10000000	10000000	100000	480	U	440	U	490	U
4-CHLOROANILINE	ug/kg	230000	4200000	-	480	U	440	U	490	U
4-CHLOROPHENYL PHENYL ETHER	ug/kg	-	-	-	480	U	440	U	490	U
4-NITROANILINE	ug/kg	-	-	-	950	U	880	U	970	U
4-NITROPHENOL	ug/kg	-	-	-	950	U	880	U	970	U
ACENAPHTHENE	ug/kg	3400000	10000000	100000	480	U	440	U	490	U
ACENAPHTHYLENE	ug/kg	3400000	10000000	-	480	U	440	U	490	U
ANILINE	ug/kg	-	-	-	480	U	440	U	490	U
ANTHRACENE	ug/kg	10000000	10000000	100000	480	U	230	J	490	U
AZOBENZENE	ug/kg	-	-	-	480	U	440	U	490	U
BENZO(A)ANTHRACENE	ug/kg	900	4000	500000	190	J	**2000**		110	J

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-4
DETECTED CONCENTRATIONS OF
SVOCs IN SURFACE SOIL

				Sample ID	MML-SSC38		MML-SSC39		MML-SSW04	
				Sample Date	3/2/2010		3/2/2010		2/2/2010	
				Depth	0.0 - 0.5		0.0 - 0.5		0.0-0.5	
Analyte	Units	Residential Direct Contact	Non-Residential Direct Contact	Impact to Groundwater	Result	Flag	Result	Flag	Result	Flag
BENZO(A)PYRENE	ug/kg	660	660	100000	250	J	**2100**		140	J
BENZO(B)FLUORANTHENE	ug/kg	900	4000	50000	360	J	**3200**		220	J
BENZO(G,H,I)PERYLENE	ug/kg	-	-	-	140	J	1500		490	U
BENZO(K)FLUORANTHENE	ug/kg	900	4000	500000	180	J	**930**		490	U
BENZOIC ACID	ug/kg	-	-	-	2400	U	2200	U	8300	E
BENZYL ALCOHOL	ug/kg	10000000	10000000	50000	160	J	440	U	150	J
BIS(2-CHLOROETHOXY)METHANE	ug/kg	-	-	-	480	U	440	U	490	U
BIS(2-CHLOROETHYL)ETHER	ug/kg	660	3000	10000	480	U	440	U	490	U
BIS(2-CHLOROISOPROPYL)ETHER	ug/kg	-	-	-	480	U	440	U	490	U
BIS(2-ETHYLHEXYL)PHTHALATE	ug/kg	49000	210000	100000	200	J	270	J	180	J
BUTYL BENZYL PHTHALATE	ug/kg	1100000	10000000	100000	480	U	440	U	490	U
CARBAZOLE	ug/kg	-	-	-	480	U	120	J	490	U
CHRYSENE	ug/kg	9000	40000	500000	190	J	2100		120	J
DIBENZO(A,H)ANTHRACENE	ug/kg	660	660	100000	480	U	480		490	U
DIBENZOFURAN	ug/kg	-	-	-	480	U	440	U	490	U
DIETHYL PHTHALATE	ug/kg	10000000	10000000	50000	480	U	440	U	490	U
DIMETHYL PHTHALATE	ug/kg	10000000	10000000	50000	480	U	440	U	490	U
DI-N-BUTYL PHTHALATE	ug/kg	5700000	10000000	100000	480	U	440	U	490	U
DI-N-OCTYL PHTHALATE	ug/kg	1100000	10000000	100000	480	U	440	U	490	U
FLUORANTHENE	ug/kg	2300000	10000000	100000	430	J	3500		230	J
FLUORENE	ug/kg	2300000	10000000	100000	480	U	96	J	490	U
HEXACHLOROBENZENE	ug/kg	660	24000	100000	480	U	440	U	490	U
HEXACHLOROBUTADIENE	ug/kg	1000	21000	100000	480	U	440	U	490	U
HEXACHLOROCYCLOPENTADIENE	ug/kg	400000	7300000	100000	480	U	440	U	490	U
HEXACHLOROETHANE	ug/kg	6000	100000	100000	480	U	440	U	490	U
INDENO(1,2,3-CD)PYRENE	ug/kg	900	4000	500000	140	J	**1600**		490	U
ISOPHORONE	ug/kg	1100000	10000000	50000	480	U	440	U	490	U
NAPHTHALENE	ug/kg	230000	4200000	100000	480	U	440	U	490	U
NITROBENZENE	ug/kg	28000	520000	10000	480	U	440	U	490	U
N-NITROSODIMETHYLAMINE	ug/kg	-	-	-	480	U	440	U	490	U
N-NITROSO-DI-N-PROPYLAMINE	ug/kg	660	660	100000	480	U	440	U	490	U
N-NITROSODIPHENYLAMINE	ug/kg	140000	600000	100000	480	U	440	U	490	U
PENTACHLOROPHENOL	ug/kg	6000	24000	100000	950	U	880	U	970	U
PHENANTHRENE	ug/kg	-	-	-	130	J	1300		490	U
PHENOL	ug/kg	10000000	10000000	50000	480	U	440	U	490	U
PYRENE	ug/kg	1700000	10000000	100000	440	J	6200	E	210	J
PYRIDINE	ug/kg	-	-	-	480	U	440	U	490	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-5
SUMMARY OF DETECTED CONCENTRATIONS OF
PESTACIDES AND PCBs IN SURFACE SOIL

				Sample ID	MML-SSC01		MML-SSC08		MML-SSC19		MML-SSC23	
				Sample Date	1/21/2010		1/21/2010		1/21/2010		1/21/2010	
				Depth	0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5	
Analyte	**Units**	**Residential Direct Contact**	**Non-Residential Direct Contact**	**Impact to Groundwater**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
4,4'-DDD	ug/kg	3000	12000	50,000	2.1	U	2.1	U	2.2	U	2	U
4,4'-DDE	ug/kg	2000	9000	50,000	5.9		2.9		2.2	U	2	U
4,4'-DDT	ug/kg	2000	9000	500,000	8.9		8.7		1.7	J	2	U
ALDRIN	ug/kg	40	170	50,000	2.1	U	2.1	U	2.2	U	2	U
ALPHA-BHC	ug/kg	-	-	-	2.1	U	2.1	U	2.2	U	2	U
ALPHA-CHLORDANE	ug/kg	-	-	-	0.87	J	2.1	U	2.2	U	2	U
AROCLOR-1016	ug/kg	490	2000	50,000	41	U	41	U	44	U	39	U
AROCLOR-1221	ug/kg	490	2000	50,000	82	U	82	U	89	U	79	U
AROCLOR-1232	ug/kg	490	2000	50,000	41	U	41	U	44	U	39	U
AROCLOR-1242	ug/kg	490	2000	50,000	41	U	41	U	44	U	39	U
AROCLOR-1248	ug/kg	490	2000	50,000	41	U	41	U	44	U	39	U
AROCLOR-1254	ug/kg	490	2000	50,000	41	U	41	U	44	U	33	J
AROCLOR-1260	ug/kg	490	2000	50,000	28	J	49		44	U	39	U
BETA-BHC	ug/kg	-	-	-	2.1	U	2.1	U	2.2	U	2	U
DELTA-BHC	ug/kg	-	-	-	2.1	U	2	J	2.2	U	2	U
DIELDRIN	ug/kg	42	180	50,000	2.1	U	2.1	U	2.2	U	0.54	J
ENDOSULFAN I	ug/kg	340000	6,200,000	50,000	2.1	U	2.1	U	2.2	U	2	U
ENDOSULFAN II	ug/kg	-	-	-	2.1	U	2.1	U	2.2	U	2	U
ENDOSULFAN SULFATE	ug/kg	-	-	-	2.1	U	2.1	U	2.2	U	2	U
ENDRIN	ug/kg	17000	310000	50,000	2.1	U	2.1	U	2.2	U	2	U
ENDRIN ALDEHYDE	ug/kg	-	-	-	2.1	U	2.1	U	2.2	U	2	U
ENDRIN KETONE	ug/kg	-	-	-	2.1	U	2.1	U	2.2	U	2	U
GAMMA-BHC (LINDANE)	ug/kg	520	2200	50,000	2.1	U	2.1	U	2.2	U	2	U
GAMMA-CHLORDANE	ug/kg	-	-	-	2.7		2.2		2.2	U	2.2	
HEPTACHLOR	ug/kg	150	650	50,000	2.1	U	2.1	U	2.2	U	2	U
HEPTACHLOR EPOXIDE	ug/kg	-	-	-	2.1	U	2.1	U	2.2	U	2	U
METHOXYCHLOR	ug/kg	280000	5200000	50,000	10	U	10	U	11	U	9.9	U
TOXAPHENE	ug/kg	100	200	50,000	100	U	100	U	110	U	99	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-5
SUMMARY OF DETECTED CONCENTRATIONS OF
PESTACIDES AND PCBs IN SURFACE SOIL

				Sample ID	MML-SSC24		MML-SSC30		MML-SSC32		MML-SSC37	
				Sample Date	1/21/2010		3/2/2010		3/2/2010		3/2/2010	
				Depth	0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5	
Analyte	**Units**	**Residential Direct Contact**	**Non-Residential Direct Contact**	**Impact to Groundwater**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
4,4'-DDD	ug/kg	3000	12000	50,000	410	U	2.6		2.1	U	11	U
4,4'-DDE	ug/kg	2000	9000	50,000	410	U	2.7		2.1	U	2.9	J
4,4'-DDT	ug/kg	2000	9000	500,000	410	U	14		1.7	J	11	U
ALDRIN	ug/kg	40	170	50,000	410	U	2.1	U	2.1	U	11	U
ALPHA-BHC	ug/kg	-	-	-	410	U	2.1	U	2.1	U	11	U
ALPHA-CHLORDANE	ug/kg	-	-	-	1900		2.1	U	2.1	U	7.2	J
AROCLOR-1016	ug/kg	490	2000	50,000	610	U	42	U	43	U	1800	U
AROCLOR-1221	ug/kg	490	2000	50,000	1200	U	84	U	85	U	3600	U
AROCLOR-1232	ug/kg	490	2000	50,000	610	U	42	U	43	U	1800	U
AROCLOR-1242	ug/kg	490	2000	50,000	610	U	42	U	43	U	1800	U
AROCLOR-1248	ug/kg	490	2000	50,000	610	U	42	U	43	U	1800	U
AROCLOR-1254	ug/kg	490	2000	50,000	610	U	42	U	43	U	1800	U
AROCLOR-1260	ug/kg	490	2000	50,000	610	U	23	J	43	U	**3100**	
BETA-BHC	ug/kg	-	-	-	410	U	2.1	U	2.1	U	11	U
DELTA-BHC	ug/kg	-	-	-	410	U	2.1	U	2.1	U	11	U
DIELDRIN	ug/kg	42	180	50,000	410	U	2.1	U	2.1	U	14	
ENDOSULFAN I	ug/kg	340000	6,200,000	50,000	410	U	2.1	U	2.1	U	11	U
ENDOSULFAN II	ug/kg	-	-	-	410	U	2.1	U	2.1	U	11	U
ENDOSULFAN SULFATE	ug/kg	-	-	-	410	U	2.1	U	2.1	U	11	U
ENDRIN	ug/kg	17000	310000	50,000	410	U	2.1	U	2.1	U	11	U
ENDRIN ALDEHYDE	ug/kg	-	-	-	410	U	2.1	U	2.1	U	11	U
ENDRIN KETONE	ug/kg	-	-	-	410	U	2.1	U	2.1	U	11	U
GAMMA-BHC (LINDANE)	ug/kg	520	2200	50,000	410	U	2.1	U	2.1	U	11	U
GAMMA-CHLORDANE	ug/kg	-	-	-	3900		2.1	U	2.1	U	32	
HEPTACHLOR	ug/kg	150	650	50,000	410	U	2.1	U	2.1	U	11	U
HEPTACHLOR EPOXIDE	ug/kg	-	-	-	410	U	2.1	U	2.1	U	25	
METHOXYCHLOR	ug/kg	280000	5200000	50,000	2000	U	11	U	11	U	56	U
TOXAPHENE	ug/kg	100	200	50,000	20000	U	110	U	110	U	560	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-5
SUMMARY OF DETECTED CONCENTRATIONS OF
PESTACIDES AND PCBs IN SURFACE SOIL

				Sample ID	MML-SSC38		MML-SSC39		MML-SSW04	
				Sample Date	3/2/2010		3/2/2010		2/2/2010	
				Depth	0.0-0.5		0.0-0.5		0.0-0.5	
Analyte	**Units**	**Residential Direct Contact**	**Non-Residential Direct Contact**	**Impact to Groundwater**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
4,4'-DDD	ug/kg	3000	12000	50,000	2.4	U	2.6		9.7	U
4,4'-DDE	ug/kg	2000	9000	50,000	7		5.3		12	
4,4'-DDT	ug/kg	2000	9000	500,000	12		23		25	
ALDRIN	ug/kg	40	170	50,000	2.4	U	0.79	J	9.7	U
ALPHA-BHC	ug/kg	-	-	-	2.4	U	2.2	U	9.7	U
ALPHA-CHLORDANE	ug/kg	-	-	-	2.4	U	3.5		9.7	U
AROCLOR-1016	ug/kg	490	2000	50,000	48	U	43	U	49	U
AROCLOR-1221	ug/kg	490	2000	50,000	96	U	87	U	97	U
AROCLOR-1232	ug/kg	490	2000	50,000	48	U	43	U	49	U
AROCLOR-1242	ug/kg	490	2000	50,000	48	U	43	U	49	U
AROCLOR-1248	ug/kg	490	2000	50,000	48	U	43	U	49	U
AROCLOR-1254	ug/kg	490	2000	50,000	48	U	43	U	91	
AROCLOR-1260	ug/kg	490	2000	50,000	32	J	19	J	62	
BETA-BHC	ug/kg	-	-	-	2.4	U	2.2	U	9.7	U
DELTA-BHC	ug/kg	-	-	-	2.4	U	2.2	U	9.7	U
DIELDRIN	ug/kg	42	180	50,000	1.6	J	16		12	
ENDOSULFAN I	ug/kg	340000	6,200,000	50,000	2.4	U	2.2	U	9.7	U
ENDOSULFAN II	ug/kg	-	-	-	2.4	U	2.2	U	9.7	U
ENDOSULFAN SULFATE	ug/kg	-	-	-	2.4	U	2.2	U	9.7	U
ENDRIN	ug/kg	17000	310000	50,000	2.4	U	2.2	U	9.7	U
ENDRIN ALDEHYDE	ug/kg	-	-	-	2.4	U	2.2	U	9.7	U
ENDRIN KETONE	ug/kg	-	-	-	2.4	U	2.2	U	9.7	U
GAMMA-BHC (LINDANE)	ug/kg	520	2200	50,000	2.4	U	2.2	U	9.7	U
GAMMA-CHLORDANE	ug/kg	-	-	-	1.9	J	9.3		4.7	J
HEPTACHLOR	ug/kg	150	650	50,000	2.4	U	2.3		9.7	U
HEPTACHLOR EPOXIDE	ug/kg	-	-	-	2.4	U	2.2	U	9.7	U
METHOXYCHLOR	ug/kg	280000	5200000	50,000	12	U	11	U	49	U
TOXAPHENE	ug/kg	100	200	50,000	120	U	110	U	490	U

Notes:

ug/kg = micrograms per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-6
SUMMARY OF DETECTED CONCENTRATIONS OF
METALS IN SURFACE SOIL

				Sample ID	MML-SSC01		MML-SSC19		MML-SSC23		MML-SSC24	
				Sample Date	1/21/2010		1/21/2010		1/21/2010		1/21/2010	
				Depth	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	**Units**	**Residential Direct Contact**	**Non-Residential Direct Contact**	**Impact to Groundwater**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ARSENIC	mg/kg	20	20	-	2.4		2.6		1.1	B	5.9	
BARIUM	mg/kg	700	4,700	-	55		140		72		60	
CADMIUM	mg/kg	39	100	-	0.24	B	0.15	B	0.14	B	2	
CHROMIUM	mg/kg	120,000	-	-	16		24		17		13	
LEAD	mg/kg	400	600	-	39		31		15		70	
MERCURY	mg/kg	14	270	-	0.063		0.032	B	0.05		0.021	B
SELENIUM	mg/kg	63	3,100	-	0.56	B	1.3	B	0.9	B	0.91	
SILVER	mg/kg	110	4,100	-	1.2	U	1.3	U	1.2	U	1.2	U

Notes:

mg/kg = milligrams per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

B = Constituent detected in Method Blank

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-6
SUMMARY OF DETECTED CONCENTRATIONS OF
METALS IN SURFACE SOIL

				Sample ID	MML-SSC30		MML-SSC32		MML-SSC37		MML-SSC38	
				Sample Date	3/2/2010		3/2/2010		3/2/2010		3/2/2010	
				Depth	0.0 - 0.5		0.0 - 0.5		0.0 - 0.5		0.0 - 0.5	
Analyte	**Units**	**Residential Direct Contact**	**Non-Residential Direct Contact**	**Impact to Groundwater**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ARSENIC	mg/kg	20	20	-	4.9		1.9		**21**		5.5	
BARIUM	mg/kg	700	4,700	-	82		150		150		54	
CADMIUM	mg/kg	39	100	-	0.29	B	0.23	B	6.6		0.35	B
CHROMIUM	mg/kg	120,000	-	-	16		21		53		13	
LEAD	mg/kg	400	600	-	94		23		**2600**		69	
MERCURY	mg/kg	14	270	-	0.1		0.032	B	0.14		0.073	
SELENIUM	mg/kg	63	3,100	-	0.64		0.7	B	1.5		0.62	B
SILVER	mg/kg	110	4,100	-	1.3	U	1.3	U	0.58	B	1.4	U

Notes:

mg/kg = milligrams per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

B = Constituent detected in Method Blank

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-6
SUMMARY OF DETECTED CONCENTRATIONS OF METALS IN SURFACE SOIL

				Sample ID	MML-SSC39		MML-SSW04	
				Sample Date	3/2/2010		2/2/2010	
				Depth	0.0 - 0.5		0.0-0.5	
Analyte	**Units**	**Residential Direct Contact**	**Non-Residential Direct Contact**	**Impact to Groundwater**	**Result**	**Flag**	**Result**	**Flag**
ARSENIC	mg/kg	20	20	-	17		5.7	
BARIUM	mg/kg	700	4,700	-	110		44	
CADMIUM	mg/kg	39	100	-	0.37	B	0.17	B
CHROMIUM	mg/kg	120,000	-	-	26		16	
LEAD	mg/kg	400	600	-	61		63	
MERCURY	mg/kg	14	270	-	0.064		0.18	
SELENIUM	mg/kg	63	3,100	-	0.88	B	1.5	U
SILVER	mg/kg	110	4,100	-	1.3	U	1.5	U

Notes:

mg/kg = milligrams per kilogram

ft = Feet

Flag = Laboratory data qualifier code

U = Not detected above the noted method detection limit

J = Estimated value (result less than limit of Quantitation but greater than MDL)

E = Concentration exceeds upper level of the calibration range

B = Constituent detected in Method Blank

Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-7: SUMMARY OF NON-RADIOLOGICAL SAMPLES EXCEEDING NJDEP SOIL CLEANUP CRITERIA

Non-Radiological Constituents	Unit	Soil Cleanup Criteria	Sampling Locations				
			MML-SSC08	MML-SSC24	MML-SSC30	MML-SSC37	MML-SSC39
VOCs							
None							
SVOCs							
BENZO(A)ANTHRACENE	ug/kg	900	39,000	NE	2,700	1,800	2,000
BENZO(A)PYRENE	ug/kg	660	25,000	NE	2,600	1,600	2,100
BENZO(B)FLUORANTHENE	ug/kg	900	26,000	930	2,900	2,500	3,200
BENZO(K)FLUORANTHENE	ug/kg	900	13,000	NE	1,500	NE	930
CHRYSENE	ug/kg	9,000	30,000	NE	NE	NE	NE
DIBENZO(A,H)ANTHRACENE	ug/kg	660	4,000	NE	NE	NE	NE
INDENO(1,2,3-CD)PYRENE	ug/kg	900	13,000	NE	2,100	1,800	1,600
Pesticides and PCBs							
AROCLOR-1260	ug/kg	490	NE	NE	NE	3,100	NE
Metals							
ARSENIC	mg/kg	20	NE	NE	NE	21	NE
LEAD	mg/kg	400	NE	NE	NE	2,600	NE

Footnote:
VOCs = volatile organic compounds
SVOCs = semivolatile organic compounds
µg/kg = micrograms per kilogram
mg/kg = milligram per kilogram
NE = Not Exceeded
PCBs = polychlorinated biphenyls

TABLE 5-8
SUMMARY OF TCLP RESULTS IN SURFACE SOIL

		Sample ID	MML-SSC01		MML-SSC08		MML-SSC10		MML-SSC24		MML-SSC38		MML-SST14	
		Sample Date	1/21/2010		4/20/2010		4/20/2010		1/21/2010		3/2/2010		4/20/2010	
		Depth	0-0.5		0-0.5		0-0.5		0-0.5		0-0.5		0-0.5	
Metals	**RCRA TCLP Waste Criteria**	**Units**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ARSENIC	5	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
BARIUM	100	mg/l	0.7	B	0.23	B	0.34	B	0.83	B	0.37	B	0.3	B
CADMIUM	1	mg/l	0.05	U	0.05	U	0.05	U	0.021	B	0.05	U	0.05	U
CHROMIUM	5	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
LEAD	5	mg/l	0.015	B	0.03	U	0.03	U	0.032		0.028	B	0.03	U
MERCURY	0.2	mg/l	0.002	U	0.002	U	0.00013	B	0.002	U	0.002	U	0.00014	B
SELENIUM	1	mg/l	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
SILVER	5	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pesticides														
ALPHA-CHLORDANE	-	mg/l	0.0005	U	0.0005	U	0.0005	U	0.0002	J	0.0005	U	0.0005	U
CHLORDANE	0.03	mg/l	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
ENDRIN	0.02	mg/l	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U
GAMMA-BHC (LINDANE)	0.4	mg/l	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U
GAMMA-CHLORDANE	0.03	mg/l	0.0005	U	0.0005	U	0.0005	U	0.00021	J	0.0005	U	0.0005	U
HEPTACHLOR	0.008	mg/l	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U
HEPTACHLOR EPOXIDE	0.008	mg/l	0.0005	U	0.0005	U	0.0005	U	0.00031	J	0.0005	U	0.0005	U
METHOXYCHLOR	10	mg/l	0.0025	U	0.0025	U	0.0025	U	0.0025	U	0.0025	U	0.0025	U
TOXAPHENE	0.5	mg/l	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U
SVOC														
1,4-DICHLOROBENZENE	7.5	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
2,4,5-TRICHLOROPHENOL	400	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
2,4,6-TRICHLOROPHENOL	2	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
2,4-D	-	mg/l	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U
2,4-DINITROTOLUENE	0.13	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
2-METHYLPHENOL	-	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
3+4-METHYLPHENOL	-	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
HEXACHLOROBENZENE	0.13	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
HEXACHLOROBUTADIENE	0.5	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
HEXACHLOROETHANE	3	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
NITROBENZENE	2	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
PENTACHLOROPHENOL	100	mg/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
PYRIDINE	5	mg/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
SILVEX	1	mg/l	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U
VOC														
1,1-DICHLOROETHENE	700	ug/l	10	U	5	U	5	U	10	U	10	U	5	U
1,2-DICHLOROETHANE	500	ug/l	10	U	5	U	5	U	10	U	10	U	5	U
2-BUTANONE	-	ug/l	100	U	50	U	50	U	100	U	100	U	50	U
BENZENE	500	ug/l	10	U	5	U	5	U	10	U	10	U	5	U
CARBON TETRACHLORIDE	500	ug/l	10	U	5	U	5	U	10	U	10	U	5	U
CHLOROBENZENE	100000	ug/l	10	U	5	U	5	U	10	U	10	U	5	U
CHLOROFORM	6000	ug/l	10	U	5	U	5	U	10	U	10	U	5	U
TETRACHLOROETHENE	700	ug/l	10	U	5	U	5	U	10	U	10	U	5	U
TRICHLOROETHENE	500	ug/l	10	U	5	U	5	U	10	U	10	U	5	U
VINYL CHLORIDE	200	ug/l	10	U	5	U	5	U	10	U	10	U	5	U

Notes:
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ft = Feet
Flag = Laboratory data qualifier code
U = Not detected above the noted method detection limit
J = Estimated value (result less than limit of Quantitation but greater than MDL)
E = Concentration exceeds upper level of the calibration range
B = Constituent detected in Method Blank
Bold/Shaded cells indicate sample concentration exceeds the MSC

TABLE 5-9
SUMMARY OF TEST PIT SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBT11				MML-SBT11				MML-SBT11			
		Date	2/22/2010				2/22/2010				2/22/2010			
		Depth (Feet)	0-0.5				0-0.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.84	M3, G	0.6	0.25	0.81	M3, G	0.62	0.3	0.63	M3, G	0.54	0.23
Ra-226	1.46	pCi/g	**53.7**	G, TI	2.5	6.6	**21.2**	G, TI	2.9	3.4	**2.8**	G, TI	1.7	1.2
Th-234	1.11	pCi/g	**27.9**	G	2.5	3.7	**12.1**	G	2.5	2.3	1.03	U, G	1.51	0.94
U-234	NA	pCi/g	17.8		0.1	3	14		0.1	2.3	1.15		0.07	0.26
U-235	NA	pCi/g	1.97	M3	0.61	0.4	1.14	G	0.8	0.39	0.057	U, G	0.39	0.22
U-238	1.11	pCi/g	**18.2**	M3	0.1	3.1	**14.2**		0.1	2.3	**1.19**		0.05	0.26

		Sample ID	MML-SBT12				MML-SBT13				MML-SBT14			
		Date	2/22/2010				2/23/2010				2/23/2010			
		Depth (Feet)	4.5-5.5				0-1.5				0-0.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.21	M3, G	0.68	0.34	0.92		0.32	0.2	0.9	M3, G	0.6	0.28
Ra-226	1.46	pCi/g	**209**	G, TI	6	25	1.04	U, SI	1.16	0.74	**30.5**	G, TI	3	4.2
Th-234	1.11	pCi/g	**26.6**	M3, G	11.9	8	**1.5**	U	3.1	1.9	**6.3**	G	2.9	2
U-234	NA	pCi/g	35.8	M3	1.8	7.1	0.67		0.06	0.16	6.3		0.1	1.1
U-235	NA	pCi/g	5.3	M3	1.5	1.1	0.039	U	0.31	0.18	0.76	U, G	0.79	0.49
U-238	1.11	pCi/g	**39.2**	M3	1.1	7.6	0.68		0.04	0.16	**6.1**		0	1.1

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-9
SUMMARY OF TEST PIT SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBT14				MML-SBT14				MML-SBT14			
		Date	2/23/2010				2/23/2010				2/24/2010			
		Depth (Feet)	0-1				4.5-5.5				4.5-5.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.52	M3, G, TI	1.18	0.59	0.99	M3, G	0.7	0.34	**32**	TI, J	24	14
Ra-226	1.46	pCi/g	**130**	G, TI	5	16	**114**	G, TI	3	14				
Th-234	1.11	pCi/g	**27.2**	M3, G	4	4.2	**73.2**	M3, G	6.4	9.9	**160**	TI, J	134	84
U-234	NA	pCi/g	7.3	M3	0.3	1.5	122	M3	1	20				
U-235	NA	pCi/g	3.17	G	1.12	0.68	6.6	M3	0.75	2	13.8	U, J	16.2	10
U-238	1.11	pCi/g	**7.4**	M3	0.2	1.5	**114**	M3	1	19				

		Sample ID	MML-SBT14			
		Date	2/23/2010			
		Depth (Feet)	5.5-6			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.68	M3, G	1.24	0.56
Ra-226	1.46	pCi/g	**224**	G, TI	7	27
Th-234	1.11	pCi/g	**46.3**	M3, G	6.1	6.8
U-234	NA	pCi/g	178	M3	0	28
U-235	NA	pCi/g	12.4	M3	2.2	2.6
U-238	1.11	pCi/g	**176**	M3	0	27

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

Notes:
U = Result is less than the sample specific MDC or less than the associated TPU
G = Sample density differs by more than 15% of LCS density: sample results may be biased
TI = Nuclide identification is tentative
M3 = Requested MDC was not met, but the reported activity is greater than the reported MDC.
J = the value is estimated
SI = Nuclide identification and/or quantitation is tentative

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG01				MML-SBG01				MML-SBG02			
		Date	2/24/2010				2/24/2010				2/3/2010			
		Depth (Feet)	10-12				2-4				0.5-3			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.72	TI	0.49	0.34	0.71	G	0.44	0.25	1.06	G	0.33	0.21
Ra-226	1.46	pCi/g	1	U,SI	1.9	1.2	**1.5**	U,G,SI	1.7	1.1	**1.82**	G,TI	1.48	0.95
Th-234	1.11	pCi/g	0.22	U	1.36	0.78	0.17	U,G	1.35	0.79	-0.2	U,G	3.3	1.9
U-234	NA	pCi/g	0.54		0.09	0.14	0.58		0.05	0.15	0.8		0.05	0.18
U-235	NA	pCi/g	0.19	U	0.53	0.32	0.034	U,G	0.52	0.3	0.017	U,G	0.3	0.18
U-238	1.11	pCi/g	0.67		0.07	0.16	0.5		0.02	0.14	0.65		0.03	0.16

		Sample ID	MML-SBG02				MML-SBG03				MML-SBG03			
		Date	2/3/2010				2/4/2010				2/4/2010			
		Depth (Feet)	10-12				3-4.5				8.5-9.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.98	G	0.35	0.18	1.45	G	0.37	0.27	1.08	G	0.29	0.18
Ra-226	1.46	pCi/g	**2.6**	G,TI	1.5	1	**2.16**	G,TI	1.31	0.88	**2.55**	G,TI	1.22	0.83
Th-234	1.11	pCi/g	**2.2**	U,G	3.6	2.2	0.49	U,G	1.51	0.92	0.2	U,G	2.8	1.7
U-234	NA	pCi/g	1.14		0.02	0.25	0.95		0.03	0.21	1.49		0.06	0.3
U-235	NA	pCi/g	0.076	U,G	0.38	0.23	0.082	U,G	0.45	0.27	0.1	U,G	0.31	0.18
U-238	1.11	pCi/g	1.01		0.05	0.22	0.99		0.04	0.21	**1.77**		0.07	0.35

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG04				MML-SBG04				MML-SBG05			
		Date	2/4/2010				2/4/2010				2/4/2010			
		Depth (Feet)	1.5-3				7.5-9.5				11-12			
Parameter	ISV	Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	1.36	G	0.35	0.24	1.1	G	0.44	0.24	0.69	G	0.28	0.14
Ra-226	1.46	pCi/g	**2.33**	G,TI	1.39	0.92	**2**	G,TI	2	1.3	1.09	G,TI	0.95	0.61
Th-234	1.11	pCi/g	**3.7**	LT,G,TI	3.1	2	0.79	U,G	1.48	0.91	1.1	U,G	2.5	1.5
U-234	NA	pCi/g	1.19		0.05	0.25	1.09		0.06	0.24	0.49		0.07	0.13
U-235	NA	pCi/g	0.044	U,G	0.31	0.18	0.072	U,G	0.39	0.23	0.1	U,G	0.27	0.15
U-238	1.11	pCi/g	**1.11**		0.02	0.24	0.94		0.05	0.21	0.55		0.07	0.14

		Sample ID	MML-SBG05				MML-SBG06				MML-SBG06			
		Date	2/4/2010				2/4/2010				2/4/2010			
		Depth (Feet)	2-3.5				0-1				7-8			
Parameter	ISV	Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.76	G	0.37	0.17	1.2	G	0.42	0.24	0.65		0.27	0.14
Ra-226	1.46	pCi/g	**1.72**	G,TI	1.47	0.94	**1.88**	G,TI	1.36	0.89	0.98	U,SI	1.04	0.65
Th-234	1.11	pCi/g	0.7	U,G	2.6	1.6	0.25	U,G	1.24	0.75	0.6	U	2.7	1.6
U-234	NA	pCi/g	0.56		0.07	0.15	0.79		0.02	0.19	0.52		0.06	0.14
U-235	NA	pCi/g	0.063	U,G	0.39	0.23	0.032	U,G	0.44	0.26	0.025	U	0.31	0.18
U-238	1.11	pCi/g	0.69		0.07	0.17	0.79		0.04	0.19	0.6		0.05	0.15

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG07				MML-SBG07				MML-SBG08			
		Date	2/5/2010				2/5/2010				2/5/2010			
		Depth (Feet)	4-5				7-8.5				1-2.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.32	G	0.35	0.23	0.57		0.3	0.15	1.4	G	0.33	0.23
Ra-226	1.46	pCi/g	**2.37**	G,TI	1.33	0.89	0.71	U,SI	1	0.62	**2.42**	G,TI	1.27	0.87
Th-234	1.11	pCi/g	**1.5**	U,G	3.5	2.1	0.7	U	2.9	1.8	0.5	U,G	3	1.8
U-234	NA	pCi/g	1.5		0.05	0.29	0.5		0.04	0.13	0.96		0.06	0.21
U-235	NA	pCi/g	0.046	U,G	0.4	0.24	0.08	U	0.25	0.15	0.02	U,G	0.39	0.23
U-238	1.11	pCi/g	**1.21**		0.04	0.24	0.53		0.05	0.14	1.03		0.03	0.22

		Sample ID	MML-SBG08				MML-SBG09				MML-SBG09			
		Date	2/5/2010				2/15/2010				2/15/2010			
		Depth (Feet)	2.5-3				0-2				10-11			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.24	G	0.36	0.23	1.01	G	0.35	0.2	0.68	G	0.28	0.14
Ra-226	1.46	pCi/g	**2.21**	G,TI	1.26	0.85	**1.5**	G,TI	1.25	0.8	1.22	U,G,SI	1.25	0.79
Th-234	1.11	pCi/g	**1.5**	U,G	3.3	2	**1.8**	U,G	2.9	1.8	**1.3**	U,G	2.9	1.8
U-234	NA	pCi/g	1.2		0.06	0.24	0.68		0.09	0.17	0.55		0.08	0.15
U-235	NA	pCi/g	0.19	U,G	0.41	0.2	0.037	U,G	0.28	0.17	0.029	U,G	0.3	0.18
U-238	1.11	pCi/g	**1.29**		0.04	0.26	0.8		0.04	0.19	0.53		0.08	0.15

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG10				MML-SBG10				MML-SBG11			
		Date	2/15/2010				2/15/2010				2/15/2010			
		Depth (Feet)	0-3				6-8				1-2.5			
Parameter	ISV	Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	1.13	G	0.28	0.19	0.71	G	0.24	0.13	0.9	G	0.33	0.19
Ra-226	1.46	pCi/g	**1.95**	G,TI	1.11	0.74	**1.76**	G,TI	1.12	0.74	1.04	U,G,SI	1.19	0.75
Th-234	1.11	pCi/g	**1.5**	U,G	2.7	1.7	**1.5**	U,G	2.9	1.8	**2.2**	U,G	3.3	2
U-234	NA	pCi/g	0.85		0.08	0.21	0.99		0.07	0.22	0.66		0.05	0.15
U-235	NA	pCi/g	0.084	U,G	0.28	0.17	0.072	U,G	0.18	0.11	0.078	U,G	0.37	0.22
U-238	1.11	pCi/g	0.87		0.06	0.21	0.85		0.04	0.2	0.59		0.04	0.14

		Sample ID	MML-SBG11				MML-SBG12				MML-SBG12			
		Date	2/15/2010				2/15/2010				2/15/2010			
		Depth (Feet)	7-8.5				0-2				3-4			
Parameter	ISV	Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.6	G	0.29	0.15	0.58		0.3	0.14	0.8		0.26	0.17
Ra-226	1.46	pCi/g	1.26	G,TI	1.04	0.67	**1.62**	SI	1.06	0.69	1.42	SI	1.05	0.69
Th-234	1.11	pCi/g	**1.3**	U,G	2.9	1.8	0.6	U	2.6	1.6	**1.4**	U	2.1	1.3
U-234	NA	pCi/g	0.47		0.03	0.12	0.94	M3	0.1	0.23	0.78		0.07	0.19
U-235	NA	pCi/g	0.06	U,G	0.21	0.13	0.044	U	0.25	0.15	0.037	U	0.29	0.17
U-238	1.11	pCi/g	0.5		0.04	0.13	0.95		0.09	0.23	0.9		0.06	0.2

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG13				MML-SBG13				MML-SBG14			
		Date	2/5/2010				2/5/2010				2/4/2010			
		Depth (Feet)	4-5				5-6				0.5-4			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.77	G	0.25	0.24	1.72	G	0.26	0.24	1.15	G	0.41	0.23
Ra-226	1.46	pCi/g	**2.08**	G,TI	1.16	0.77	**2.27**	G,TI	1.11	0.75	**3.2**	G,TI	2	1.3
Th-234	1.11	pCi/g	**1.4**	U,G	3.2	2	1.1	U,G	3.3	2	**1.39**	U,G	1.48	0.93
U-234	NA	pCi/g	1.19		0.05	0.25	1.06		0.05	0.23	1.17		0.09	0.26
U-235	NA	pCi/g	0.14	U,G	0.25	0.15	0.11	U,G	0.34	0.21	0.13	U,G	0.32	0.19
U-238	1.11	pCi/g	1.01		0.05	0.22	**1.2**		0.02	0.25	**1.24**		0.09	0.27

		Sample ID	MML-SBG14				MML-SBG15				MML-SBG15			
		Date	2/4/2010				2/3/2010				2/3/2010			
		Depth (Feet)	11-12				0-2				2-3			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.71		0.31	0.25	1.07	G	0.37	0.21	0.73	G	0.39	0.18
Ra-226	1.46	pCi/g	**2.36**	SI	1.33	0.88	**13.7**	G,TI	1.6	2	1	U,G,SI	1.9	1.2
Th-234	1.11	pCi/g	0.5	U	2.7	1.7	**5.1**	M3,G	4	2.6	0.55	U,G	1.37	0.83
U-234	NA	pCi/g	1.02	M3	0.14	0.24	6.6		0.1	1.1	0.67		0.08	0.16
U-235	NA	pCi/g	0.064	U	0.34	0.21	0.56	G,TI	0.42	0.27	0.09	U,G	0.3	0.18
U-238	1.11	pCi/g	1.09		0.06	0.24	**7**		0.1	1.2	0.52		0.05	0.14

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG16				MML-SBG16				MML-SBG17			
		Date	2/17/2010				2/17/2010				2/3/2010			
		Depth (Feet)	0-1.5				1.5-3				0-2			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.99	G	0.23	0.16	0.98	G	0.27	0.18	1.24	G	0.27	0.2
Ra-226	1.46	pCi/g	**2.03**	G,TI	1.12	0.74	**2.11**	G,TI	1.02	0.7	**5.2**	G,TI	1.4	1.1
Th-234	1.11	pCi/g	-0.6	U,G	2.2	1.3	**2.5**	U,G	3	1.9	0.5	U,G	3.4	2
U-234	NA	pCi/g	0.88	M3	0.13	0.21	1.01		0.08	0.23	1.52		0.06	0.31
U-235	NA	pCi/g	0.037	U,G	0.24	0.14	0.14	U,G	0.19	0.12	0.3	U,G	0.31	0.19
U-238	1.11	pCi/g	0.93		0.08	0.21	0.82		0.07	0.2	**1.47**		0.05	0.3

		Sample ID	MML-SBG17				MML-SBG18				MML-SBG18			
		Date	2/3/2010				2/17/2010				2/17/2010			
		Depth (Feet)	2-5				0-1				1.5-3			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.79	G	0.37	0.2	0.97	M3,G	0.73	0.34	0.64	G	0.45	0.26
Ra-226	1.46	pCi/g	1.14	U,G,SI	1.15	0.73	**20.1**	G,TI	3.3	3.4	1	U,G,SI	1.8	1.1
Th-234	1.11	pCi/g	0.39	U,G	1.13	0.68	**6.1**	G	2.8	2	-0.03	U,G	1.35	0.78
U-234	NA	pCi/g	0.62		0.07	0.16	5.1	M3	0.3	1	0.6		0.07	0.16
U-235	NA	pCi/g	-0.004	U,G	0.39	0.23	0.33	U,G	0.81	0.49	0.039	U,G	0.5	0.29
U-238	1.11	pCi/g	0.55		0.07	0.15	**5.1**	M3	0.16	0.99	0.62		0.09	0.17

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG18				MML-SBG19				MML-SBG19			
		Date	2/17/2010				2/16/2010				2/16/2010			
		Depth (Feet)	3-4				0-1.5				1.5-3			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.88	G	0.5	0.25	1.3	G	0.26	0.2	1.11	G	0.34	0.19
Ra-226	1.46	pCi/g	**34.2**	G,TI	2.6	4.5	**1.96**	G,TI	1.16	0.76	1.05	U,G,SI	1.28	0.8
Th-234	1.11	pCi/g	**11.1**	G	1.7	1.8	-0.1	U,G	2.5	1.5	0.5	U,G	3.3	2
U-234	NA	pCi/g	14.5	M3	0.2	2.5	1.01		0.07	0.23	1.08		0.07	0.24
U-235	NA	pCi/g	0.8	G	0.66	0.38	0.097	U,G	0.27	0.16	0.1	U,G	0.29	0.17
U-238	1.11	pCi/g	**14.6**	M3	0.2	2.5	0.86		0.06	0.2	0.85		0.08	0.2

		Sample ID	MML-SBG20				MML-SBG20				MML-SBG21			
		Date	2/25/2010				2/25/2010				2/25/2010			
		Depth (Feet)	10-12				7.5-8.5				10-11			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.91		0.33	0.19	0.66		0.19	0.12	0.52	G	0.36	0.19
Ra-226	1.46	pCi/g	**1.79**	SI	1.3	0.85	**1.51**	SI	0.83	0.55	**1.5**	G,TI	1.42	0.91
Th-234	1.11	pCi/g	**1.5**	U	3.2	1.9	0.8	U	2.3	1.4	-0.06	U,G	1.22	0.72
U-234	NA	pCi/g	0.74		0.07	0.17	0.6		0.02	0.15	0.57		0.05	0.14
U-235	NA	pCi/g	0.066	U	0.32	0.19	0.09	U	0.27	0.16	0.14	U,G	0.28	0.17
U-238	1.11	pCi/g	0.77		0.05	0.17	0.68		0.04	0.16	0.49		0.01	0.13

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG21				MML-SBG22				MML-SBG22			
		Date	2/25/2010				2/24/2010				2/24/2010			
		Depth (Feet)	1-3				10-12				8-10			
Parameter	ISV	Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.76		0.48	0.27	0.76		0.37	0.21	0.74		0.24	0.15
Ra-226	1.46	pCi/g	**1.7**	SI	1.7	1.1	0.82	U,SI	1.35	0.83	1.28	SI	1.2	0.76
Th-234	1.11	pCi/g	0.6	U	1.7	1	0.5	U	3	1.8	0.7	U	2.9	1.7
U-234	NA	pCi/g	1.02		0.09	0.23	0.52		0.07	0.14	0.36	M3	0.13	0.13
U-235	NA	pCi/g	0.012	U	0.51	0.28	0.14	U	0.32	0.2	0.017	U	0.36	0.21
U-238	1.11	pCi/g	0.87		0.07	0.2	0.64		0.08	0.16	0.5		0.06	0.14

		Sample ID	MML-SBG23				MML-SBG23				MML-SBG24			
		Date	2/22/2010				2/22/2010				2/22/2010			
		Depth (Feet)	2-4				4-6				0-2			
Parameter	ISV	Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	1.13	M3,G	0.51	0.31	0.43	LT,G	0.36	0.17	1.14	M3,G	0.59	0.31
Ra-226	1.46	pCi/g	0.9	U,G,SI	2.6	1.6	0.54	U,G,SI	1.37	0.83	**1.8**	U,G,SI	2.6	1.6
Th-234	1.11	pCi/g	0.3	U,G	2.1	1.3	1.04	U,G	1.28	0.8	0.4	U,G	2.5	1.5
U-234	NA	pCi/g	0.72		0.04	0.17	0.52		0.04	0.14	0.77		0.05	0.17
U-235	NA	pCi/g	0.052	U,G	0.6	0.35	0.015	U,G	0.47	0.28	0.055	U,G	0.57	0.32
U-238	1.11	pCi/g	0.67		0.04	0.16	0.42		0.05	0.12	0.84		0.04	0.19

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG24				MML-SBG25				MML-SBG25			
		Date	2/22/2010				2/18/2010				2/18/2010			
		Depth (Feet)	2-4				0-3				3-4.5			
Parameter	ISV	Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.62	G	0.24	0.13	0.83	G	0.32	0.18	0.9	G	0.25	0.15
Ra-226	1.46	pCi/g	1.21	G,TI	1.18	0.74	1.27	U,G,SI	1.34	0.84	**2.18**	G,TI	1.11	0.74
Th-234	1.11	pCi/g	0.1	U,G	2.3	1.4	0.9	U,G	3.3	2	0.8	U,G	3.2	1.9
U-234	NA	pCi/g	0.61		0.07	0.16	0.78		0.09	0.18	0.88		0.03	0.2
U-235	NA	pCi/g	0.047	U,G	0.25	0.15	0.026	U,G	0.38	0.23	0.024	U,G	0.36	0.21
U-238	1.11	pCi/g	0.74		0.06	0.18	0.72		0.05	0.17	0.9		0.05	0.2

		Sample ID	MML-SBG26				MML-SBG26				MML-SBG27			
		Date	2/18/2010				2/18/2010				2/18/2010			
		Depth (Feet)	0-3				6-8				0-1			
Parameter	ISV	Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.42	LT,G	0.35	0.16	0.79	G	0.39	0.21	0.86	G	0.32	0.18
Ra-226	1.46	pCi/g	0.87	U,G,SI	1.17	0.73	**1.6**	U,G,SI	1.7	1.1	1.18	U,G,SI	1.28	0.8
Th-234	1.11	pCi/g	0.9	U,G	2.9	1.8	0.8	U,G	3.5	2.1	**1.8**	U,G	3.6	2.2
U-234	NA	pCi/g	0.52		0.07	0.14	0.58		0.01	0.14	0.51		0.08	0.14
U-235	NA	pCi/g	0.04	U,G	0.27	0.16	0.27	U,G	0.39	0.21	0.13	U,G	0.24	0.15
U-238	1.11	pCi/g	0.39		0.05	0.12	0.57		0.03	0.14	0.78		0.09	0.19

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG27				MML-SBG28				MML-SBG28			
		Date	2/18/2010				2/16/2010				2/16/2010			
		Depth (Feet)	1-2.5				0.5-2				1.5-3			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.59	G	0.37	0.18	0.95	G	0.37	0.2	1.35	G	0.26	0.2
Ra-226	1.46	pCi/g	1.13	U,G,SI	1.24	0.78	**2.41**	G,TI	0.96	0.72	**2.27**	G,TI	1.21	0.81
Th-234	1.11	pCi/g	0.27	U,G	1.13	0.68	-0.4	U,G	3	1.8	0.4	U,G	2.8	1.7
U-234	NA	pCi/g	0.59		0.09	0.15	0.55		0.04	0.14	1.15		0.06	0.25
U-235	NA	pCi/g	0.087	U,G	0.39	0.23	0.06	U,G	0.33	0.2	0.066	U,G	0.31	0.18
U-238	1.11	pCi/g	0.51		0.07	0.14	0.59		0.04	0.15	0.9		0.02	0.21

		Sample ID	MML-SBG29				MML-SBG29				MML-SBG30			
		Date	2/16/2010				2/16/2010				2/16/2010			
		Depth (Feet)	0-3				3-5				0-2.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.29	G	0.31	0.21	0.66	G	0.39	0.18	1.05	M3,G	0.56	0.29
Ra-226	1.46	pCi/g	**2.17**	G,TI	1.29	0.86	**1.59**	G,TI	1.35	0.86	0.8	U,G,SI	2.9	1.7
Th-234	1.11	pCi/g	1	U,G	2.7	1.6	0.55	U,G	1.25	0.76	0.9	U,G	1.9	1.1
U-234	NA	pCi/g	1.03		0.06	0.23	0.78		0.07	0.19	0.61		0.05	0.15
U-235	NA	pCi/g	0.06	U,G	0.3	0.18	0.16	U,G	0.27	0.17	0.26	U,G	0.56	0.34
U-238	1.11	pCi/g	0.83		0.08	0.2	0.67		0.07	0.17	0.73		0.05	0.17

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
used to report Th-232 concentrations
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG30				MML-SBG31				MML-SBG31			
		Date	2/16/2010				2/17/2010				2/17/2010			
		Depth (Feet)	2.5-5				0-1.5				1.5-3			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.65	G	0.47	0.25	1.24	M3,G	0.56	0.31	1.15	M3,G	0.56	0.32
Ra-226	1.46	pCi/g	1.38	U,G,SI	1.51	0.95	**2.3**	U,G,SI	2.5	1.6	**1.6**	U,G,SI	1.9	1.2
Th-234	1.11	pCi/g	0.57	U,G	1.48	0.89	**1.2**	U,G	2.4	1.4	0.14	U,G	1.6	0.94
U-234	NA	pCi/g	0.88		0.07	0.2	0.65		0.08	0.17	0.84		0.07	0.21
U-235	NA	pCi/g	0.108	U,G	0.5	0.3	0.17	U,G	0.56	0.34	0.028	U,G	0.53	0.31
U-238	1.11	pCi/g	0.89		0.03	0.2	0.77		0.08	0.19	0.95		0.06	0.23

		Sample ID	MML-SBG32				MML-SBG33				MML-SBG33			
		Date	2/17/2010				2/17/2010				2/17/2010			
		Depth (Feet)	1.5-3				10-11				9-10			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.09	M3,G	0.68	0.37	1.4	M3,G	0.77	0.41	1.31	M3,G	0.64	0.4
Ra-226	1.46	pCi/g	**3.2**	G,TI	2.7	1.8	**3**	G,TI	2.4	1.6	**1.8**	U,G,SI	2.9	1.8
Th-234	1.11	pCi/g	0.3	U,G	1.8	1	0.7	U,G	2	1.2	0.7	U,G	2.6	1.5
U-234	NA	pCi/g	1.01		0.09	0.23	1.11		0.06	0.24	1		0.06	0.23
U-235	NA	pCi/g	0.08	U,G	0.66	0.38	0.041	U,G	0.65	0.37	0.22	U,G	0.69	0.41
U-238	1.11	pCi/g	0.88		0.08	0.21	**1.12**		0.04	0.24	0.94		0.05	0.21

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG32				MML-SBG34				MML-SBG34			
		Date	2/17/2010				2/22/2010				2/22/2010			
		Depth (Feet)	0-1.5				2.5-3				3.5-5.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.16	M3,G	0.64	0.36	0.98	G	0.37	0.2	0.85	G	0.33	0.19
Ra-226	1.46	pCi/g	1	U,G,SI	3	1.8	**1.72**	G,TI	1.34	0.87	**1.73**	G,TI	1.15	0.77
Th-234	1.11	pCi/g	0.7	U,G	2.7	1.6	0.3	U,G	3.7	2.2	0.1	U,G	3	1.7
U-234	NA	pCi/g	0.8		0.06	0.19	0.72		0.07	0.17	0.94		0.03	0.2
U-235	NA	pCi/g	0.033	U,G	0.72	0.4	0.055	U,G	0.32	0.19	0.077	U,G	0.38	0.22
U-238	1.11	pCi/g	0.86		0.05	0.2	0.85		0.06	0.2	1.01		0.01	0.21

		Sample ID	MML-SBG35				MML-SBG36				MML-SBG35			
		Date	2/16/2010				2/16/2010				2/16/2010			
		Depth (Feet)	3-5				0-1.5				0-3			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.17	G	0.36	0.21	1.27	M3,G	0.64	0.4	1.09	G	0.32	0.2
Ra-226	1.46	pCi/g	**2.21**	G,TI	1.35	0.89	**1.5**	U,G,SI	2	1.2	**1.77**	G,TI	1.15	0.76
Th-234	1.11	pCi/g	**1.29**	LT,G	1.25	0.79	0.38	U,G	1.47	0.87	**1.7**	U,G	3.3	2
U-234	NA	pCi/g	1.07		0.05	0.24	0.85		0.06	0.2	0.87	M3	0.13	0.21
U-235	NA	pCi/g	0.08	U,G	0.24	0.14	0.009	U,G	0.61	0.34	0.18	U,G	0.24	0.15
U-238	1.11	pCi/g	1		0.05	0.23	0.91		0.04	0.21	0.95		0.08	0.22

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
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TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG36				MML-SBG37				MML-SBG37			
		Date	2/16/2010				2/24/2010				2/24/2010			
		Depth (Feet)	1.5-3				2-3				9-11			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.1	M3,G	0.57	0.33	0.57	G	0.28	0.14	0.71	G	0.31	0.17
Ra-226	1.46	pCi/g	1.4	U,G,SI	2.7	1.7	**1.85**	G,TI	1.1	0.74	0.81	U,G,SI	1.24	0.76
Th-234	1.11	pCi/g	0.5	U,G	2.2	1.3	-0.2	U,G	3	1.8	0.9	U,G	3.2	2
U-234	NA	pCi/g	0.76		0.07	0.19	0.49		0.07	0.14	0.44		0.06	0.12
U-235	NA	pCi/g	0.09	U,G	0.62	0.36	0.1	U,G	0.21	0.13	0.11	U,G	0.29	0.17
U-238	1.11	pCi/g	0.7		0.06	0.18	0.67		0.05	0.17	0.59		0.04	0.15

		Sample ID	MML-SBG38				MML-SBG38				MML-SBG39			
		Date	2/23/2010				2/23/2010				3/1/2010			
		Depth (Feet)	5-7				10-12				0-1			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.56	G	0.26	0.14	1.11	G	0.4	0.22	0.71	G	0.44	0.22
Ra-226	1.46	pCi/g	1.05	U,G,SI	1.21	0.75	1.11	U,G,SI	1.59	0.99	**132**	G,TI	4	16
Th-234	1.11	pCi/g	**1.8**	U,G	3.4	2.1	**2.4**	U,G	3.2	2	**21.1**	M3,G	6.9	5
U-234	NA	pCi/g	0.68		0.07	0.17	0.78		0.04	0.18	14.7	M3	0.6	2.9
U-235	NA	pCi/g	0.049	U,G	0.37	0.22	0.008	U,G	0.36	0.21	2.24	M3	0.97	0.52
U-238	1.11	pCi/g	0.48		0.04	0.13	0.73		0.06	0.17	**13.9**	M3	0.5	2.8

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG39				MML-SBG40				MML-SBG40			
		Date	3/1/2010				2/23/2010				2/23/2010			
		Depth (Feet)	2-4				0.5-2				6-8			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	0.63	G	0.36	0.18	0.82	G	0.46	0.25	0.52	G	0.34	0.15
Ra-226	1.46	pCi/g	**14**	G,TI	1.7	2.1	0.9	U,G,SI	1.7	1	**2.45**	G,TI	1.05	0.76
Th-234	1.11	pCi/g	**4.9**	G	3.5	2.3	0.51	U,G	1.43	0.86	0.9	U,G	3	1.8
U-234	NA	pCi/g	3.16		0.01	0.55	0.64		0.04	0.16	1.57		0.08	0.31
U-235	NA	pCi/g	0.43	G,TI	0.42	0.26	0.27	U,G	0.33	0.21	0.15	U,G	0.24	0.15
U-238	1.11	pCi/g	**3.09**		0.03	0.54	0.62		0.05	0.15	**1.58**		0.06	0.31

		Sample ID	MML-SBG41				MML-SBG41				MML-SBG42			
		Date	3/1/2010				3/1/2010				2/23/2010			
		Depth (Feet)	0-2				2-4.5				3-4.5			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.08	M3,G	0.52	0.27	0.85	M3,G	0.62	0.29	0.75	M3,G	0.51	0.24
Ra-226	1.46	pCi/g	**27.9**	G,TI	2.4	3.8	**62.1**	G,TI	3.4	7.8	**34.5**	G,TI	2.6	4.5
Th-234	1.11	pCi/g	**5.9**	G	1.9	1.4	**18.7**	G	2.9	2.9	**10.1**	M3,G	6.9	4.5
U-234	NA	pCi/g	8	M3	0.1	1.4	7.9	M3	0.3	1.6	35.4		0.1	5.6
U-235	NA	pCi/g	0.88	M3	0.65	0.42	1.8	M3	1	0.58	2.1	G,TI	0.68	0.44
U-238	1.11	pCi/g	**7.8**		0.1	1.3	**8.4**	M3	0.2	1.6	**37.1**		0	5.9

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

Parameter	ISV	Sample ID	MML-SBG42				MML-SBG43				MML-SBG43			
		Date	2/23/2010				2/24/2010				2/24/2010			
		Depth (Feet)	6-7.5				10-11.5				6-9			
		Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.52	G	0.29	0.15	1.23	G	0.5	0.31	1.08	G	0.49	0.29
Ra-226	1.46	pCi/g	**1.89**	G,TI	1.46	0.94	1.2	U,G,SI	2.2	1.4	1.2	U,G,SI	2.3	1.4
Th-234	1.11	pCi/g	**2**	U,G	2.9	1.8	0.6	U,G	1.9	1.1	0.5	U,G	1.8	1
U-234	NA	pCi/g	0.85		0.07	0.2	0.95		0.04	0.21	0.89		0.06	0.2
U-235	NA	pCi/g	0.12	U,G	0.26	0.16	0.055	U,G	0.61	0.34	0.032	U,G	0.55	0.32
U-238	1.11	pCi/g	0.79		0.06	0.19	1.08		0.02	0.23	0.83		0.06	0.19

Parameter	ISV	Sample ID	MML-SBG44				MML-SBG44				MML-SBG45			
		Date	2/24/2010				2/24/2010				2/24/2010			
		Depth (Feet)	0-1.5				1.5-3				0-2			
		Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.81	G	0.38	0.19	0.83	G	0.44	0.25	0.69	G	0.49	0.24
Ra-226	1.46	pCi/g	**2.2**	G,TI	1.6	1	1.3	U,G,SI	1.6	1	**4.5**	G,TI	1.7	1.3
Th-234	1.11	pCi/g	0.6	U,G	3.2	1.9	0.3	U,G	3	1.8	**1.6**	U,G	1.6	1
U-234	NA	pCi/g	0.85		0.06	0.2	0.71		0.05	0.17	2.24		0.07	0.42
U-235	NA	pCi/g	0.049	U,G	0.36	0.21	0.06	U,G	0.43	0.25	0.024	U,G	0.52	0.3
U-238	1.11	pCi/g	0.75		0.07	0.18	0.67		0.02	0.17	**2.01**		0.07	0.38

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

		Sample ID	MML-SBG45				MML-SBG45				MML-SBG46			
		Date	2/24/2010				2/24/2010				2/24/2010			
		Depth (Feet)	10-12				3.5-4.5				10-12			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	1.19		0.48	0.27	0.83	G	0.47	0.23	1.21	M3,G	0.59	0.37
Ra-226	1.46	pCi/g	**1.9**	SI	1.7	1.1	**2.8**	G,TI	1.8	1.2	**1.7**	U,G,SI	2.4	1.5
Th-234	1.11	pCi/g	**3.5**	LT,TI	3.4	2.2	0.8	U,G	3.5	2.1	0.1	U,G	1.65	0.95
U-234	NA	pCi/g	0.96		0.06	0.21	3.9		0.06	0.68	1.01		0.05	0.21
U-235	NA	pCi/g	0.054	U	0.39	0.22	0.26	U,G	0.48	0.3	0.059	U,G	0.59	0.34
U-238	1.11	pCi/g	**1.15**		0.04	0.24	**1.92**		0.04	0.36	0.98		0.05	0.21

		Sample ID	MML-SBG46				MML-SBG46				MML-SBG47			
		Date	2/24/2010				2/24/2010				2/24/2010			
		Depth (Feet)	0-1				7.5-9.5				10-12			
Parameter	**ISV**	**Units**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**	**Result**	**Qual**	**MDC**	**± TPU**
Ac-228	2.18	pCi/g	**188**	G,TI	54	39	1.27	G	0.31	0.22	0.78		0.39	0.21
Ra-226	1.46	pCi/g	**30300†**	G,J	0	3500	**2.8**	G,TI	1.6	1.1	1.26	U,SI	1.3	0.83
Th-234	1.11	pCi/g	**3780**	G	460	530	0.8	U,G	3.6	2.1	0.9	U	3.4	2.1
U-234	NA	pCi/g					1.15		0.07	0.24	0.48		0.08	0.13
U-235	NA	pCi/g	631	G	83	85	0.03	U,G	0.4	0.24	0.065	U	0.41	0.24
U-238	1.11	pCi/g					0.92		0.06	0.21	0.55		0.05	0.14

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
† = Ra-226 result is based on Bi-214
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

Parameter	ISV	Sample ID	MML-SBG47				MML-SBG48			
		Date	2/24/2010				2/25/2010			
		Depth (Feet)	2-3				1-3			
		Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.85		0.32	0.2	1.39	G	0.34	0.23
Ra-226	1.46	pCi/g	**1.57**	SI	1.32	0.86	**1.58**	G,TI	1.48	0.94
Th-234	1.11	pCi/g	**1.7**	U	2.7	1.7	0.6	U,G	2.9	1.7
U-234	NA	pCi/g	0.57		0.01	0.14	0.9		0.05	0.2
U-235	NA	pCi/g	0.009	U	0.4	0.23	0.18	U,G	0.32	0.19
U-238	1.11	pCi/g	0.61		0.03	0.15	1.05		0.07	0.23

Parameter	ISV	Sample ID	MML-SBG48				MML-SBG49			
		Date	2/25/2010				2/25/2010			
		Depth (Feet)	8-9				3-4			
		Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.59	G	0.37	0.19	1.27	G	0.41	0.24
Ra-226	1.46	pCi/g	0.97	U,G,SI	1.4	0.87	1.23	U,G,SI	1.33	0.84
Th-234	1.11	pCi/g	0.74	U,G	1.28	0.79	0.4	U,G	3.3	2
U-234	NA	pCi/g	0.53		0.04	0.13	0.93		0.07	0.21
U-235	NA	pCi/g	0.14	U,G	0.25	0.15	0.067	U,G	0.37	0.22
U-238	1.11	pCi/g	0.55		0.03	0.14	0.95		0.06	0.21

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
*See Notes on last page for Qualifier

TABLE 5-10
SUMMARY OF SUBSURFACE SOIL
RADIOLOGICAL RESULTS

Parameter	ISV	Sample ID	MML-SBG49				MML-SBG50			
		Date	2/25/2010				3/1/2010			
		Depth (Feet)	2-3				2-3			
		Units	Result	Qual	MDC	± TPU	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	1.43	G	0.31	0.23	0.88	G	0.3	0.17
Ra-226	1.46	pCi/g	**2.05**	G,TI	1.3	0.86	**2.04**	G,TI	1.09	0.74
Th-234	1.11	pCi/g	**1.2**	U,G	3.4	2	**2.8**	U,G	3.7	2.3
U-234	NA	pCi/g	0.97		0.06	0.22	0.77		0.06	0.18
U-235	NA	pCi/g	0.2	U,G	0.28	0.18	0.14	U,G	0.2	0.13
U-238	1.11	pCi/g	0.98		0.05	0.22	0.61		0.07	0.15

Parameter	ISV	Sample ID	MML-SBG50			
		Date	3/1/2010			
		Depth (Feet)	3-5			
		Units	Result	Qual	MDC	± TPU
Ac-228	2.18	pCi/g	0.51	G	0.27	0.15
Ra-226	1.46	pCi/g	**1.88**	G,TI	1.28	0.84
Th-234	1.11	pCi/g	**1.9**	U,G	2.7	1.7
U-234	NA	pCi/g	1.02		0.08	0.23
U-235	NA	pCi/g	0.11	U,G	0.26	0.16
U-238	1.11	pCi/g	**1.23**		0.07	0.26

Notes:
pCi/g = picoCuries per gram
Qual = Qualifier
MDC = Minimum Detectable concentration
TPU = Total Propogated Uncertainty
ISV = Investigative Screening Value
NA = Not Applicable
Bold/Shaded indicates result is in excess of ISV
Bold/Shaded indicates result is in excess of ISV
Ac-228 is the daughter product of Th-232 and
*See Notes on last page for Qualifier

Notes:
U = Result is less than the sample specific MDC or less than the associated TPU
G = Sample density differs by more than 15% of LCS density: sample results may be biased
TI = Nuclide identification is tentative
M3 = Requested MDC was not met, but the reported activity is greater than the reported MDC.
J = the value is estimated
SI = Nuclide identification and/or quantitation is tentative

TABLE 5-11
SUMMARY OF GROUNDWATER
RADIOLOGICAL RESULTS

Parameter	MCL	Sample ID	MML-GWG10			
		Date	3/2/2010			
		Units	Result	Qual	MDC	± TPU
GROSS ALPHA	15	pCi/l	2.4	U	2.5	1.5
GROSS BETA	50	pCi/l	8.7		3.1	2.3
Ra-226	5	pCi/l	0.04	U	0.37	0.2
Ra-228	5	pCi/l	0.26	U	0.62	0.31
Th-228	15	pCi/l	0.077	U	0.132	0.076
Th-230	15	pCi/l	0.003	U	0.111	0.054
Th-232	15	pCi/l	0.01	U	0.027	0.018
U-234	21	pCi/l	0.071	U	0.095	0.067
U-235	21	pCi/l	0.029	U	0.039	0.052
U-238	21	pCi/l	0.082	LT	0.064	0.066
URANIUM	30	ug/l	0.11		NA	NA

Notes:
pCi/l = picoCuries per liter
ug/l = micrograms per liter
Qual = Qualifier
MDC = Minimum Detectable Concentration
TPU = Total Propogated Uncertainty
MCL = Maximum Contaminant Level
Bold/Shaded indicates result is in excess of MCL
*See Notes on last page for Qualifier

Notes:
U = Result is less than the sample specific MDC or less than the associated TPU
G = Sample density differs by more than 15% of LCS density: sample results may be biased
TI = Nuclide identification is tentative
M3 = Requested MDC was not met, but the reported activity is greater than the reported MDC.
J = the value is estimated
SI = Nuclide identification and/or quantitation is tentative

Table 7-1: Occupational DAC Values for Site ROPC's

ROPC	Class	10 CFR 20 App B DAC (µCi/ml)
^{226}Ra	W	3E-10
^{232}Th	W	5E-13[1]
^{234}U	Y	2E-11
^{235}U	Y	2E-11
^{238}U	Y	2E-11

[1]Most limiting for primary alpha emitting ROPC
W – Radionuclide retention of 10 to 100 days
Y – Radionuclide retention of > 100 days

Table 7-2 Project Effluent Action Levels for Site ROPCs

ROPC	Class	10 CFR 20 App B Effluent Concentration [µCi/mL]	Project Effluent Action Limit [µCi/mL]
^{226}Ra	W	9E-13	**1.8E-13**
^{232}Th	W	4E-15[1]	**8E-16[2]**
^{234}U	Y	5E-14	**1E-14**
^{235}U	Y	6E-14	**1.2E-14**
^{238}U	Y	6E-14	**1.2E-14**

[1] Most limiting for primary alpha emitting ROPC

[2] The Action Limit reductions of 20% of the10CFR20 Appendix B values only applies to the Effluent Concentrations

W – Radionuclide retention of 10 to 100 days

Y – Radionuclide retention of > 100 days

Table 7-3: Summary of Conceptual Site Model

Media	Pathway Complete	Contamination Exceeding ISVs	Additional Evaluation Necessary
Groundwater	No	No	Yes
Surface Water	Yes	NE	Yes
Sediment	Yes	NE	Yes
Soil	Yes	Yes	Yes
Air	Yes	NE	Yes

ISVs-Investigation Screening Values
NE-Not evaluated

TABLE 8-1: SUMMARY OF AREAS OF INTEREST

AOI	AOI Description	Rationale/Information	Data Summary					
			ROPC	Results Exceeding 10x ISV	Potential for Uranium Nuggets	Potential for Methane	Chemical Data Exceeding NJDEP SSC	Potential for Radiological Subsurface Contamination
1	Southeast portion of Site along Pershing Avenue from Mountain Avenue to Bound Brook	Surface and subsurface soil exceeding ISVs. Concrete debris exhibiting elevated activity. Proximity of residences. Elevated methane.	Ra-226, U-238	Yes	Low	High	SVOCs	High
2	Wooded area extending north from the tree line to Bound Creek	Sporadic areas of elevated activity. Surface and subsurface soil exceeding ISVs. Difficulty in conducting surveys. Flood prone area. Potential for leachate seeps and surface runoff to surface water.	Predominantly Ra-226, Isolated U-238	No	Low	Medium	SVOCs, PCB, Arsenic, Lead	Medium
3	Area within and surrounding the former DOE excavation	Previous remedial actions. Potential for Uranium ore nuggets. Surface and subsurface soil exceeding ISVs. Elevated methane.	U-238, Ra-226, Th-232	Yes, at a single location	Medium	Low	SVOCs	Medium
4	Central portion of the landfill between AOIs 1, 2, 3 and Mountain Avenue	Surveys indicated areas of elevated activity. Surface and subsurface soil exceeding ISVs. Elevated methane.	Ra-226, U-238	No	Low	Medium	None Identified	Medium
5	Northwest portion of Site adjacent to AOI 3 occupying the church and municipal building.	Minimal impact from past operations. Two subsurface locations exceeding ISVs. Low potential for radiological contamination.	Isolated Ra-226	No	Low	Low	SVOCs	Low

Notes:

AOI = Area of Interest

ISV = Investigation Screening Valule

NJDEP = New Jersey Department of Environmental Protection Soil Screening Concentration

SVOCs = Semivolatile Organic Compounds

PCBs = Polychlorinated Biphenyls

TABLE 8-2: RECOMMENDATIONS FOR REMEDIAL INVESTIGATION

AOI	Type of Survey Unit	Survey Type	Additional Comments
1	Class 1	Characterization	Focused characterization of surface and subsurface soil near SSC02, SSC03, GP15 and GP33 to better define extent.
2	Class 1	Characterization	Systematic sampling of soil within the wooded area. Focused characterization of surface and subsurface soil surrounding TP-11 to better define extent.
3	Class 1	Characterization	Focused characterization of surface and subsurface soil near GP-03, GP-03, GP-46 and TP-14 to better define extent. Investigate potential for additional nuggets.
4	Class 1	Characterization	Focused characterization of surface and subsurface soil near GP-9, GP-10, GP-11, GP-24, GP-25 and GP-26 to better define extent.
5	Class 2 or 3	Characterization	Conduct Final Status Survey (surface and subsurface) under MARSSIM as a Class 2 or 3 Survey Unit (following determination of criteria).

Figures

N

Areas of Interest

DOE Excavation
1984 - 1986

Site Boundary

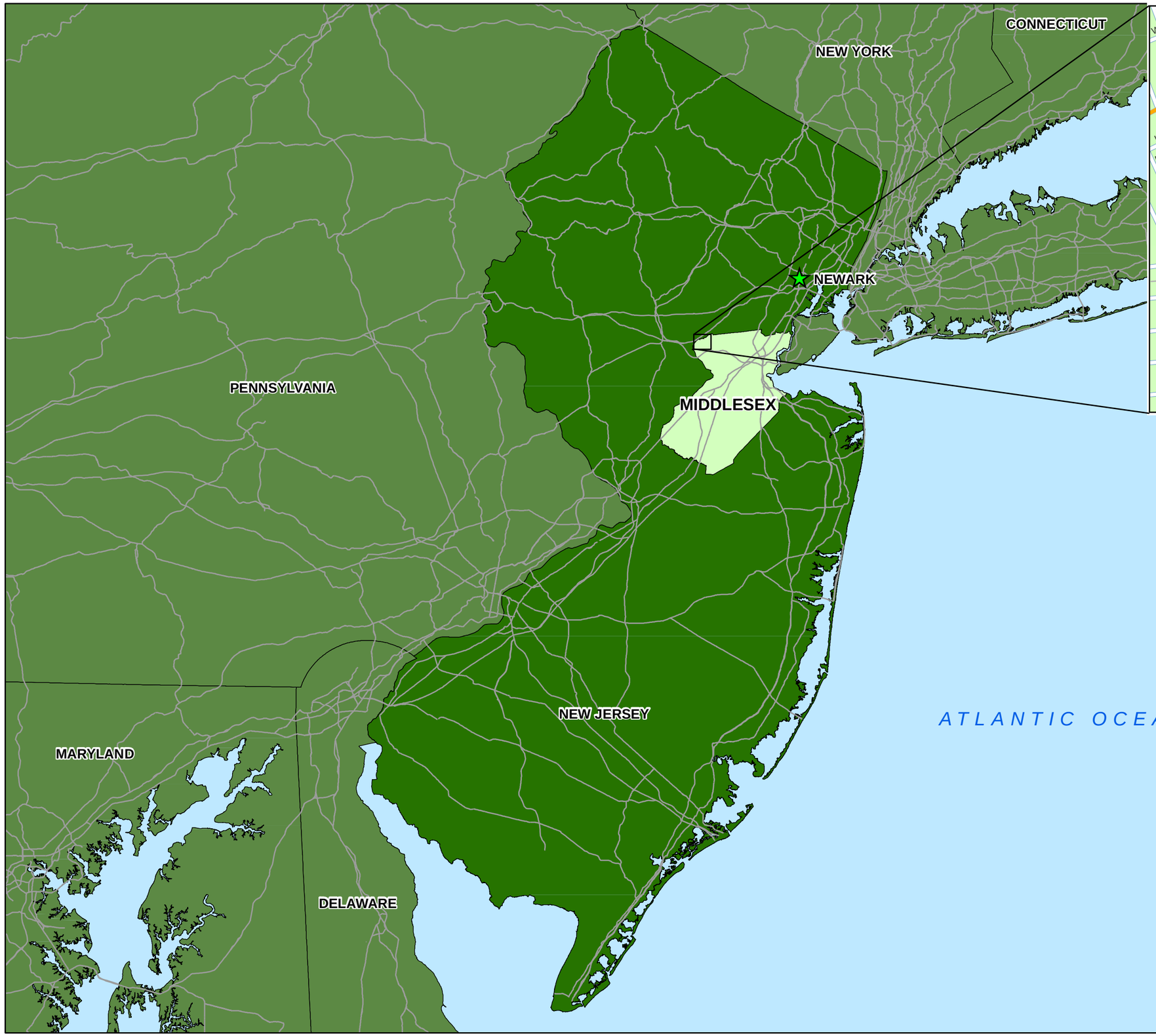
Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

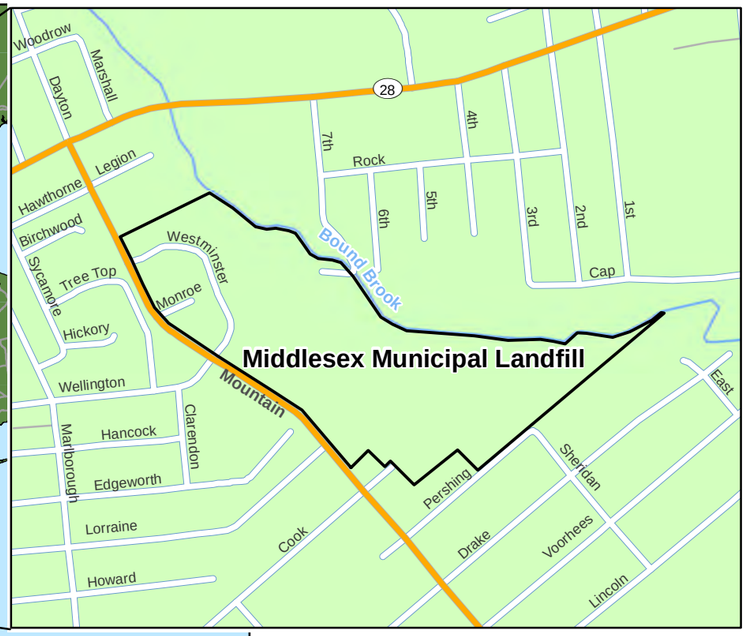
0 110 220 440 660 Feet

MIDDLESEX MUNICIPAL LANDFILL
AREAS OF INTEREST - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE ES-1
Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201		U.S. Army Corps of Engineers





N

Highway

Middlesex County

Site Outline

0 5 10 20 30 40 Miles

LOCATION OF MIDDLESEX MUNICIPAL LANDFILL SITE

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 1-1

Cabrera Services
1106 N. Charles St Suite 300
Baltimore, MD 21201

U.S. Army Corps of Engineers

N

DOE Excavation
1984 - 1986

Site Boundary

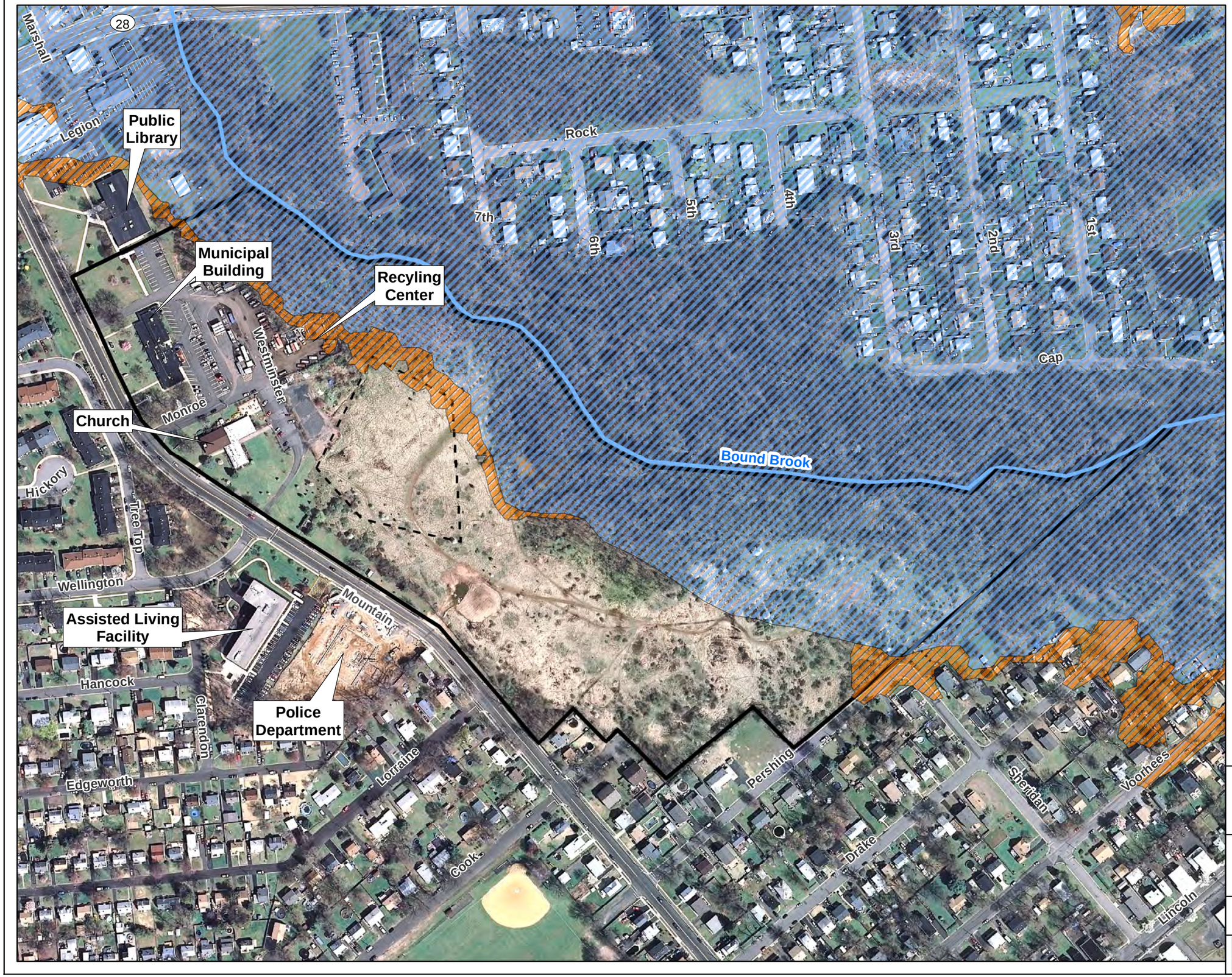
Aerial Source: USGS, Spring 2007

0 112.5 225 450 675 Feet

MIDDLESEX MUNICIPAL LANDFILL
SITE LAYOUT

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 2-1
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers



N

0.2% Annual Chance Flood Hazard Zone

100 Year Flood Zone

DOE Excavation 1984 - 1986

Site Boundary

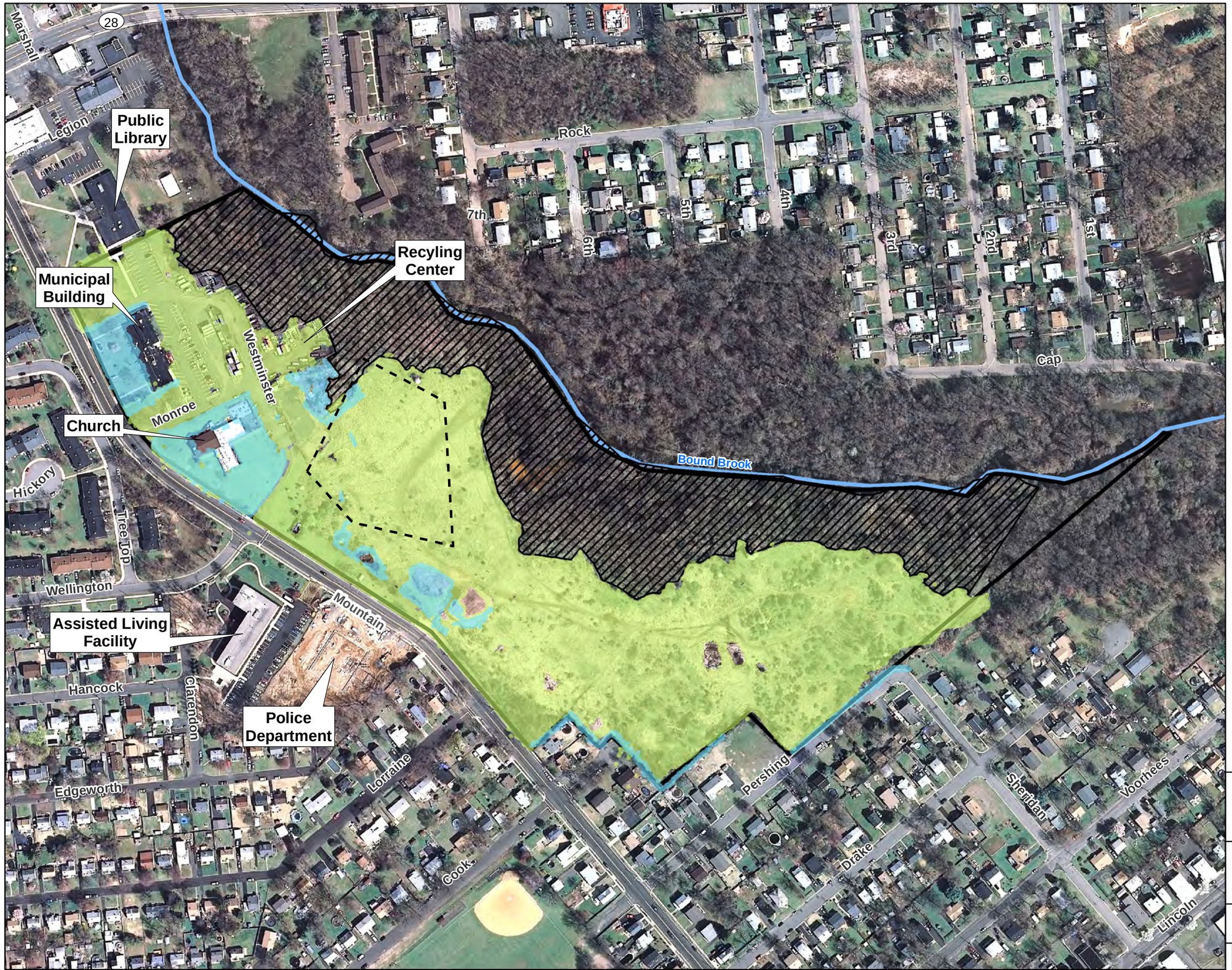
Aerial Source: USGS, Spring 2007
Flood Zone Source: FEMA, 2010

0 100 200 400 600 Feet

FEMA FLOOD HAZARD ZONES

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 3-1
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers



N

CLASS Survey Area

Gamma Walkover Survey Area

Manual Gamma Walkover Survey Area

DOE Excavation 1984 - 1986

Site Boundary

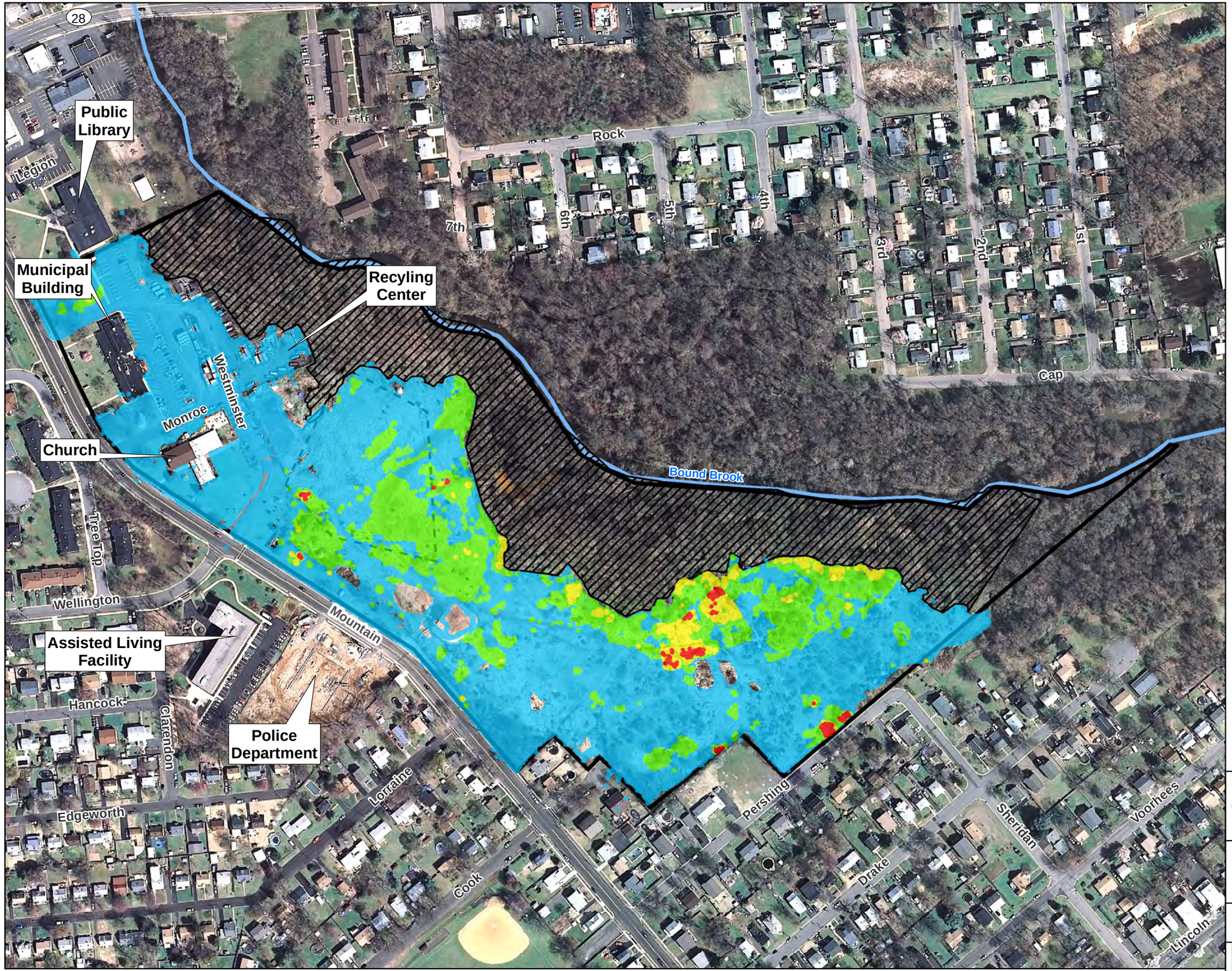
Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 112.5 225 450 675 Feet

EXTENT OF GAMMA SURVEYS - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 4-1
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers



N

Z-Score

- < 1
- 1 - 2
- 2 - 3
- > 3

Area Scanned but not GPS Recorded

DOE Excavation 1984 - 1986

Site Boundary

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 112.5 225 450 675 Feet

CLASS SURVEY Z-SCORE RESULTS - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-1

Cabrera Services
1106 N. Charles St Suite 300
Baltimore, MD 21201

U.S. Army Corps of Engineers

N

Z-Score

- < 1
- 1 - 2
- 2 - 3
- > 3

Area Scanned but not GPS Recorded

DOE Excavation 1984 - 1986

Site Boundary

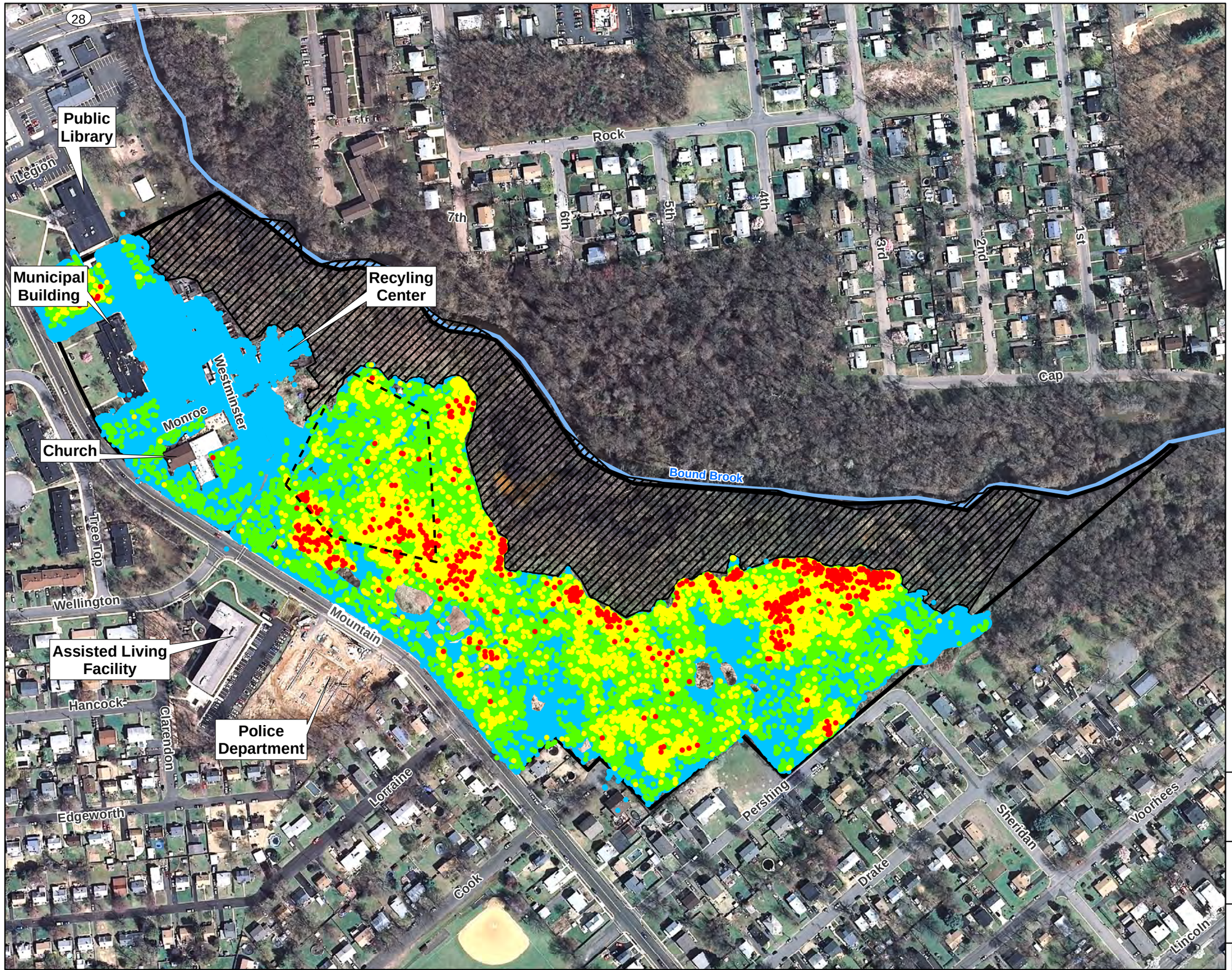
Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 112.5 225 450 675 Feet

GAMMA WALKOVER SURVEY Z-SCORE RESULTS - 2010

SITE INVESTIGATION REPORT MIDDLESEX MUNICIPAL LANDFILL MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-2
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers



N

Z-Score of ROI for Thorium

- < 1 (ROI: 1.0 - 31.1 cpm)
- 1 - 2 (ROI 32.0 - 39.1 cpm)
- 2 - 3 (ROI 40.0 - 47.0 cpm)
- > 3 (ROI 48.0 - 74.2 cpm)

Area Scanned but not GPS Recorded

DOE Excavation 1984 - 1986

Site Boundary

cpm = counts per minute
ROI = Region of Interest

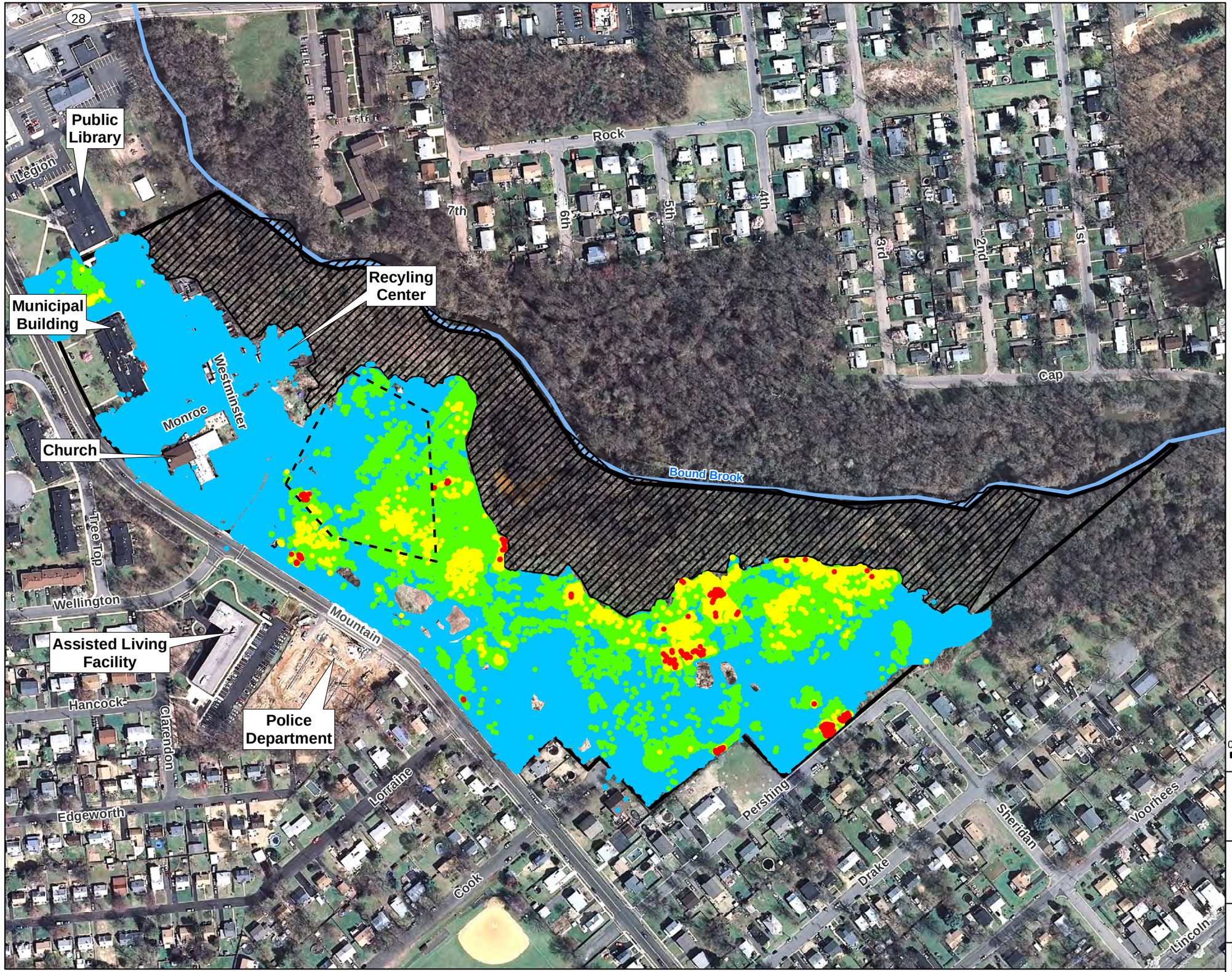
Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010 using CLASS

0 112.5 225 450 675 Feet

Z-SCORE OF ROI FOR THORIUM - 2010

SITE COMPLETION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-3
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers



N

Z-Score of ROI for Radium

- < 1 (ROI: 70.08 - 323.3 cpm)
- 1 - 2 (ROI 323.33 - 381.80 cpm)
- 2 - 3 (ROI 382.1 - 440.7 cpm)
- > 3 (ROI 441.5 - 1922.7 cpm)

Area Scanned but not GPS Recorded

DOE Excavation 1984 - 1986

Site Boundary

cpm = counts per minute
ROI = Region of Interest

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010 using CLASS

0 112.5 225 450 675 Feet

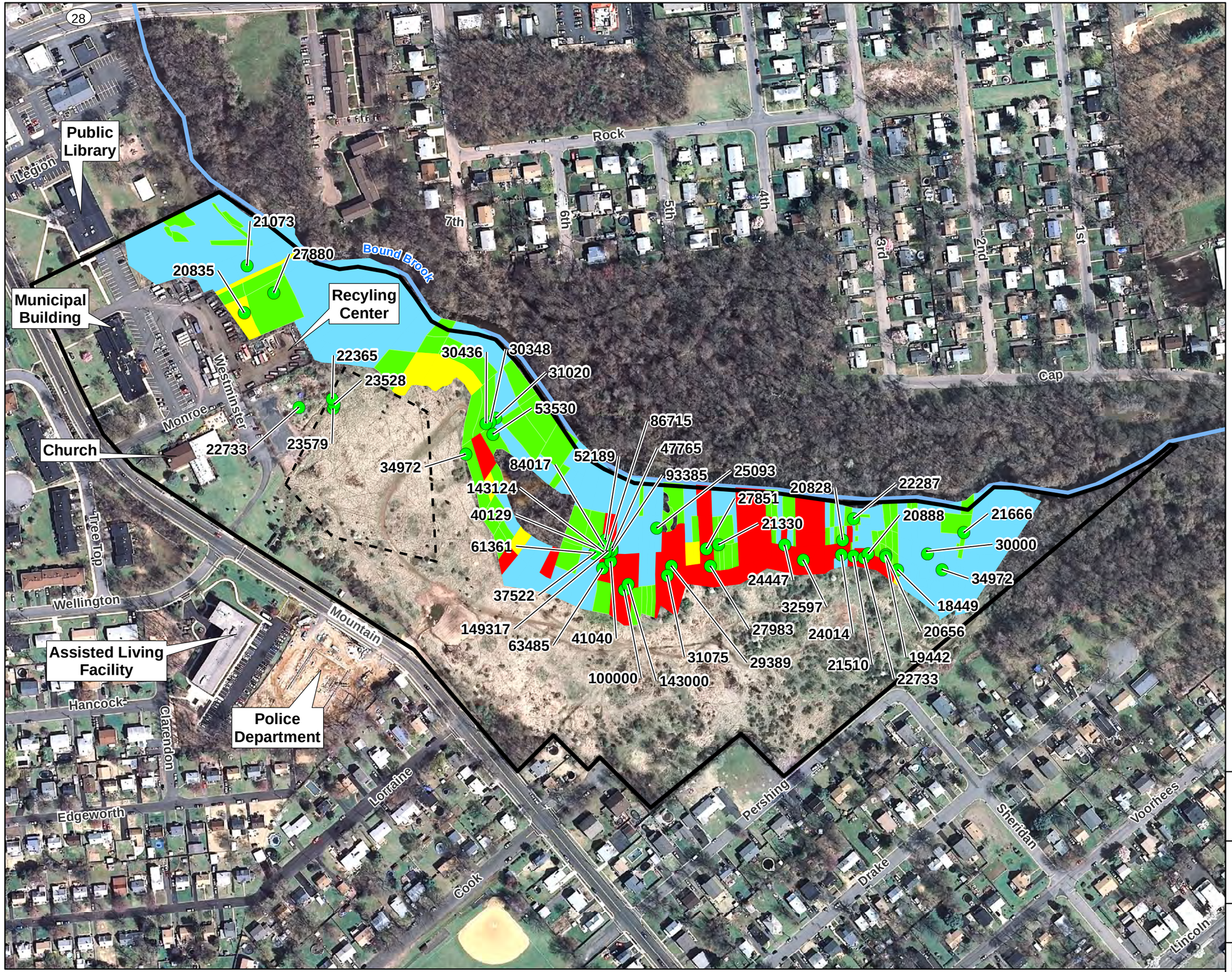
Z-SCORE OF ROI FOR RADIUM - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-4

Cabrera Services
1106 N. Charles St Suite 300
Baltimore, MD 21201

U.S. Army Corps of Engineers



N

CPM Within Wooded Area

- < 17,000
- 17,001-20,000
- 20,001-21,000
- >21,000 (cpm)

21666 — Location of Elevated Gross Gamma Radiation in Counts Per Minute

DOE Excavation 1984 - 1986

Site Boundary

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 112.5 225 450 675 Feet

GAMMA SURVEY RESULTS FOR WOODED AREA - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-5

Cabrera Services
1106 N. Charles St Suite 300
Baltimore, MD 21201

U.S. Army Corps of Engineers

N

Surface Soil Sample Locations

DOE Excavation 1984 - 1986

Site Boundary

ID Definitions
C - Sample Location based on CLASS
SSW - Surface Soil Woods
M - Sample Location based on Walk Over Survey

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 110 220 440 660 Feet

SURFACE SOIL SAMPLE LOCATIONS - 2010

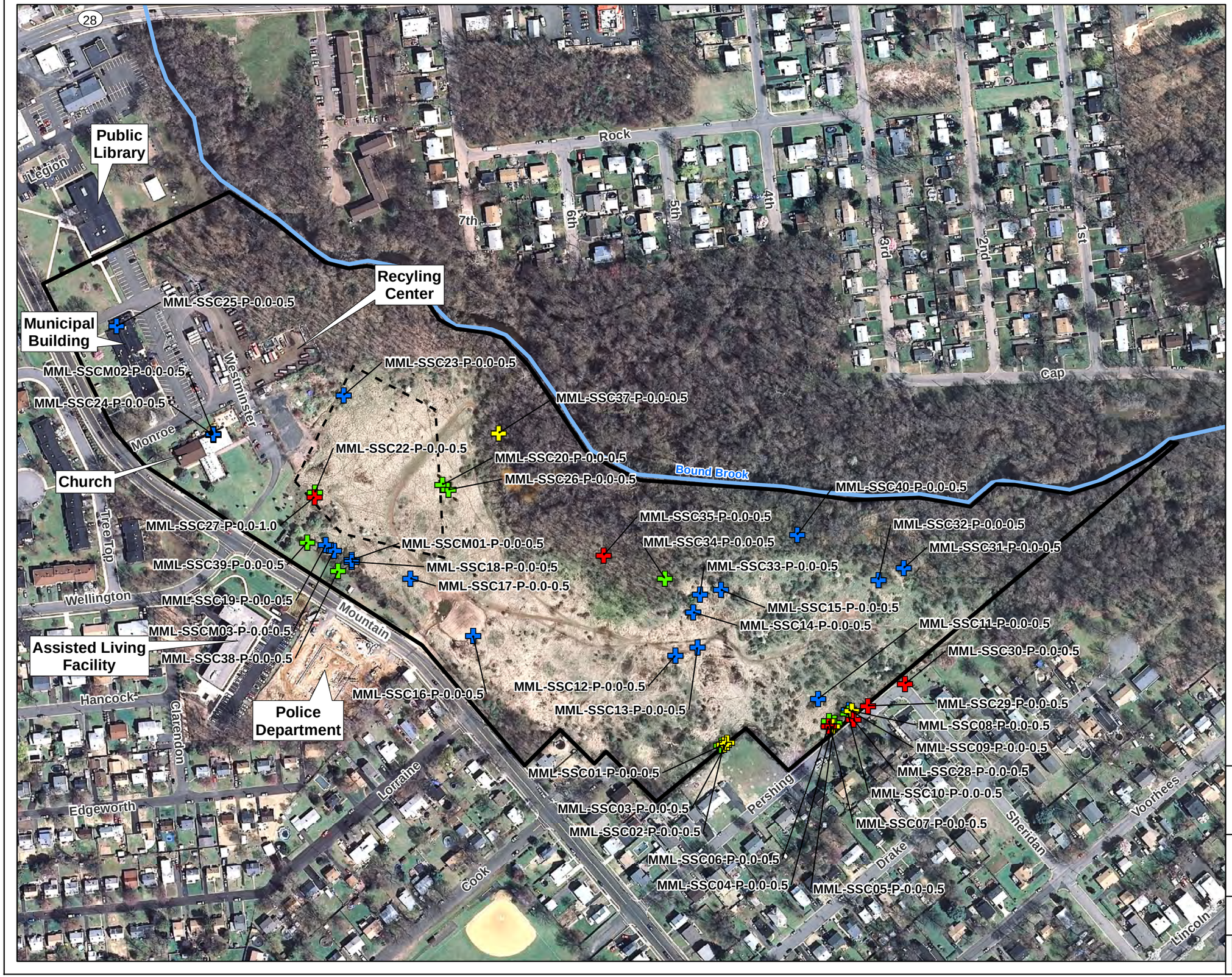
SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-6
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers

SURFACE SOIL RADIOLOGICAL RESULTS EXCEEDING ISV'S - 2010

SITE INVESTIGATION REPORT MIDDLESEX MUNICIPAL LANDFILL MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-7
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers



N

Surface Soil Samples
Uranium Results

- **< 1.11**
- **1.12 - 5.00**
- **5.10 - 10.00**
- **10.10 - 20.60**
- **DOE Excavation 1984 - 1986**
- **Site Boundary**

All results in:
pCi/g (picoCuries per gram)

Maximum Concentration Detected - 20.6 pCi/g

ISV for Uranium is 1.11 pCi/g

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 110 220 440 660 Feet

SURFACE SOIL U-238 RESULTS - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-8
Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201		U.S. Army Corps of Engineers

28
Legion
Public Library
Municipal Building
Recyling Center
Church
Assisted Living Facility
Police Department
Rock
7th
6th
5th
4th
3rd
2nd
1st
Cap
Westminster
Monroe
Tree Top
Wellington
Mountain
Hancock
Clarendon
Edgeworth
Lorraine
Cook
Bound Brook
Pershing
Drake
Sheridan
Voorhees
Lincoln
MML-SSC25-P-0.0-0.5
MML-SSCM02-P-0.0-0.5
MML-SSC24-P-0.0-0.5
MML-SSC23-P-0.0-0.5
MML-SSC37-P-0.0-0.5
MML-SSC22-P-0.0-0.5
MML-SSC20-P-0.0-0.5
MML-SSC26-P-0.0-0.5
MML-SSC27-P-0.0-1.0
MML-SSCM01-P-0.0-0.5
MML-SSC39-P-0.0-0.5
MML-SSC18-P-0.0-0.5
MML-SSC17-P-0.0-0.5
MML-SSC19-P-0.0-0.5
MML-SSCM03-P-0.0-0.5
MML-SSC38-P-0.0-0.5
MML-SSC16-P-0.0-0.5
MML-SSC12-P-0.0-0.5
MML-SSC13-P-0.0-0.5
MML-SSC01-P-0.0-0.5
MML-SSC03-P-0.0-0.5
MML-SSC02-P-0.0-0.5
MML-SSC06-P-0.0-0.5
MML-SSC04-P-0.0-0.5
MML-SSC05-P-0.0-0.5
MML-SSC40-P-0.0-0.5
MML-SSC35-P-0.0-0.5
MML-SSC34-P-0.0-0.5
MML-SSC33-P-0.0-0.5
MML-SSC32-P-0.0-0.5
MML-SSC31-P-0.0-0.5
MML-SSC15-P-0.0-0.5
MML-SSC14-P-0.0-0.5
MML-SSC11-P-0.0-0.5
MML-SSC30-P-0.0-0.5
MML-SSC29-P-0.0-0.5
MML-SSC08-P-0.0-0.5
MML-SSC09-P-0.0-0.5
MML-SSC28-P-0.0-0.5
MML-SSC10-P-0.0-0.5
MML-SSC07-P-0.0-0.5

N

Surface Soil Samples
Thorium Results

- < 2.18
- 2.19 - 9.00
- DOE Excavation 1984 - 1986
- Site Boundary

All results in pCi/g (picoCuries per gram)

Maximum Concentration Detected - 16.2 pCi/g

ISV for Thorium is 2.18 pCi/g

Th-232 based on analysis of Ra-228 (Ac-228)

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 110 220 440 660 Feet

SURFACE SOIL TH-232 RESULTS - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-9
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers

N

Surface Soil Samples
Radium Results

- < 1.46
- 1.47 - 5.99
- 6.00 - 15.99
- 16.00 - 50.99
- 51.00 - 79.60
- DOE Excavation 1984 - 1986
- Site Boundary

All results in pCi/g (picoCuries per gram)

Maximum Concentration Detected - 79.6 pCi/g

ISV for Radium is 1.46 pCi/g

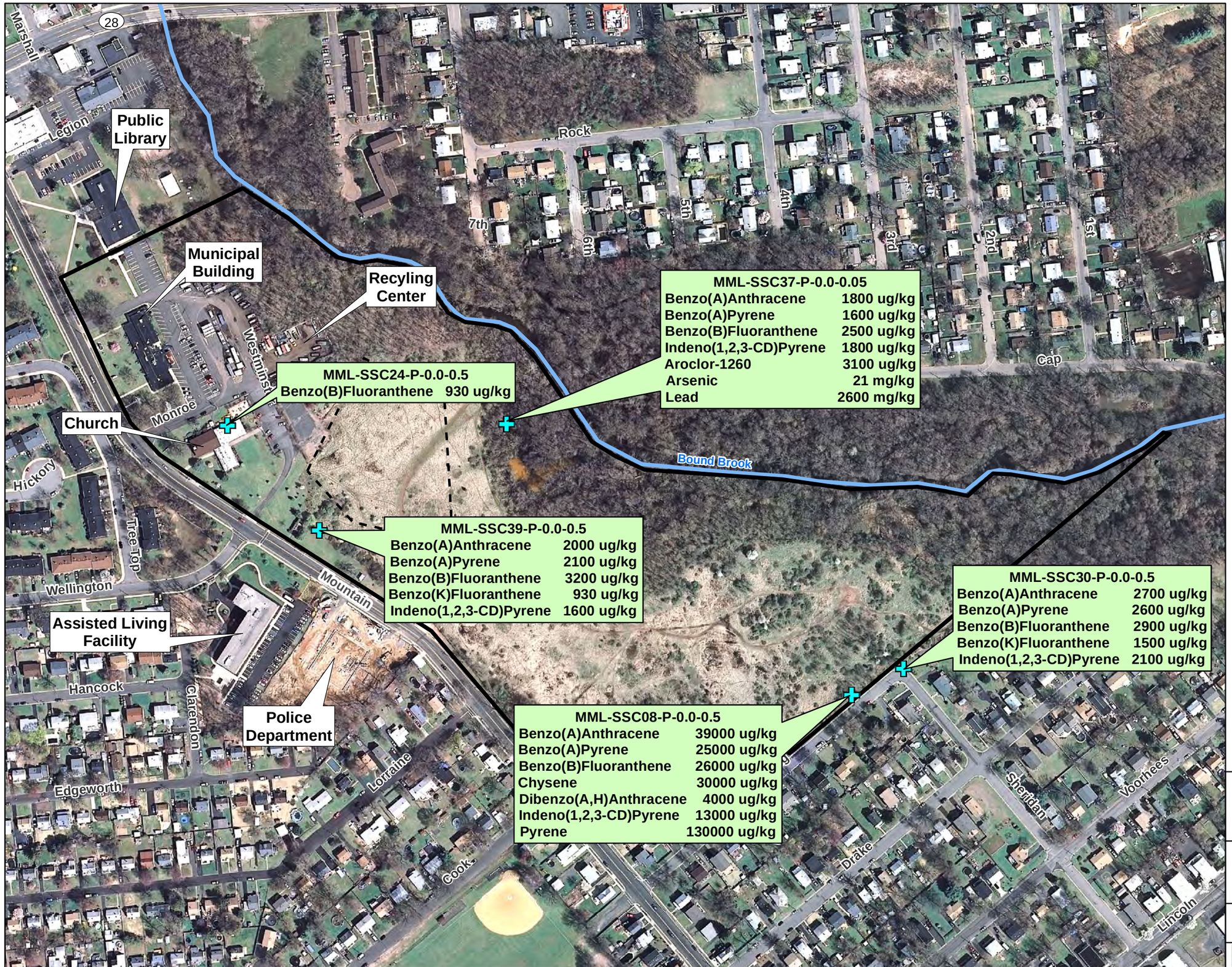
Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 110 220 440 660 Feet

SURFACE SOIL RA-226 RESULTS - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-10
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers



N

Surface Soil Sample Locations

DOE Excavation 1984 - 1986

Site Boundary

ug/kg - microgram per kilogram
mg/kg - milligram per kilogram

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 112.5 225 450 675 Feet

SURFACE SOIL CHEMISTRY RESULTS EXCEEDING NJDEP SOIL SCREENING CRITERIA - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-11
Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201		U.S. Army Corps of Engineers

N

Geoprobe Sample Locations

Groundwater Sample Location

Test Pit Sample Locations

DOE Excavation 1984 - 1986

Site Boundary

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 110 220 440 660 Feet

SUBSURFACE (TEST PIT AND GEOPROBE) SAMPLE LOCATIONS - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-12
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers

METHANE GAS IN SUBSURFACE SOIL - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-13
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers

N

Test Pit Sample Locations

DOE Excavation 1984 - 1986

Site Boundary

All Results in pCi/g - picoCuries per gram

Ac-228 is assumed to equal Th-232

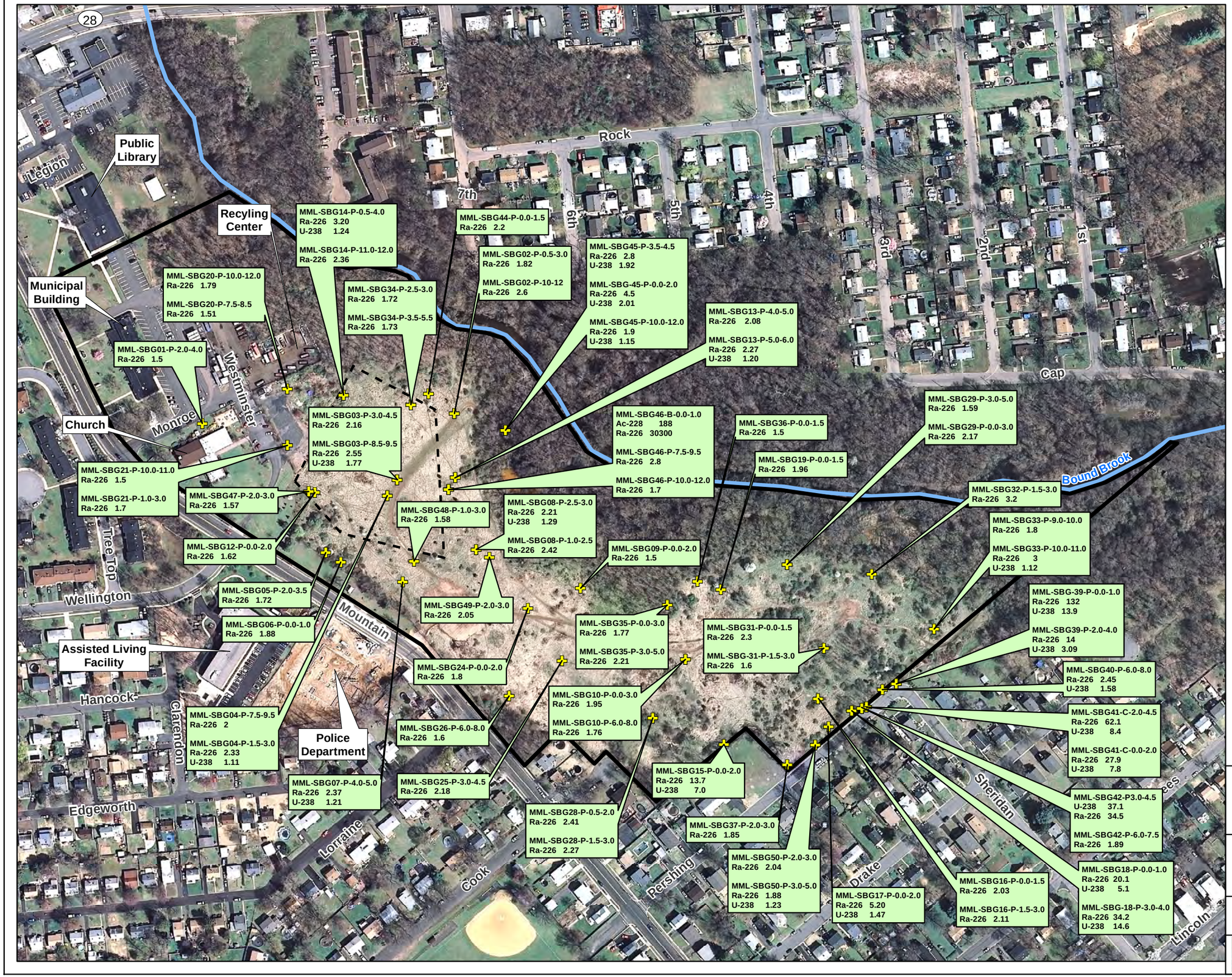
Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 110 220 440 660 Feet

TEST PIT RADIOLOGICAL RESULTS EXCEEDING ISVs - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-14
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers



N

Subsurface Soil Sample Locations

DOE Excavation 1984 - 1986

Site Boundary

All Results in pCi/g - picoCuries per gram

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 105 210 420 630 Feet

SUBSURFACE SOIL RADIOLOGICAL RESULTS EXCEEDING ISVs - 2010

SITE INVESTIGATION REPORT MIDDLESEX MUNICIPAL LANDFILL MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-15
Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201		U.S. Army Corps of Engineers

N

Subsurface Soil Samples
Uranium Results

- **< 1.11**
- **1.12 - 10.00**
- **10.10 - 50.00**
- **50.10 - 176.00**
- **DOE Excavation 1984 - 1986**
- **Site Boundary**

All results in pCi/g (picoCuries per gram)

Maximum Concentration Detected - 176.00 pCi/g

ISV for Uranium is 1.11 pCi/g

Numbers next to sample ID represents the sample depth

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 110 220 440 660 Feet

SUBSURFACE SOIL U-238 RESULTS - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-16
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers

N

Subsurface Soil Samples
Radium Results

- < 1.46
- 1.47 - 5.00
- 5.10 - 15.00
- 15.10 - 50.00
- 50.10 - 100.00
- 100.10 - 224.00
- 30,300
- DOE Excavation 1984 - 1986
- Site Boundary

All results in pCi/g (picoCuries per gram)

Maximum Concentration Detected - 30,300 pCi/g

ISV for Radium is 1.46 pCi/g

Numbers next to sample ID represents the sample depth

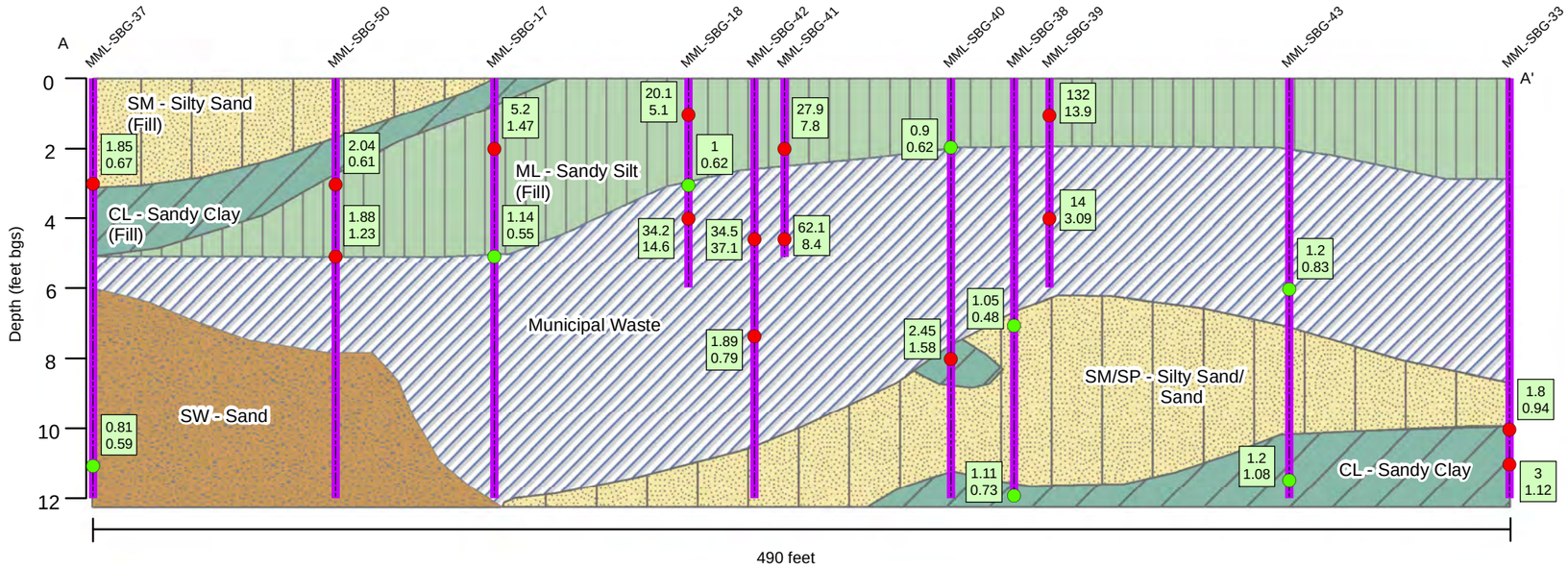
Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

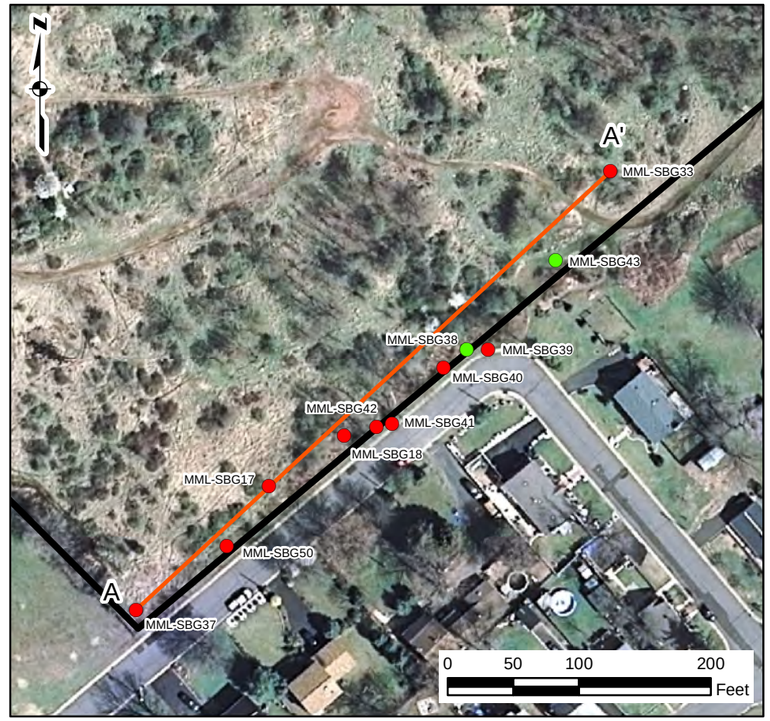
0 110 220 440 660 Feet

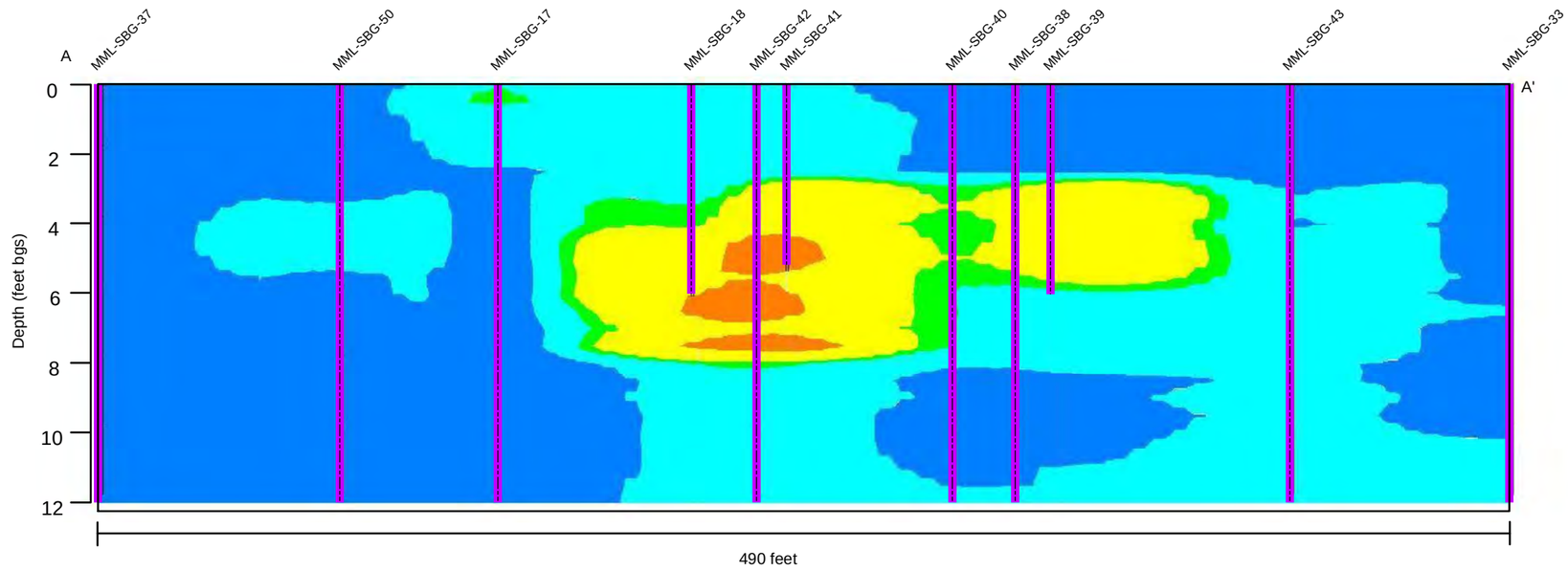
SUBSURFACE SOIL RA-226 RESULTS - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-17
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers







Downhole Gamma Results
Counts Per Minute

- 0 - 4,000
- 4,000 - 8,000
- 8,000 - 10,000
- 10,000 - 20,000
- 20,000 - 30,000
- 30,000 - 51,000

Legend

- Site Outline
- Cross Section (A - A')
- Soil Boring

Soil Sample Location

- Below ISV
- Exceeds ISV

Sample Results (pCi/g)
5.2 / 1.47 Ra-226 / U-238

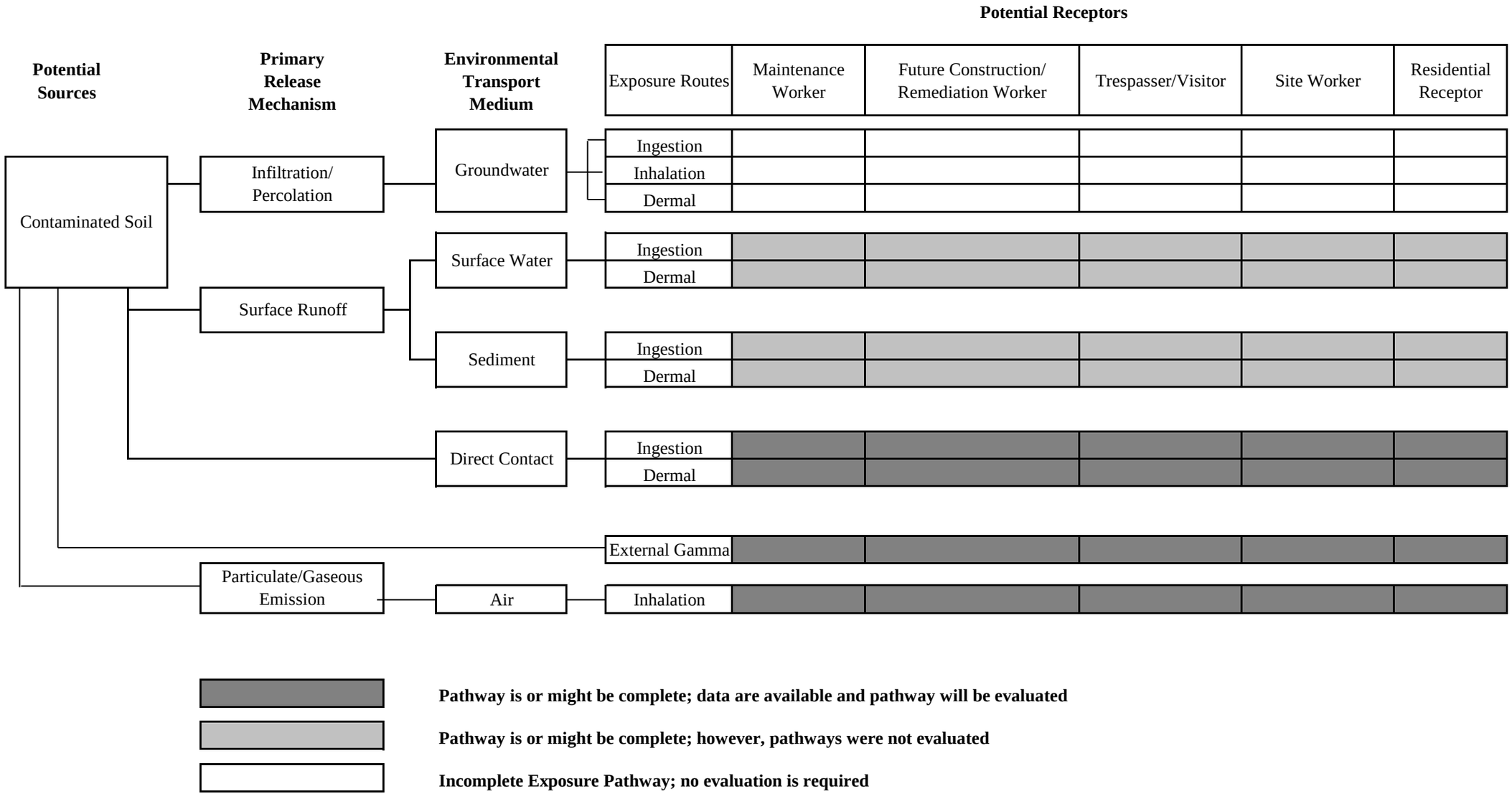
pCi/g = picocuries per gram
ISV = Investigative Screening Value

CROSS SECTION (A - A')
ALONG PERSHING AVENUE

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 5-18
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers

Figure 7-1: Middlesex Municipal Landfill Conceptual Site Model



N

Areas of Interest

DOE Excavation 1984 - 1986

Site Boundary

Aerial Source: USGS, Spring 2007
Data Collected Dec. 2009 - Jan. 2010

0 110 220 440 660 Feet

MIDDLESEX MUNICIPAL LANDFILL
AREAS OF INTEREST - 2010

SITE INVESTIGATION REPORT
MIDDLESEX MUNICIPAL LANDFILL
MIDDLESEX, NEW JERSEY

9/10	CABRERA Project No. 08-3800.08	FIGURE 8-1
	Cabrera Services 1106 N. Charles St Suite 300 Baltimore, MD 21201	U.S. Army Corps of Engineers

APPENDIX A
GAMMA SURVEY DATA
(ON CD)

1

APPENDIX B
TEST PIT LOGS

CABRERA SERVICES
RADIOLOGICAL · ENGINEERING · REMEDIATION

Project: Middlesex Municipal Landfill	**TEST PIT LOG**
Project Location: Middlesex Borough, NJ	**No.:** TP-Ø1
Project Number: 08-3800.08	

Date(s) Excavated: 1/27/10	Logged By: J. Oliver	Checked By: A. Williams
Length of Excavation: 8'	Width of Excavation: 2'	Depth of Excavation: 7.8'
Excavation Equipment: Mini Excavator	Excavation Contractor: EPI	Approx. Surface Elev.: NA
Water Observations:		Weather: Sunny Cold
Test Pit Location: 492830.6 / 635387.7 (feet)		Surface Condition: Grassy, wet

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*	TESTS
0			Sandy Clay, veryfine, brown. Organic Material. Wet, Soft.	14-16K LeLØ PIDØ
.5 (~~1~~)			Very fine Sandy Clay. Some Silt. Dense. Slightly moist. DK Brown.	14-17K. LeLØ PIDØ
1 (~~2~~)			Very fine Sand. Some Silt. Dense. Some mottling. Slightly moist. DK. Brown	15-21K LeLØ PIDØ
1.5 (~~3~~)			Very fine Sand. Some clay. DK. Brown. mottled Trace Gravel. moist. Plastic.	15-17K LeLØ PIDØ
2 (~~4~~)			Very fine Sand. Some Clay. moist. Plastic. DK Brown. mottled. Trace gravel.	14-17K LeLØ PIDØ
2.5 (~~5~~)			Very fine Sand. Some clay. Dense. Plastic mottling DK. Brown. Wet. Trace Gravel. Construction Debris	15-19K LeLØ PIDØ
3 (~~6~~)			fine Sand. Some silt. Trace Clay loose. Saturated. Medium Brown Trace fine gravel. Small amounts of trash.	15-19K LeLØ PIDØ
3.5 (~~7~~)			medium Sand. Clay lenses. DK Brown, very moist, Plastic. Heavily mottled. Some coarse gravel 1/2" Angular Construction Debris. Pulling up Trash (ie chains, legs, municipal waste)	19-26K 25132cpm LeLØ PIDØ
4 (~~8~~)			Coarse Sand. Significant amounts of Trash. moist. Loose. DK Brown. Trash is becoming more prominent	15-20K LeLØ PIDØ 10 uremon Dirt Pile 7 urem@hole.
4.5 (~~9~~)			Coarse Sand. Significant trash. moist loose DK Brown.	16-20K LeLØ PIDØ
5 (~~10~~)			Coarse Sand. Significant trash. Wet loose. DK Brown	16-19K LeLØ PIDØ
5.5 (~~11~~)			Fine Sand. Some Silt. Clay Streaks. Heavily mottled Red/Gray + lt. brown. Wet. Some fine gravel + municipal waste Prominant throughout.	16-18K LeLØ PIDØ
6 (~~12~~)			Med Sand; some silt and Clay; dark brown, wet, debris/Trash, organic odor present	14-16K LeLØ PIDØ
6.5 (~~13~~)			Med Sand, some silty clay, trash, dark brown, wet, organic odor present	~~14-16K~~ 16-17K LeLØ PIDØ
7 (~~14~~)			TD @ 7.8 ft bgs	

CABRERA SERVICES
RADIOLOGICAL - ENGINEERING - REMEDIATION

Project: Middlesex Municipal Landfill
Project Location: Middlesex Borough, NJ
Project Number: 08-3800.08

TEST PIT LOG
No.: TP-02

Date(s) Excavated: 1/29/10	Logged By: S. Owe	Checked By: A. Williams
Length of Excavation: 8 ft	Width of Excavation: 2 ft	Depth of Excavation: 8 ft bgs
Excavation Equipment: Mini Excavator	Excavation Contractor: EPI	Approx. Surface Elev.: NA
Water Observations		Weather: Cold
Test Pit Location: 492661.3 / 635251.7 (feet)		Surface Condition: Grassy

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.)	TESTS
0			Sand, fine to very fine, some silt, some OM, brown, dry	14-16 K LeI Ø PID Ø
0.5		1	↓	14-16 K LeI Ø PID Ø
1.0		2	Mostly Glass debris, Sand, fine to very fine, some silt, some large	14-16 K LeI Ø PID Ø
1.5		3	↓ angular gravel, brown, dry	14-15 K LeI Ø PID Ø
2.0		4	Sand, fine to very fine, brown, large angular gravel, debris	13-15 K LeI Ø PID Ø
2.5		5	↓ Reddish brown	14-16 K LeI Ø PID Ø
3.0		6	Sand, fine to very fine, reddish brown, loose, trace silt, moist	14-16 K LeI Ø PID Ø
3.5		7	↓	14-16 K LeI Ø PID Ø
4.0		8	↓	15-17 K LeI Ø PID Ø
4.5		9	Sand, fine to very fine, reddish brown, loose, moist, trace silt	15-17 K LeI Ø PID Ø
5.0		10	Sand, fine to very fine, reddish brown, loose, moist	15-17 K LeI Ø PID Ø
5.5		11	↓ some pea gravel, rounded	15-17 K LeI Ø PID Ø
6.0		12	↓	15-17 K LeI Ø PID Ø
6.5		13	Sand, fine to very fine, reddish brown, loose, moist, trace med rounded gravel	15-17 K LeI Ø PID Ø
7.0		14	↓	14-16 LeI Ø PID Ø
7.5			↓	14-16 K LeI Ø PID Ø
8.0				

CABRERA SERVICES
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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-03

Date(s) Excavated	1/28/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Snow, Cold
Test Pit Location	492751.7 / 635173.2 (feet)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	CPM / % / PPM TESTS
0		Clay, some sand, with coarse gravel, reddish brown, OM	21-22K Lel Ø PID Ø
0.5 1		Clay, some sand, with coarse gravel, reddish brown	23-24K Lel Ø PID Ø
1.0 2		Sandy Silt, very fine, olive green, firm	20-21K Lel Ø PID Ø
1.5 3		Sandy Gravel, medium, dark brown	20-23K Lel Ø PID Ø
2.0 4		Silty Sand, dark brown, loose,	21-22K Lel 7% PID 0.5
2.5 5			21-23K Lel 6% PID 0.2
3.0 6		debris	21-23K Lel 5% PID 0.1
3.5 7		debris	20-21K Lel 3% PID 0.3
4.0 8		Sand, some silt, fine to med, debris	20-22K Lel >10% PID 0.6
4.5 9			19-21K Lel 3% PID 0.6
5.0 10		Sandy, some silt, trace gravel, fine to medium, debris	18-19K Lel 12% PID 1.1
5.5 11		Sand, fine to very fine, some clay, brown, debris/trash	17-19K Lel 1% PID 2.1
6.0 12		Clayey sand, very fine, brown, debris	17-18K Lel 0% PID 0.7
6.5 13		Sand, medium to fine, well sorted, brown, debris	17-19K Lel 0% PID 3.3
7.0 14		Sand, medium to coarse, loose, brown, debris	18-20K Lel Ø PID 1.6
7.5		Sandy, medium to coarse, loose, brown, debris	17-19K Lel Ø PID 1.0
		TD @ 8.0 ft bgs	

CABRERA SERVICES
RADIOLOGICAL - ENGINEERING - REMEDIATION

Project: Middlesex Municipal Landfill	TEST PIT LOG
Project Location: Middlesex Borough, NJ	No.: TP-04
Project Number: 08-3800.08	

Date(s) Excavated 1/29/10	Logged By S. Owe	Checked By A. Williams
Length of Excavation 8ft	Width of Excavation 2ft	Depth of Excavation 8ft bgs
Excavation Equipment Mini Excavator	Excavation Contractor EPI	Approx. Surface Elev. NA
Water Observations		Weather Cold
Test Pit Location 492682.7 / 635206.5 (feet)		Surface Condition Grassy

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.)	TESTS
0			Silty Sand, very fine, brown, some OM, dry	17-19K LeI Ø PID Ø
0.5 1			Silty Sand, very fine, some coarse, brown, some OM, dry	16-18K LeI Ø PID Ø
1.0 2			Silty Sand very fine, some coarse, brown, dry	17-18K LeI Ø PID Ø
1.5 3			Sand, fine to medium, loose, reddish brown, dry	17-18K LeI Ø PID Ø
2.0 4			Gravelly Sand, fine to medium, large angular gravel, loose, dk brown	15-17K LeI Ø PID Ø
2.5 5			↓	15-17K LeI Ø PID Ø
3.0 6			↓	14-16K LeI Ø PID Ø
3.5 7			Gravelly Sand, fine to med, large gravel brown, loose, angular, dry	15-17K LeI Ø PID Ø
4.0 8			Sand, fine to med, loose, significant trash, dry	15-17K LeI Ø PID Ø
4.5 9			Sand, fine to medium, loose, Trash, gray brown, dry	16-18K LeI Ø PID Ø
5.0 10			↓ + Medium rounded gravel and trace coarse sand	16-18K LeI Ø PID Ø
5.5 11			Sand, fine to medium, some rounded gravel, trash, Petroleum odor, moist	17-19K LeI Ø PID 1.8
6.0 12			↓ Petroleum odor	17-19K LeI Ø PID 3.8
6.5 13			↓ Some clay	15-17K LeI Ø PID 2.5
7.0 14			Sand, fine to med, brown, trash Some clay, Petroleum odor	15-17K LeI Ø PID 0.4
7.5			↓	15-17K LeI Ø PID 0.4
8.0				

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-05

Date(s) Excavated	1/27/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8.0 ft bgs
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Sunny Cold
Test Pit Location	492885.0 / 635118.4			Surface Condition	Grassy

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	TESTS
0			Sandy Clay, very fine, soft, brown moist	18-20 K LeL 0 PID 0
0.5 / 1			dark brown	19-20 K LeL 0 PID 0
1 / 2			Sandy Clay, very fine, soft, dark brown, moist, trace organic Material	19-22 K LeL 0 PID 0
1.5 / 3			= sandy Silt layer, very fine, dense, olive color @ 1.7'	19-22 K LeL 0 PID 0
2 / 4				18-21 K LeL 0 PID 0
2.5 / 5			Sandy Clay, very fine, soft, dark brown moist, trace OM (Sandy silt layer, very fine dense, olive @ 2.7')	18-21 K LeL 0 PID 0
3 / 6			Silty Sand, med to fine, loose, moist	15-19 K LeL 0 PID 0
3.5 / 7			Silty Sand, fine to medium, well graded, gray	17-19 K LeL 1% PID 0
4 / 8				17-20 K LeL 1% PID 0
4.5 / 9			Sandy Silt, very fine, hard, dense, dry	17-19 K LeL 1% PID 0
5 / 10			and trash / debris	17-19 K LeL 1% PID 0
5.5 / 11			and trash / debris, organic odor	17-19 K LeL 9% PID 0
6 / 12			Sand, fine to coarse, well sorted, dark brown, loose, lots of debris	16-19 K LeL 3% PID 0
6.5 / 13				15-16 K LeL 3% PID 0
7 / 14			Clayey Sand, fine, OM, debris, wet	15-16 K LeL 3% PID 0
7.5			Sand, fine to med, debris, wet	15-17 K LeL 6% PID 0
8.0			TD @ 8.0 ft bgs	

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-06

Date(s) Excavated	1/27/10	Logged By	J. Oliver	Checked By	A. Williams
Length of Excavation	8'	Width of Excavation	2'	Depth of Excavation	8.0'
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Sunny, cold
Test Pit Location	492979.6 / 635233.6 (feet)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	TESTS
0		Silty Clay, med density, dark brown	19-21K LeL 0 PID 0
.5 1		Silty Clay, med density, some organic material	~~14-17K~~ 20-24K LeL 0 PID 0
1 2		Silty Clay, trace gravel, slightly moist, reddish brown	20-23K LeL 0 PID 0
1.5 3		Silty Clay, trace fine gravel, slightly moist, reddish brown	21-24K LeL 0 PID 0
2 4		Sand, fine, trace med gravel, debris/trash	20-24K LeL 0 PID 0
2.5 5		Silty Clay, mottled, heavily brittle, dark brown, trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
3 6		Silty Clay, mottled, heavily brittle, dark brown, trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
3.5 7		Silty Clay, mottled, heavily, brittle, dark brown trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
4 8		Silty Clay, mottled, heavily brittle, dark, brown, trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
4.5 9		Silty Clay, mottled, brittle, dark, brown, trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
5 10		Silty Clay, mottled, brittle, dark brown, trace large cobbles and fine gravel	19-22K LeL 6% PID 0
5.5 11		Silty Clay, heavily mottled, brittle, large amount of trash/debris, dark brown, trace large cobbles, trace gravel	19-22K LeL 5% PID 0
6 12		Sandy clay, dark brown, very soft, fine to med, well sorted	18-22K LeL 5% PID 0
6.5 13		↓	18-22K LeL 10% (drop to 8% after 15min) PID 0
7 14		Sandy clay, dark brown, organic matter, trash/debris	19-22K LeL 11% PID 0
7.5 8.0	TD@ 8.0 ft bgs ↓		19-22K LeL 8% PID 0

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RADIOLOGICAL - ENGINEERING - REMEDIATION

Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-07

Date(s) Excavated	1/29/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft bgs
Excavation Equipment	Min. Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Cold
Test Pit Location	493613.4 / 634837.5 (ft)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*	TESTS
0		Silty clay, medium density, strong brown; dry	16-20K Lel Ø PID Ø
0.5 1		Silty Clay, medium density, strong brown, dry, trace gravel	17-20K Lel Ø PID Ø
1.0 2		Silty sand, soft, loose, dry, very fine, some med Gravel and cobbles	16-21K Lel Ø PID Ø
1.5 3		Clay, fat, dense, hard, very plastic, trace medium sand, debris	17-21K Lel Ø PID Ø
2.0 4		Sand, some silt, loose, soft, moist, dark brown, significant trash	16-19K Lel Ø PID Ø
2.5 5		wet, organic odor	16-18K Lel Ø PID Ø
3.0 6		mostly trash / debris	13-17K Lel Ø PID Ø
3.5 7		mostly trash / debris	14-18K Lel Ø PID Ø
4.0 8		Sand, fine, dark brown, trash, moist	14-17K Lel Ø PID Ø
4.5 9		Sand, fine, loose, dark brown, some cobbles, angular, trace gravel, significant debris	13-16K Lel Ø PID Ø
5.0 10			13-17K Lel Ø PID Ø
5.5 11			15-19K Lel Ø PID Ø
6.0 12		Gravelly Sand, med to fine, loose, soft, gray, rounded gravels, debris	13-17K Lel Ø PID Ø
6.5 13			13-18K Lel Ø PID Ø
7.0 14		wet LEL @ 7%	14-18K Lel 7% PID Ø
7.5		LEL @ 13%	16-19K Lel 13% PID Ø
8.0		TD @ 8 ft bgs	

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-08

Date(s) Excavated	1/28/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Snow / Cold
Test Pit Location	493756.2 / 634687.6 (feet)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	TESTS
0		Silty Clay, some sand, brown, organic material	14-15K Lel Ø PID 0.2
0.5 1		Sandy Clay, fine to coarse, poorly sorted, brown, debris	14-15K Lel Ø PID 0.3
1.0 2		Sandy Gravel, some clay, fine to coarse, brown	15-16K Lel Ø PID 0.3
1.5 3		Sandy clay, fine to medium, soft, wet	17-18K Lel Ø PID Ø
2.0 4		Sandy Clay, fine to medium, med density, wet, debris, perched water	18-19K Lel Ø PID Ø
2.5 5		↓	16-18K Lel Ø PID Ø
3.0 6		Clayey Sand, fine to coarse, some gravel, brown, wet debris	16-17K Lel Ø PID Ø
3.5 7		Sand, fine to medium, some clay, brown, significant debris	16-17K Lel Ø PID Ø
4.0 8		Sand, fine to medium, loose, dry significant debris	17-18K Lel Ø PID Ø
4.5 9		↓	17-18K Lel Ø PID Ø
5.0 10		↓	17-18K Lel Ø PID Ø
5.5 11		↓	15-17K Lel Ø PID Ø
6.0 12		Sandy Clay, some gravel, dark brown, very soft, OM, debris	16-17K Lel Ø PID Ø
6.5 13		↓	15-16K Lel Ø PID Ø
7.0 14		↓	15-16K Lel Ø PID Ø
7.5		↓	15-16K lel Ø PID Ø
8.0		TD @ 8 ft bgs	

CABRERA SERVICES
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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-09

Date(s) Excavated	1/28/10	Logged By	J. Oliver	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Snow, Cold
Test Pit Location	493972.8 / 634697.1 (ft)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	TESTS
0		Clay and Silt, strong brown, fairly loose, trace med sand, significant OM, Some Cobbles	22-45K Hot spot = 48,459 cpm Lel Ø PID Ø
0.5		Silty Clay, strong brown, fairly loose, Some cobbles. Concrete piece found, elevated cpm	21-26K Concrete = 41,327 cpm Lel = Ø PID Ø
1.0		Sandy Clay, Strong brown, dry, fairly loose, coarse, poorly sorted, med plasticity, some cobbles and coarse to fine gravel	23-26K Lel Ø PID Ø
1.5		↓ and trash/debris	23-28K Lel Ø PID Ø
2.0		Sand, fine to very fine, loose, well sorted, dry, trace gravel	21-23K Lel Ø PID Ø
2.5		↓	~~18-19K~~ 21-23K Lel Ø PID Ø
3.0		↓ Some silt	21-23K Lel Ø PID Ø
3.5			18-19K Lel Ø PID Ø
4.0		↓ moist	17-19K Lel Ø PID Ø
4.5		Sand, medium to very fine, loose, dry, brown, trace gravel	20-25K Lel Ø PID Ø
5.0		Clay, fat, moist, very plastic, soft, dense, trace medium gravel, trace very fine sand	17-18K Lel Ø PID Ø
5.5		Sand, very fine, cemented, brown, dry, debris	17-18K Lel Ø PID Ø
6.0		Silty Clay, trace sand and gravel, mottled, dry, strong brown	18-19K Lel Ø PID Ø
6.5		↓ Instrument dial found ~70K cpm	18-19K (Dial 70K cpm) Lel = Ø PID = Ø
7.0			18-19K Lel Ø PID Ø
7.5			18-19K Lel Ø PID Ø
8.0			

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-10

Date(s) Excavated	1/29/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Cold
Test Pit Location	494051.3 / 634756.6 (ft)			Surface Condition	Grassy

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*	TESTS
0			Silty Sand, fine to medium, brown, OM, trace gravel, Angular	14-16 K Lel Ø PID Ø
0.5			Silty Sand, very fine, loose, brown, dry, debris	13-14 K Lel Ø PID Ø
1.0			Silty Sand, fine, ~~to med, some coarse~~, ~~some~~, debris, loose	13-14 K Lel Ø PID Ø
1.5			Silty Sand, fine to medium, some coarse, OM, debris	13-14 K Lel Ø PID Ø
2.0			↓	12-14 K Lel Ø PID Ø
2.5			Silty Sand, fine, trace large gravel, OM, dry, debris	15-16 K Lel Ø PID Ø
3.0			↓ + significant debris	14-15 K Lel Ø PID Ø
3.5			↓ + significant debris	13-15 K Lel Ø PID Ø
4.0			Sandy Clay, very fine, some pea gravel, rounded, reddish brown, soft debris, moist	13-15 K Lel Ø PID Ø
4.5			Organic debris / matter	13-14 K Lel Ø PID Ø
5.0			Sand, fine to medium, light brown organic matter and debris, wet	13-15 K Lel Ø PID Ø
5.5			Sandy Clay, very fine, reddish, brown, medium, OM / debris, moist	12-14 K Lel Ø PID Ø
6.0			↓	13-14 K Lel Ø PID Ø
6.5			↓	13-14 K Lel Ø PID Ø
7.0			Organic Material / Debris	12-14 K Lel Ø PID Ø
7.5			↓	12-14 K Lel Ø PID Ø
8.0				

CABRERA SERVICES
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Project: Middlesex Municipal Landfill **Project Location:** Middlesex, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TEST PIT 11

Date(s) Excavated 2/22/10	Logged By **John W. Oliver**	Checked By
Length of Excavation 8'	Width of Excavation 2'	Depth of Excavation 8.1'
Excavation Equipment MINI EXCAVATOR	Excavation Contractor ETI	Approx. Surface Elev. NA
Water Observations WATER TABLE AT 6'		Weather OVERCAST, WET, COLD
Test Pit Location		Surface Condition WOODED, WET

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (i.e., textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.)	TESTS
0		Sandy SILT, STRONG BROWN, ROOTS, BLOCKEY, DRY	
1		SAND, AND SILT. BROWN, SOME TRASH, MOIST	
2		MOSTLY MUNICIPAL WASTE, SILT AND SAND, BROWN, MOIST.	13-16K PID 0 LEL 0 13-16K PID 0 LEL 0
3		ALMOST ALL MUNICIPAL WASTE. VERY LITTLE SOIL. DRUM LED FOUND AT 2.5' BGS.	13-15K PID 0 LEL 0 13-15K PID 0 LEL 0 11-14K PID 0 LEL 0
4			11-13K PID 0 LEL 0
5			10-12K PID 0 LEL 0 11-13K PID 0 LEL 0
6			11-12K PID 0 LEL 0 11-12K PID 0 LEL 0
7		SILTY CLAY, DARK BROWN, SATURATED, SOME-LITTLE TRASH.	11-13K PID 0 LEL 0 11-13K PID 0 LEL 0 13-14K PID 0 LEL 0
8			
9			
10			
11			
12			
13			
14			

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** Test Pit 12

Date(s) Excavated 2/22/10	Logged By **John W. Oliver**	Checked By
Length of Excavation 8'	Width of Excavation 2'	Depth of Excavation 6'
Excavation Equipment Mini Excavator	Excavation Contractor EPI	Approx. Surface Elev. N/A
Water Observations NONE SEEN		Weather Overcast, cold
Test Pit Location		Surface Condition Grassy, wet

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION (i.e., textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.)	TESTS
0			Sand and Silt, Strong Brown, Dry	15-16K PID @ LEL 0
1			Clay and Silt, Brown, Dry Trace Trash	50-60K PID @ LEL 0
			Sandy Silt, Brown, Dry	40-50K PID @ LEL 0
2				70-90K PID @ LEL 0
				30-45K PID @ LEL 0
3				25-35K PID @ LEL 0
				25-35K PID @ LEL 0
4			Large Cobbles Present. Several Pieces of Broken up concrete. Readings on concrete range from 42K-225K. Pipe found at 5'-5.5'	30-90K PID @ LEL 0
				90-50K PID @ LEL 0
5				50-60K PID @ LEL 0
				60-70K PID @ LEL 0
6			Refusal @ 6' Due to large concrete debris and discovery of unknown pipe	70-80K PID @ LEL 0
7				
8				
9				
10				
11				
12				
13				
14				

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** No.: Test Pit 13

Date(s) Excavated 2/23/10	Logged By John W. Oliver	Checked By
Length of Excavation 8'	Width of Excavation 2'	Depth of Excavation 8'
Excavation Equipment Mini Excavator	Excavation Contractor EPI	Approx. Surface Elev. N/A
Water Observations Water Table at 4.5'		Weather Wet, cold
Test Pit Location		Surface Condition Wet/saturated

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (i.e., textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.)	TESTS
0		Sand and Silt, Brown, Moist, Trace Gravel and Cobbles	17-20K PID 0 LEL 0
1		Silt and Sand, Dark Brown, Dry, Trace Gravel and Cobbles.	16-18K PID 0 LEL 0
2		Clay with Silt, Strong Brown, Moist, Chunks of Concrete	16-18K PID 0 LEL 0
3		Mostly Municipal Waste with Concrete Chunks.	15-17K PID 0 LEL 0 14-16K PID 0 LEL 0
4		▼ ▼ ▼	14-16K PID 0 LEL 0 13-17K PID 0 LEL 0
5		Waste is saturated no discernable soil.	14-16K PID 0 LEL 0 14-16K PID 0 LEL 0
6			14-16K PID 0 LEL 0 14-16K PID 0 LEL 0
7			14-16K PID 0 LEL 0 13-15K PID 0 LEL 0
8			13-15K PID 0 LEL 0
9			
10			
11			
12			
13			
14			

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TEST PIT 14

Date(s) Excavated 2/23/10	Logged By **John W. Oliver**	Checked By
Length of Excavation 8' → 10'	Width of Excavation 2' → 4'	Depth of Excavation 7'
Excavation Equipment MINI EXCAVATOR	Excavation Contractor EPI	Approx. Surface Elev. N/A
Water Observations		Weather WET, COLD
Test Pit Location		Surface Condition SATURATED, GRASSY

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (i.e., textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.)	TESTS
0		SANDY SILT, BROWN, MOIST, TRACE COBBLES	14-16K PID 0 LEL 0
1		SILTY CLAY, STRONG BROWN, DRY	16-19K PID 0 LEL 0 18-21K PID 0 LEL 0
2		CLAY AND SILT, STRONG BROWN, MOIST	16-19K PID 0 LEL 0 16-18K PID 0 LEL 0
3		SANDY SILT, DARK BROWN, MOIST, SOME MUNICIPAL WASTE	17-19K PID 0 LEL 0 19-22K PID 0 LEL 0
4			20-28K PID 0 LEL 0 21-30K PID 0 LEL 0
5		MUNICIPAL WASTE, TRACE CONCRETE BLOCKS	20-25K PID 0 LEL 0 30-35K PID 0 LEL 0
6			30-35K PID 0 LEL 0 30-35K PID 0 LEL 0
7		LIMIT OF EXCAVATION DUE TO TRENCH INSTABILITY.	30-35K PID 0 LEL 0
8			
9		TRENCH WIDENED TO LOCATE HOT SPOT.	
10			
11			
12			
13			
14			

APPENDIX C
SOIL BORING LOGS

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Soil Boring Log

Boring No: GP-01

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/24/2010 - 1515 | Page 1 of 1

Date / Time End 2/24/2010 - 1615

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Saturated.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML				0.0		SILTY CLAY, Brown, Wet.
1								
1.5		SM			100%	0.0		SANDY SILT, Brown, Dry
2								
2.5		SP		MML-SBG01-P-2.0-4.0		0.0		Poorly Sorted SAND, Dark Brown, Dry
3								
3.5						0.0		
4		SW				0.0		Well Graded SAND, Brown, Dry.
4.5					100%			
5								
5.5						0.0		
6								
6.5		SM				0.0		SILTY SAND, Light Brown, Dry.
7								
7.5		CH				0.0		Fat CLAY, Strong Brown, Dry.
8		ML			100%	0.0		SANDY SILT, Light Brown, Dry.
8.5								
9								
9.5		SM				0.0		SILTY SAND, Brown, Dry.
10		SP		MML-SBG01-P-10.0-12.0	100%	0.0		Poorly Graded SAND, Brown, Dry.
10.5								
11						0.0		
11.5								
12								

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Soil Boring Log

Boring No: GP-02

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/3/2010 -1505 | Page 1 of 1

Date / Time End 2/3/2010 - 1650

Water Depth/Time 10.0' - 1517 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML				0.0		SANDY SILT, Soft, Slightly dense, Dark Brouwn, Wet, mostly silt, little medium to coarse sand.
1		GM		ML-SBG02-P-0.5-3.0	40%			SILTY GRAVEL, Soft, Loose, Brown, Dry, Some Medium Angular Gravel, Little Silt, Trace Clay
1.5		ML				0.0		SILT WITH SAND, Soft, Loose, Brown, Dry, Mostly Silt, Some Sand, Trace Medium Angular Gravel.
2								Poorly graded SAND, Soft, Slightly Dense, Very Dark Brown, Dry, Mostly Fine Sand, Trace Silt.
2.5								

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Soil Boring Log

Boring No: GP-03

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/4/2010 - 1510 | Page 1 of 1

Date / Time End 2/4/2010 - 1600

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML				0.0		SILTY CLAY, Stiff, Very Dense, Strong Brown, Dry, Some Silt, Little Clay. Soil is Laminated and has occasional pieces of gravel.
1		ML			100%	0.0		SANDY SILT, Hard, Dense, Strong Brown, Dry, Some Sand, Few Silt, Trace Medium Gravel
1.5								
2								
2.5		CL-ML				0.0		SILTY CLAY, Hard, Dense, Dark Brown, Dry Mostly Silt, Some Clay. Lenses of construction lumber with occasional pieces of glass fragments.
3								
3.5		CL		MML-SBG03-P-3.0-4.5		0.0		LEAN CLAY, Stiff, Very Dense, Dark Brown, Dry, Mostly Clay, Few Silt. Blockey.
4								
4.5					100%	0.0		
5		CL-ML				0.0		SILTY CLAY, Stiff, Very Dens, Dark Brown, Dry, Some Silt, Little Clay. Increasing trash content down core.
5.5								
6								
6.5						0.0		
7								
7.5					100%	0.0		
8				MML-SBG03-P-8.5-9.5				
8.5						0.0		
9								
9.5						0.0		SILTY CLAY with SAND, Soft, Slightly Dense, Brown, Moist, Mostly Silt, Little Clay, Trace Coarse Sand. Increasing trash down core with little logable soil.
10		CL-ML						
10.5					90%	0.0		
11								
						0.0		

11.5 12		SW						Well Sorted SAND, Soft, Loose, Very Dark Brown, Moist, Mostly Coarse Sand, Trace Silt.

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Soil Boring Log

Boring No: GP-04

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/4/2010 - 1346 | Page 1 of 1

Date / Time End 2/4/2010 - 1620

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0.5		CL-ML		MML-SBG04-P-1.5-3.0	100%	0.0		SILTY CLAY, Hard, Dense, Strong rown, Dry, Mostly Silt, Little Clay, Trace Medium Angular Gravel.
1						0.0		
1.5								
2						0.0		SILT WITH SAND, Hard, Dense, Strong Brown, Dry , Mostly Silt, Some Fine Sand. Occasional Medium to Fine Angular Gravel intrusions throughout core.
2.5								
3						0.0		
3.5		ML						
4						0.0		
4.5								
5						0.0		
5.5								
6						0.0		SILTY SAND, Hard, Dense, Dark Brown, Dry, Mostly Very Fine Sand, Some Silt, Trace Medium to Fine Angular Gravel.
6.5								
7						0.0		
7.5		SM		MML-SBG04-P-7.5-9.5	60%			
8								
8.5								
9								
9.5								
10						0.0		CLAY WITH SILT, Soft, Slightly Dense, Dark Brown, Moist, Some Clay, Little Silt, Trace Coarse Sand. Section of core appears to be mottled.
10.5		CH			50%			
11								
11.5								
12								

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Soil Boring Log

Boring No: GP-05

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/4/2010 - 0750 | Page 1 of 1

Date / Time End 2/4/2010 - 0910

Water Depth/Time 5.0' - 0800 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0						0.0		Frozen Soil
0.5		CL-ML						SILTY CLAY, Stiff, Dense, Strong Brown, Dry, Mostly Silt, Little Clay
1								
1.5		SM		MML-SBG05-P-2.0-3.0	80%	0.0		SILTY SAND, Hard, Dense, Gray, Dry, Mostly Sand, Some Silt, Trace Medium Angular Gravel. Color changes down core to Dark Brown.
2						0.0		
2.5								
3								
3.5		SP				0.0		Poorly Sorted SAND with GRAVEL, Slightly Dense, Strong Brown, Moist, Mostly Medium to Fine Sand, Little Fine Angular Gravel.
4						0.0		
4.5								
5						0.0		Well Sorted Sand, Soft, Slightly Dense, Strong Brown, Wet, Mostly Medium Sand. Soil is streaked with trace Fine Angular Gravel down core.
5.5								
6						0.0		
6.5								
7						0.0		
7.5					80%			
8						0.0		
8.5		SW						
9						0.0		
9.5								
10						0.0		
10.5								
11				3G05-P-10.0-12.0	100%	0.0		


11.5
12
MML-SE

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Soil Boring Log

Boring No: GP-06

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/4/2010 - 0813 | Page 1 of 1

Date / Time End 2/4/2010 - 1010

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0				MML-SBG06-P-0.0-1.0		0.0		Frozen
0.5		CL-ML						SILTY CLAY, Hard, Dense, Strong Brown, Dry, Some Clay, Few Silt, Trace Coarse Sand. Blockey with some Mottling
1						0.0		
1.5		ML						GRAVELLY SILT with SAND, Stiff, Slightly Dense, Strong Brown, Dry, Mostly Fine to Medium Angular Gravel, Little Silt, Few Medium to Fine Sand.
2						0.0		
2.5					90%			Poorly Graded SAND with SILT, Hard, Dense, Light Brown, Dry, Mostly Fine to Very Fine Sand, Little Silt.
3						0.0		
3.5		SP-SM						
4						0.0		
4.5								
5						0.0		
5.5		CL-ML						SILTY CLAY, Hard, dense, Strong Brown, Dry, Mostly Silt, Some Clay.
6						0.0		
6.5								
7				MML-SBG06-P-7.0-8.5		0.0		Well Sorted SAND with SILT, Hard, Very Dense, Strong Brown, Dry, Mostly Very Fine Sand, Some Silt. Compacted and Homogenous.
7.5		SW-SM			70%			
8						0.0		
8.5								
9								Poorly Sorted SAND, Soft, Loose, Gray, Moist, Mostly Coarse to Medium Sand. Homogenous.
9.5								
10		SP				0.0		
10.5								
11					100%			
11.5						0.0		
12								

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Soil Boring Log

Boring No: GP-07

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/5/2010 - 0958 | Page 1 of 1

Date / Time End 2/5/2010 - 1200

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		GP				0.0		Poorly Graded GRAVEL with SAND, Stiff, Brown, Dry, Mostly Coarse to Meadium Angular Gravel, Little Medium Sand.
1		ML						SILT with SAND, Stiff, Medium Dense, Strong Brown, Dry, Mostly Silt, Little Medium Sand
1.5		GW				0.0		Well graded GRAVEL, Loose, Gray to White, Dry, Mostly Coarse to Medium Angular Gravel.
2		CL-ML			100%			SILTY CLAY, Hard, Dense, Brown, Dry, Mostly Silt, Some Clay. Soil appears Blockey.
2.5						0.0		
3		MH				0.0		Elastic SILT, Stiff, Dense, Strong Brown, Moist, Some Silt, Little Clay, Trace Medium Sand.
3.5								
4				MML-SBG07-P-4.0-5.0		0.0		
4.5		GP-GM			100%			Poorly Sorted GRAVEL with SILT, Stiff, Very Dense, Brown, Dry, Mostly Medium to Fine Coarse Gravel, Little Silt.
5		SM				0.0		SILTY SAND, Soft, Slightly Dense, Dark Brown, Moist, Mostly Silt, Some Medium to Fine Sand. Some Mottling throughout.
5.5								
6						0.0		
6.5								Municipal Waste including plastic and glass fragments.
7								
7.5		SW		MML-SBG07-P-7.0-8.5	80%	0.0		Well Sorted SAND, Soft, Loose, Light Brown, Dry, Mostly Fine to Very Fine Sand, Traces of Silt.
8								
8.5						0.0		
9								
9.5					15%	0.0		
10								**REFUSAL**
10.5								
11								
11.5								
12								

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Soil Boring Log

Boring No: GP-08

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/5/2010 - 0753 | Page 1 of 1

Date / Time End 2/5/2010 - 0940

Water Depth/Time 2.5' - 0810 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML			100%	0.0		SILTY CLAY, Stiff, Dense, Strong Brown, Dry, Some Silt, Some clay, Trace Medium to Fine Angular Gravel. Some Mottling Present.
1				MML-SBG08-P-1.5-2.5		0.0		SILTY SAND, Soft, Slightly Dense, Brown, Moist, some Coarse to Medium Sand, Little Clay, Trace Fine Angular Gravel.
1.5		SM						
2						0.0		
2.5				MML-SBG08-P-2.5-3.0				GRAVELLY SILT, Stiff, Slightly Dense, Brown, Wet, Mostly Medium Angular Gravel, Some Silt, Trace Fine Sand.
3		ML			80%	0.0		
3.5								
4						0.0		SILTY CLAY, Hard, Dense, Brown, Moist to Dry, Mostly Silt, Little Clay, Trace Coarse Sand.
4.5		CL-ML						
5						0.0		SILTY SAND, Soft, Slightly Dense, Brown, Dry, Mostly Medium to Fine Sand, Little Silt. Municipal waste is disbursed throughout.
5.5		SM						
6					0%			RECOVERY PREVENTED BY MUNICIPAL WASTE
6.5								
7								
7.5								
8								
8.5								
9					80%	0.0		SILTY SAND, Soft, Slightly Dense, Brown, Moist, Some Medium to Fine Sand, Some Silt, Trace Clay. Core is Mottled.
9.5								Poorly Graded SAND with GRAVEL, Stiff, Brown, Dry, Mostly Sand, Some Medium to Fine Angular Gravel.
10						0.0		SILTY CLAY, Hard, Dense, Brown, Dry, Some Silt, Little Clay, Trace Very Fine Sand.
10.5								
11						0.0		
11.5								
12								

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Soil Boring Log

Boring No: GP-09

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/15/2010 - 1125 | Page 1 of 1

Date / Time End 2/15/2010 - 1325

Water Depth/Time 6.0' - 1140 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet, Snowy

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0						0.0		Frozen Soil
0.5		CL-ML		MML-SBG09-P-0.0-2.0				SILTY CLAY, Hard, Dense, Moist, Brown, Some Clay, Some Silt, Trace fine Angular Gravel.
1		GP-GM				0.0		Poorly Graded GRAVEL with SILT, Loose, Very Light Gray, Dry, Mostly Coarse to Fine Angular Gravel, Few Silt.
1.5					100%			
2		ML						GRAVELLY SILT, Stiff, Loose, Strong Brown, Dry, mostly Silt, Some Medium to Fine Angular Gravel.
2.5						0.0		
3		CL-ML						Municipal Waste including coal slag. SILTY CLAY, Stiff, Very Dense, Brown, Dry, Mostly Clay, some Silt.
3.5						0.0		Municipal Waste
4								
4.5					70%	0.0		
5								
5.5		SM				0.0		SILTY SAND, Stiff, Hard, Moist, Mostly Fine Sand, Little Silt, Trace Fine Angular Gravel.
6								
6.5						0.0		SILTY SAND, Stiff, Hard, Strong Brown, Wet, Mostly Fine Sand, Little Silt. Municipal waste mixed in with soil.
7								
7.5		SM			30%			
8								
8.5								
9								
9.5		SW		MML-SBG09-P-10.0-11.0	30%	0.0		Well Graded SAND, Soft, Loose, Brown, Moist, Mostly Fine Sand, Few Silt.
10								
10.5								
11								
11.5								
12								

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Soil Boring Log

Boring No: GP-10

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/15/2010 - 1440 | Page 1 of 1

Date / Time End 2/15/2010 - 1539

Water Depth/Time 6.0' - 1500 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet, Snowy

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG10-P-0.0-3.0		0.0		SILT with SAND, Hard, Very Dense, Brown, Moist, Some Silt, Some Fine to Very Fine Sand.
1								
1.5		SM			100%	0.0		SILTY SAND, Very Stiff, Dense, Strong Brown, Dry, Mostly Medium to Fine Sand, Some Silt.
2								
2.5						0.0		Municipal Waste
3								
3.5		CL-ML			20%	0.0		Silty Clay, Stiff, Dense, Gleyed, Dry, Some Clay, Little Silt. Municipal waste is interbedded with soil.
4								
4.5								
5								
5.5								
6								
6.5		SP		MML-SBG10-P-6.0-8.0		0.0		Poorly Graded SAND with GRAVEL, Loose, Brown, Saturated, Mostly Coarse Sand, Some Coarse Rounded Gravel.
7								
7.5		ML			70%	0.0		SANDY SILT, Hard, Dense, Strong Brown, Dry, Mostly Silt, Some Very Fine Sand.
8								
8.5						0.0		
9								
9.5		SM			30%	0.0		SILTY SAND, Soft, Loose, Light Brown, Saturated, Some Coarse to Medium Sand, Some Silt.
10								
10.5								
11								
11.5								
12								

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Soil Boring Log

Boring No: GP-11

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/15/2010 - 1546 | Page 1 of 1

Date / Time End 2/15/2010 - 1640

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet, Snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0.5		CL-ML				0.0		SILTY CLAY, Hard, Dense, Brown, Moist, Some Clay, Little Silt.
1		ML						SILTY SAND, Stiff, Slightly Dense, Brown, Moist, Some Very Fine Sand, Little Silt, Trace Clay.
1.5		MH		MML-SBG11-P-1.0-2.5	100%	0.0		Elastic SILT, Stiff, Medium Dense, Strong Brown, Dry, Mostly Silt, Little Clay. Lenses of Coarse Angular Gravel Present throughout.
2						0.0		Municipal Waste
2.5								
3						0.0		
3.5								
4		SW				0.0		Well Graded SAND, Stiff, Dense, Brown, Moist, Mostly Very Fine Sand, Trace Silt. Some Municipal Waste present.
4.5					80%			
5						0.0		
5.5								
6								
6.5		SM				0.0		SILTY SAND, Hard, Very Dense, Light Brown, Moist, Some Fine to Very Fine Sand, Some Silt.
7				MML-SBG11-P-7.0-8.5	100%	0.0		
7.5								
8						0.0		
8.5								
9						0.0		
9.5					30%			
10								
10.5								REFUSAL due to impenetrable object.
11								
11.5								
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-12

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/15/2010 - 0940 | Page 1 of 1

Date / Time End 2/15/2010 - 1054

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet, Snow

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG12-P-0.0-2.0	60%	0.0		SANDY SILT, Soft, Loose, Dark Brown, Moist, Mostly Silt, Some Medium to Fine Sand.
1						0.0		SILTY SAND, Soft, Slightly Dense, Light Brown, Dry, Mostly Fine Sand, Some Silt.
1.5								
2								
2.5								
3		SM		MML-SBG12-P-3.0-4.0	100%	0.0		
3.5								
4						0.0		
4.5								
5						0.0		Poorly Graded SAND, Soft, Slightly Dense, Brown, Moist, Mostly Coarse to Medium Sand, Trace Silt, occasional Fine Angular Gravel Present. Mottled.
5.5								
6						0.0		
6.5		SP			100%			
7						0.0		
7.5								
8						0.0		
8.5								
9		ML				0.0		SILT with SAND, Stiff, Medium Dense, Strong Brown, Dry, Some Silt, Some Fine Sand.
9.5								
10		SP			100%	0.0		Poorly Graded SAND, Soft, Slightly Dense, Brown, Dry, Mostly Coarse to Fine Sand, Trace Fine Angular Gravel.
10.5								
11						0.0		
11.5								
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-13

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/5/2010 | Page 1 of 1

Date / Time End 2/5/2010

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0						0.0		Frozen
0.5		SM						SILTY SAND, Stiff, Dense, Strong Brown, Dry, Some Fine Sand, Some Silt, Trace Fine Angular Gravel.
1						0.0		
1.5					100%			
2		CL-ML				0.0		SILTY CLAY WITH SAND, Hard, Dense, Brown, Dry, Some Clay, Little Silt, Few Coarse to Medium Sand.
2.5								
3						0.0		
3.5		CH		MML-SBG13-P-4.0-5.0				Fat Clay, Stiff, Very Dense, Strong Brown, Dry, Mostly Clay, Few Silt, Trace Fine Gravel. Laminated.
4						0.0		
4.5					100%			
5								
5.5				MML-SBG13-P-5.0-6.0		0.0		
6		CL-ML						SILTY CLAY, Stiff, Very Dense, Strong Brown, Dry, Some clay, Little Silt, Trace Fine Angular Gravel.
6.5						0.0		
7								
7.5					100%			
8		SM				0.0		SILTY SAND, Stiff, Dense, Strong Brown, Dry, Mostly Very Fine Sand, Some Silt, Trace Clay. Chunks fo wood present in core.
8.5								
9						0.0		
9.5								
10		CL-ML				0.0		SILTY CLAY, Very Stiff, Dense, Strong Brown, Dry, Some Silt, some Clay, Trace Medium Sand. Lenses of Medium Angular Gravel present.
10.5					100%			
11						0.0		
11.5								
12								

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Soil Boring Log

Boring No: GP-14

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/4/2010 - 0950 | Page 1 of 1

Date / Time End 2/4/2010 - 1320

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0						0.0		Wood fragments mixed with glass
0.5		CH						FAT CLAY, Hard, Very Dense, Strong Brown, Dry, Mostly Clay. Soil is lensed with areas of decreasing density.
1						0.0		
1.5		GP-GC		MML-SBG14-P-0.5-4.0				Poorly Graded GRAVEL with CLAY, Hard, Dense, Strong Brown, Dry, Some Gravel, Little Clay, Few Silt.
2						0.0		
2.5		SP			75%			Poorly Graded SAND, Loose, Soft, Dark Brown, Dry. Municipal waste predominant. Includes paper and glass mixed with some soil.
3						0.0		
3.5		SP						Poorly Graded SAND with GRAVEL, Stiff, Medium Dense, Brown, Dry to Moist, Some Coarse to Medium Sand, Little Fine Angular Gravel, Trace Silt.
4						0.0		
4.5								
5								
5.5						0.0		Municipal Waste. Appears to be Coal Slag, and other debris.
6								
6.5		SW				0.0		Well-Graded SAND, Stiff, Dense, Dark Brown, Dry, Mostly Medium Sand, Trace Fine Angular Gravel.
7								
7.5					65%	0.0		
8		ML						SILT with SAND, Stiff, Very Dense, Brown, Dry, Mostly Silt, Some Fine Sand, Trace Fine Angular Gravel down core.
8.5						0.0		
9								
9.5						0.0		
10								
10.5				MML-SBG14-P-11.0-12.0		0.0		
11					100%			
11.5						0.0		
12								

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Soil Boring Log

Boring No: GP-15

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/3/2010 - 1005 | Page 1 of 1

Date / Time End 2/3/2010 - 1640

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Dry.

Company: EPI | Diameter:

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		MH		MML-SBG15-P-0.0-2.0		0.0		Elastic SILT, Stiff, Dense, Brown, Moist, Some Silt, Some Clay, Trace Very Fine Sand.
1						0.0		
1.5		SW						Well Graded SAND, Soft, Loose, Dry, Mostly Medium Sand, Trace Fine Angular Gravel Lensed in soil layer.
2								
2.5				MML-SBG15-P-2.0-3.0	60%	0.0		
3		CL-ML						Silty Clay, Stiff, Medium Dense, Brown, Moist, Some Clay, Little Silt, Trace Fine Angular Gravel.
3.5						0.0		
4		ML						GRAVELY SILT, Soft, Loose, Dark Brown, Dry, Mostly Silt, Some Fine Angular Gravel.
4.5								
5								
5.5						0.0		Construction debris take up most of the recovery. Includes plywood, lumber, aggregate, etc.
6								
6.5						0.0		
7		CL			40%			Lean CLAY, Hard, Dense, Strong Brown, Moist, Mostly Clay, Trace Fine Angular Gravel. Structure appears to be blockey.
7.5								
8								
8.5								
9								
9.5								
10								**REFUSAL Due to Elevated Methane**
10.5								
11								
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-16

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/17/2010 - 1415 | Page 1 of 1

Date / Time End 2/17/2010 - 1458

Water Depth/Time 6' - 1435 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Saturated

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG16-P-0.0-1.5	100%	0.0		SANDY SILT, Stiff, Medium Dense, Brown, Dry, Mostly Silt, Little Medium to Fine Sand. Mottled.
1								
1.5		GP		MML-SBG16-P-1.5-3.0		0.0		Poorly Graded GRAVEL Loose, Gray, Dry, Mostly, Medium to Fine Angular Gravel, Few Coarse Sand.
2								
2.5		SM				0.0		SILTY SAND, Stiff, Dense, Brown, Dry, Mostly Fine Sand, Little Silt, Trace Medium Angular Gravel. Lenses of Municipal Waste including wood plastic etc in core.
3								
3.5								
4		SP-SM			50%	0.0		Poorly Graded SAND with SILT, Stiff, Medium Dense, Dark Brown, Dry, Some Fine to Very Fine Sand, Some Silt.
4.5								
5								
5.5								
6						0.0		Municipal Waste, Saturated.
6.5								
7						0.0		Well Sorted SAND, Soft, Loose, Strong Brown, Sturated, Mostly Medium Sand, Trace Silt.
7.5		SW			50%			
8								
8.5								
9						0.0		Municipal Waste, Organic Matter, Wood, Construction Debris.
9.5								
10						0.0		
10.5					30%			
11								
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-17

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/3/2010 - 1100 | Page 1 of 1

Date / Time End 2/3/2010 - 1455

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Relatively Dry

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML		MML-SBG17-P-0.0-2.0		0.0		Silty Clay, Soft, Medium Dense, Brown, Wetm, Some Clay Little Silt, Trace Fine Sand.
1								
1.5		ML				0.0		SANDY SILT, Soft, Medium Dense, Strong Brown, Dry, Mostly Silt, Some Coarse to Fine Sand.
2								
2.5		ML			70%	0.0		Gravely Silt, Soft, loose, Strong Brown, Dry, Some Silt, Some Coarse Angular Gravel, Trace Clay
3								
3.5		SP		MML-SBG17-P-3.0-5.0		0.0		Poorly graded SAND, Stiff, Medium Dense, Dark Brown, Dry, Mostly Fine Sand, Trace Clay. Some Mottling.
4								
4.5		CL-ML				0.0		SILTY CLAY, Stiff, Dense, Dark Brown, Dry, Some Clay, Some Silt, Trace Coarse Sand. Mottled.
5								
5.5		SM				0.0		SILTY SAND, Soft, Loose, Very Dark Brown, Dry, Some Coarse Sand, Some Silt, Trace Fine Angular Gravel. Municipal Waste is present.
6								
6.5		MH			40%	0.0		Fat CLAY, Soft, Medium Dense, Strong Brown, Dry, Mostly Clay, Trace Silt, Trace Fine Angular Gravel. Soil stratified with lenses of municipal waste.
7								
7.5						0.0		
8								
8.5						0.0		
9								
9.5						0.0		
10								
10.5		SM			50%	0.0		Silty Sand, Soft, Slightly Dense, Brown, Moist to Wet, Mostly Sand, Little Silt, Trace Clay. Mottled, Municipal waste present.
11								
11.5						0.0		
12								

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Soil Boring Log

Boring No: GP-18

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/17/2010 - 1525 | Page 1 of 1

Date / Time End 2/17/2010 - 1630

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Snow, Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG18-C-0.0-1.0		0.0		SANDY SILT, Brown, Dry
1						0.0		
1.5								
2		SP-SM				0.0		Poorly Graded SAND with SILT, Strong Brown, Dry.
2.5								
3				MML-SBG18-C-3.0-4.0		0.0		Elastic SILT with SAND, Brown, Dry
3.5								
4		MH				0.0		
4.5								
5		CH				0.0		Fat CLAY, Reddish Brown, Dry.
5.5								
6		SW						Well Graded SAND, Light Brown, Dry.
						0.0		REFUSAL
6.5								
7						0.0		
7.5								
8						0.0		
8.5								
9						0.0		
9.5								
10						0.0		
10.5								
11						0.0		
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-19

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/16/2010 - 0930 | Page 1 of 1

Date / Time End 2/16/2010 - 1035

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet, Snowey

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0.5		CL-ML		MML-SBG19-P-0.0-1.5		0.0		SILTY CLAY, Reddish Brown, Stiff, Very Dense, Dry
1								
1.5		ML		MML-SBG19-P-1.5-3.0	100%	0.0		SANDY SILT, Stiff, Slightly Dense, Strong Brown, Moist.
2								
2.5		SP-SM				0.0		Poorly Graded SAND with SILT, Soft, Loose, Brown, Dry
3								
3.5		SP				0.0		Poorly Graded SAND, Soft, Loose, Saturated. Mixed with Municipal Waste
4								
4.5					40%	0.0		
5		SM						SILTY SAND, Stiff, Medium Dense, Dark Brown, Dry.
5.5						0.0		
6								
6.5						0.0		Municipal Waste
7								
7.5					10%	0.0		
8								
8.5						0.0		
9								
9.5						0.0		
10								
10.5					10%	0.0		
11								
11.5						0.0		
12								

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Soil Boring Log

Boring No: GP-20

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/25/2010 - 0745 | Page 1 of 1

Date / Time End 2/25/2010 - 0830

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Ground is Saturated.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5						0.0		Poorly Graded SAND, Brown, Dry.
1						0.0		
1.5		SP			100%			
2						0.0		
2.5								
3						0.0		SILTY SAND, Brown, Dry.
3.5								
4						0.0		
4.5		SM			60%			
5						0.0		
5.5								
6						0.0		SANDY SILT, Light Brown, Dry.
6.5								
7		ML				0.0		
7.5				MML-SBG20-P-7.5-8.5	100%			Well Graded SAND, Strong Brown, Dry.
8								
8.5		SW				0.0		
9								
9.5						0.0		SILTY SAND, Brown, Dry.
10		SM						
10.5				MML-SBG20-P-10.0-12.0	80%	0.0		SILTY CLAY, Redish Brown, Dry.
11								
11.5		CL-ML				0.0		
12								

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Soil Boring Log

Boring No: GP-21

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/25/2010 - 0715 | Page 1 of 1

Date / Time End 2/25/2010 - 0800

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG21-P-1.0-3.0	100%	0.0		SANDY SILT, Brown, Wet.
1						0.0		
1.5		CL						SANDY Lean CLAY, Brown, Wet
2						0.0		
2.5		CH						Fat CLAY, Brown, Dry
3								
3.5								
4					0%			
4.5								
5								
5.5								
6								
6.5		CH				0.0		Fat CLAY, Very Light Brown, Dry
7								Municipal Waste
7.5					100%	0.0		
8		ML						SANDY SILT, Light Brown, Wet
8.5						0.0		
9		SP						Poorly Graded SAND, Brown, Dry.
9.5								
10				MML-SBG21-P-10.0-11.0				
10.5		SM			60%			SILTY SAND, Dark Brown, Moist.
11								
11.5								Municipal Waste.
12								

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Soil Boring Log

Boring No: GP-22

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/24/2010 - 1605 | Page 1 of 1

Date / Time End 2/24/2010 - 1703

Water Depth/Time 2.0' - 1615 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet, Snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		SM			100%	0.0		SILTY SAND, Dark Brown, Moist.
1						0.0		
1.5								
2		ML				0.0		SANDY SILT, Light Brown, Wet.
2.5								
3		SP			100%	0.0		Well Graded SAND, Light Brown, Dry.
3.5								
4						0.0		
4.5								
5		SP-SM				0.0		SILT with SAND, Light Brown, Dry.
5.5								
6		SP			100%	0.0		Poorly Sorted SAND, Light Brown, Dry.
6.5								
7						0.0		
7.5								
8				MML-SBG22-P-8.0-10.0		0.0		
8.5								
9		SM			100%	0.0		SILTY SAND, Strong Brown, Dry.
9.5								
10				MML-SBG22-P-10.0-12.0		0.0		
10.5								
11						0.0		
11.5								
12								

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Soil Boring Log

Boring No: GP-23

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/22/2010 - 0905 | Page 1 of 1

Date / Time End 2/22/2010 - 1015

Water Depth/Time 4.0' - 0915 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet. Snow

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML			100%	0.0		SANDY SILT, Stiff, Dense, Strong Brown, Dry
1						0.0		
1.5								
2		CL-ML		MML-SBG23-P-2.0-4.0		0.0		SILTY CLAY, Stiff, Very Dense, Reddish Brown, Dry
2.5								
3		ML				0.0		SANDY SILT, Soft, Slightly Dense, Light Brown, Wet
3.5								
4		SM		MML-SBG23-P-4.0-6.0	100%	0.0		SILTY SAND, Stiff, Dense, Brown, Wet
4.5								
5		SP-SM				0.0		Poorly Graded SAND with SILT, Stiff, Medium Dense, Wet.
5.5								Municipal Waste including construction lumber.
6						0.0		SANDY SILT, Stiff, Slightly Dense, Brown, Dry
6.5								
7		SM			60%	0.0		
7.5								
8								
8.5								
9						0.0		
9.5		SP-SM						Poorly Graded SAND with SILT, Stiff, Dense, Strong Brown, Dry
10						0.0		
10.5					100%			Municipal Waste
11						0.0		
11.5		SW						Well Graded SAND, Loose, Soft, Gray, Moist.
12								

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Soil Boring Log

Boring No: GP-24

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/22/2010 - 0735 | Page 1 of 1

Date / Time End 2/22/2010 - 0915

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet, Snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML		MML-SBG24-P-0.0-2.0		0.0		SILTY CLAY, Brown, Moist
1		ML				0.0		SANDY SILT, Dark Gray, Dry
1.5		SP-SM						Poorly Graded SAND with SILT, Strong Brown, Dry
2				MML-SBG24-P-2.0-4.0	80%	0.0		
2.5		GW						Well Graded GRAVEL, Light Gray, Dry
3						0.0		Well Graded SAND, Dark Brown, Dry
3.5								
4		SW						
4.5								
5						0.0		Municipal Waste dominates core.
5.5								
6								
6.5								
7								
7.5					10%			
8								
8.5								
9								
9.5								
10								
10.5		CH				0.0		FAT CLAY with SAND, Mixed in with Municipal Waste
11					30%			Mostly Municipal Waste.
11.5								
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-25

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/18/2010 - 1024 | Page 1 of 1

Date / Time End 2/18/2010 - 1150

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG25-P-0.0-3.0	100%	0.0		SANDY SILT, Dark Brown, Moist
1		SM				0.0		SILTY SAND, Brown, Moist.
1.5		MH						Elastic SILT, Strong Brown, Dry
2						0.0		
2.5		CL						Lean CLAY, Redish Brown, Dry
3		SP		MML-SBG25-P-3.0-4.5		0.0		Poorly Graded SAND, Dark Brown, Moist.
3.5								
4						0.0		Municipal Waste.
4.5					40%			
5								
5.5								
6		GP				0.0		Poorly Graded GRAVEL, Light Gray, Dry
6.5								Municipal Waste.
7								
7.5					20%			
8								
8.5								
9						0.0		Municipal Waste.
9.5								
10								
10.5					20%			
11								
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-26

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/18/2010 - 1342 | Page 1 of 1

Date / Time End 2/18/2010 - 1525

Water Depth/Time 7.5' - 1350 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG26-P-0.0-3.0		0.0		SANDY SILT, Dark Brown, Dry.
1								
1.5		CL-ML			100%	0.0		SILTY CLAY, Brown, Dry
2								
2.5		SP				0.0		Poorly Graded SAND, Light brown, Moist.
3								
3.5		SM				0.0		SILTY SAND, Strong Brown, Moist.
4								
4.5					100%	0.0		
5		GP-GM						Poorly Graded GRAVEL with SILT, Gray, Moist.
5.5						0.0		
6		CH						Fat CLAY, Strong Brown, Dry.
6.5				MML-SBG26-P-6.0-8.0		0.0		Municipal Waste.
7								
7.5					60%	0.0		
8		SP						Poorly Graded SAND, Light Brown, Wet.
8.5								
9								
9.5						0.0		Municipal Waste.
10		SP-SM						Poorly Graded SAND with SILT, Dark Brown, Wet
10.5					60%	0.0		Municipal Waste.
11								
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-27

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/18/2010 - 0810 | Page 1 of 1

Date / Time End 2/18/2010 - 0950.

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML		MML-SBG28-P-0.0-1.0		0.0		SILTY CLAY, Dark Brown, Moist.
1								
1.5		ML		MML-SBG28-P-1.0-2.5	100%	0.0		SANDY SILT, Brown, Moist.
2								
2.5		SP-SM				0.0		Poorly Graded SAND with SILT, Strong Brown, Moist.
3								
3.5		CH				0.0		Fat CLAY, Strong Brown, Dry
4								
4.5					10%			
5								
5.5								
6								
6.5								No Recovery
7								
7.5					0%			
8								
8.5								
9								
9.5								No Recovery
10								
10.5					0%			
11								
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-28

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/16/2010 - 1020 | Page 1 of 1

Date / Time End 2/16/2010 - 1155

Water Depth/Time 5.0' - 1040 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		SW				0.0		Well Graded SAND, Brown, Moist
1		CL-ML		MML-SBG28-P-0.0-1.5				SILTY CLAY, Strong Brown, Moist
1.5					100%	0.0		
2		MH		MML-SBG28-P-1.5- 3.0				Fat CLAY, Brown, Moist
2.5		ML				0.0		SANDY SILT, Light Brown, Moist
3								
3.5		SP				0.0		Poorly Graded SAND, Dark Brown, Dry
4								
4.5					100%	0.0		
5								
5.5		SW				0.0		Well Graded SAND, Strong Brown, Saturated
6								
6.5						0.0		
7								
7.5					60%	0.0		
8								
8.5								
9						0.0		
9.5								
10								
10.5					20%			
11								
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-29

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/16/2010 | Page 1 of 1

Date / Time End 2/16/2010

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG29-P-0.0-3.0		0.0		SANDY SILT, Hard, Medium Dense, Brown, Dry, Some Silt, Little Medium to Fine Sand.
1								
1.5		SP-SM			75%	0.0		Poorly Graded SAND with SILT, Soft, Slightly Dense, Strong Brown, Dry, Mostly Fine to Very Fine Sand, Few Silt.
2								
2.5		SP				0.0		Poorly Graded SAND, Soft, Loose, Dark Brown, Moist, Mostly Medium to Fine Sand, Trace Silt.
3				MML-SBG29-P-3.0-5.0				
3.5						0.0		
4								
4.5					20%			
5								
5.5								
6								
6.5						0.0		Municipal Waste including news papers and wood fragments. Very little soil to log from.
7								
7.5					30%	0.0		
8								
8.5								
9								
9.5								**Hard Refusal**
10								
10.5								
11								
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-30

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/16/2010 - 1541 | Page 1 of 1

Date / Time End 2/16/2010 - 1708

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0.5		CL-ML		MML-SBG30-P-0.0-2.5	100%	0.0		SILTY CLAY, Hard, Dense, Brown, Dry, Mostly Clay, Little Silt
1		MH				0.0		Elastic SILT, Stiff, Medium Dense, Strong Brown, Dry, Some Silt, Little Clay, Trace Fine Sand
1.5								
2						0.0		SANDY SILT, Soft, Slightly Dense, Brown, Dry, Mostly Fine Sand, Little Silt. Interbedded with Municipal Waste including paper and coal slag.
2.5								
3				MML-SBG30-P-2.5-5.0		0.0		
3.5								
4					50%	0.0		
4.5								
5		ML						
5.5								
6						0.0		
6.5								
7								
7.5					20%			
8								
8.5								
9								
9.5		GP				0.0		Poorly Graded GRAVEL with SAND, Loose Gray, Dry, Mostly Coarse to Medium Angular Gravel, little Coarse to Medium Sand.
10								
10.5		SM			75%	0.0		SILTY SAND, Soft, Medium Dense, Dark Brown, Dry, Mostly Medium to Fine Sand, Little Silt.
11								
11.5						0.0		
12								

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Soil Boring Log

Boring No: GP-31

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/17/2010 - 1115 | Page 1 of 1

Date / Time End 2/17/2010 - 1226

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG31-P-0.0-1.5	100%	0.0		SANDY SILT, Hard, Dense, Dark Brown, Dry, Mostly Silt, Little Medium Sand. Glass Fragments in core with Municipal Waste.
1								
1.5						0.0		
2		CL-ML		MML-SBG31-P-1.5-3.0				SILTY CLAY, Hard, Very Dense, Strong Brown, Dry, Some Clay, Few Silt.
2.5						0.0		
3								
3.5						0.0		Municipal Waste including plastic debris and organic material, almost no soil in core.
4					30%			
4.5						0.0		
5								
5.5								
6								
6.5					0%			Municipal Waste is preventing recovery.
7								
7.5								
8								
8.5								
9								
9.5					20%	0.0		Mostly Municipal Waste including wood fragments.
10								
10.5								
11								
11.5								
12								

CABRERA SERVICES
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Soil Boring Log

Boring No: GP-32

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/17/2010 - 0945 | Page 1 of 1

Date / Time End 2/17/2010 - 1040

Water Depth/Time 9.0' - 1010 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML		MML-SBG32-P-0.0-1.5	100%	0.0		SILTY CLAY, Stiff, Dense, Brown, Dry, Mostly Clay, Some Silt.
1		ML				0.0		SANDY SILT, Stiff, Medium Dense, Strong Brown, Dry, Mostly Silt, Some Fine Sand, Trace Clay. Lenses of Medium Angular Gravel.
1.5				MML-SBG32-P-1.5-3.0				
2						0.0		
2.5		SM						SILTY SAND, Stiff, Slightly Dense, Strong Brown, Dry, Some Fine Sand, Some Silt, Lenses of Lean Clay.
3						0.0		
3.5								
4						0.0		
4.5					30%			
5								
5.5								
6								
6.5								No Recovery
7								
7.5					0%			
8								
8.5								
9								
9.5		SW				0.0		Well Graded SAND, Soft, Slightly Dense, Very Dark Brown, Wet, Mostly Medium to Fine Sand, becoming more coarse down core.
10						0.0		
10.5					100%			
11		SP				0.0		Poorly Graded SAND, Soft, Slightly Dense, Strong Brown, Wet, Mostly Coarse to Medium Sand, Trace Silt. Mottled.
11.5								
12								

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Soil Boring Log

Boring No: GP-33

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/17/2010 - 0815 | Page 1 of 1

Date / Time End 2/17/2010 - 0912

Water Depth/Time 3.0' - 0825 | Water Depth/Time 10.5' - 0840

Drilling Method: Geoprobe Macrocore | Surface Conditions: Snow, Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		SM			50%	0.0		SILTY SAND, Soft, Loose, Strong Brown, Dry, Mostly Medium to Fine Sand trending coarser down core, Little Silt. Occasional wood fragment in core.
1						0.0		
1.5								
2								
2.5								
3								
3.5					0%			No Recovery due to Municipal Waste. Note core was completely saturated.
4								
4.5								
5								
5.5								
6								
6.5					0%			No Recovery. Macrocore was completely saturated with only soil water.
7								
7.5								
8								
8.5				MML-SBGP33-P-9.0-10.0				
9								
9.5		SW				0.0		Well Graded SAND, Soft, Slightly Dense, Brown, Moist, Mostly Coarse to Medium Sand, Trace Silt.
10		CH						FAT CLAY, Stiff, dense, Strong Brown, Dry, Mostly Clay, Trace Silt. Laminated.
10.5				MML-SBGP33-P-10.0-11.0	100%	0.0		SILTY SAND, Soft, Slightly Dense, Strong Brown, Wet, Some Coarse to Medium Sand, Little Silt, Trace Clay.
11		SM				0.0		
11.5								
12								

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Soil Boring Log

Boring No: GP-34

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/22/2010 - 0950 | Page 1 of 1

Date / Time End 2/22/2010 - 1110

Water Depth/Time 3.0' - 1000 | Water Depth/Time 9.0' - 1020

Drilling Method: Geoprobe Macrocore | Surface Conditions: Saturated, Snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0.5		MH		MML-SBG34-P-2.5-3.5	100%	0.0		Elastic SILT, Brown, Wet
1						0.0		
1.5								
2		CL-ML				0.0		SILTY CLAY, Strong Brown, Dry
2.5		CH						Fat CLAY, Reddish Brown, Dry
3		CL-ML			100%	0.0		SILTY CLAY, Strong Brown, Wet.
3.5		GP		MML-SBG34-P-3.5-5.5				Poorly Graded GRAVEL with SAND, Gray, Dry
4						0.0		
4.5								
5		ML				0.0		SANDY SILT, Light Brown, Dry
5.5								Municipal Waste, wood chips and debris.
6						0.0		
6.5								
7						0.0		
7.5					30%			
8								
8.5								
9		GP				0.0		Poorly Sorted GRAVEL, Gray, Wet.
9.5		CL-ML						SILTY CLAY, Dark Brown, Wet.
10								Municipal Waste, coal slag, ash, construction debris.
10.5					25%			
11								
11.5								
12								

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Soil Boring Log

Boring No: GP-35

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/16/2010 - 0739 | Page 1 of 1

Date / Time End 2/16/2010 - 0825

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0.5		SM		MML-SBG35-P-0.0-3.0	100%	0.0		SILTY SAND, Soft, Slightly Dense, Brown, Moist, Some Fine Sand, Little Silt, Trace Clay.
1		CH				0.0		Fat CLAY, Hard, Dense, Strong Brown, Dry, Mostly Clay, Few Silt. Blockey Structure.
1.5								
2						0.0		Poorly Graded SAND with SILT, Stiff, Dense, Brown, Dry, Mostly Fine to Very Fine Sand, Little Silt. Laminated.
2.5								
3		SP-SM		MML-SBG35-P-3.0-5.0		0.0		
3.5								
4						0.0		
4.5					100%			
5		SP				0.0		Poorly Sorted SAND, Loose, Slightly Dense, Dark Brown, Moist, Mostly Fine Sand, Trace Fine Angular Gravel. Significant amount of municipal waste.
5.5								
6						0.0		Moist Municipal Waste including wood coal, coarse gravel, construction debris. No Loggable Soil.
6.5								
7						0.0		
7.5					50%			
8								
8.5								
9						0.0		
9.5								
10						0.0		
10.5					50%			
11								
11.5								
12								

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Soil Boring Log

Boring No: GP-36

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/16/2010 - 0810 | Page 1 of 1

Date / Time End 2/16/2010 - 0915

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0.5		CH		MML-SBG36-P-0.0-1.5	100%	0.0		Fat Clay, Strong Brown, Moist.
1		CL-ML						SILTY CLAY, Brown, Moist
1.5		SP				0.0		Poorly Graded SAND, Dark Brown, Dry.
2				MML-SBG36-P-1.5-3.0				Municipal Waste.
2.5						0.0		
3		ML						SILT with SAND, Very Dark Brown, Moist.
3.5						0.0		Municipal Waste.
4								
4.5					20%			
5								
5.5								
6								
6.5								**REFUSAL Due to Methane.**
7								
7.5					0%			
8								
8.5								
9								
9.5								
10								
10.5					0%			
11								
11.5								
12								

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Soil Boring Log

Boring No: GP-37

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/23/2010 - 1415 | Page 1 of 1

Date / Time End 2/24/2010 - 0840

Water Depth/Time 3.5' - 1438 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Completely Saturated, Muddy.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML				0.0		SILTY CLAY, Dark Brown, Dry.
1						0.0		
1.5		SM		MML-SBG37-P-2.0-3.0	80%			SANDY SILT, Brown, Dry.
2		GP				0.0		Poorly Graded GRAVEL, Gray, Dry.
2.5		CL-ML						SILTY CLAY, Very Dark Brown, Dry.
3						0.0		
3.5		CH						Fat CLAY, Very Dark Brown, Wet.
4						0.0		
4.5					30%			
5								Municipal Waste.
5.5								
6								
6.5		SP				0.0		Poorly Graded SAND, Light Brown, Wet.
7								
7.5					20%			
8								
8.5								
9								
9.5		SW		MML-SBG37-P-9.0-11.0		0.0		Well Graded SAND, Light Brown, Wet.
10								
10.5					100%	0.0		
11								
11.5						0.0		
12								

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Soil Boring Log

Boring No: GP-38

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/23/2010 - 1225 | Page 1 of 1

Date / Time End 2/23/2010 - 1330

Water Depth/Time 4.5' - 1230 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Snowy, Saturated.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML				0.0		SANDY SILT, Brown, Wet.
1								
1.5		ML			80%	0.0		SILT with SAND, Light Brown, Dry.
2								
2.5		ML				0.0		SANDY SILT, Reddish Brown, Dry.
3								
3.5		ML				0.0		SILT, Strong Brown, Dry.
4								
4.5					40%			Municipal Waste.
5		ML						SANDY SILT, Brown, Wet.
5.5				MML-SBG38-P-5.0-7.0				Municipal Waste.
6						0.0		
6.5								
7						0.0		
7.5					100%			Well Graded SAND, Brown, Wet.
8		SW						
8.5						0.0		
9								Elastic SILT, Gleyed, Wet.
9.5		MH				0.0		
10								
10.5				MML-SBG38-P-10.0-12.0	100%	0.0		SANDY SILT, Brown, Wet.
11		ML						
11.5						0.0		
12		CH						Fat CLAY, Redish Brown, Dry.

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-39

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 3/1/2010 - 1205 | Page 1 of 1

Date / Time End 3/1/2010 - 1235

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Hand Auger | Surface Conditions:

Company: EPI | Diameter:

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG39-P-0.0-1.0		0.0		SANDY SILT, Dark Brown, Moist.
1								
1.5		SP-SM				0.0		Poorly Graded SAND with SILT, Strong Brown, Moist.
2								
2.5		CL-ML		MML-SBG39-P-2.0-4.0		0.0		SILTY CLAY, Brown, Moist
3								
3.5						0.0		
4								
4.5		SW				0.0		Well Graded SAND, Dark Brown, Moist.
5								
5.5						0.0		
6		SM						SILTY SAND, Light Brown, Dry.
6.5								REFUSAL Due to Concrete Rubble.
7								
7.5								
8								
8.5								
9								
9.5								
10								
10.5								
11								
11.5								
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-40

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/23/2010 - 1255 | Page 1 of 1

Date / Time End 2/23/2010 - 1430

Water Depth/Time 6.0' - 1315 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Snow, Saturated.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5						0.0		SANDY SILT, Strong Brown, Wet.
1		ML		MML-SBG40-P-0.5-2.0		0.0		
1.5					50%			
2								Municipal Waste
2.5								
3						0.0		
3.5								
4								
4.5					30%			
5								
5.5								
6								
6.5		CL-ML		MML-SBG40-6.0-8.0		0.0		SILTY CLAY, Very Light Brown, Wet.
7						0.0		
7.5					100%			Fat CLAY, Gray, Wet.
8		CH				0.0		
8.5								
9								
9.5		ML				0.0		SANDY SILT, Light Brown, Dry
10						0.0		
10.5					100%			
11		GP						Poorly Graded GRAVEL, Gray, Dry.
11.5		CL				0.0		Lean CLAY, Reddish Brown, Dry.
12		CL-ML						SILTY CLAY, Brown, Wet.

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-41

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 3/1/2010 - 1030 | Page 1 of 1

Date / Time End 3/1/2010 - 1200

Water Depth/Time N.A | Water Depth/Time N.A

Drilling Method: Hand Auger | Surface Conditions: Saturated, Snow.

Company: EPI | Diameter: 2"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG41-P-0.0-2.0		0.0		SANDY SILT, Dark Brown, Moist.
1						0.0		
1.5								
2		SM				0.0		SILTY SAND, Strong Brown, Moist.
2.5				MML-SBG41-P-2.0-4.5				
3						0.0		
3.5								
4		SP				0.0		Poorly Graded SAND, Dark Brown, Moist.
4.5								
5								**REFUSAL Due to Concrete Block**
5.5								
6								
6.5								
7								
7.5								
8								
8.5								
9								
9.5								
10								
10.5								
11								
11.5								
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-42

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/23/2010 - 1520 | Page 1 of 1

Date / Time End 2/23/2010 - 1725

Water Depth/Time 6.0' - 1542 | Water Depth/Time 8.0' - 1542

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet, Snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML			30%	0.0		SANDY SILT, Dark Brown, Dry.
1								
1.5								
2								
2.5								
3		MH		MML-SBG42-P-3.0-4.5		0.0		Elastic SILT, Strong Brown, Dry.
3.5		GP						Poorly Graded GRAVEL, Gray, Dry.
4		SP			60%	0.0		Poorly Graded SAND, Brown, Moist.
4.5								
5								
5.5								
6		SW		MML-SBG42-P-6.0-8.5	100%	0.0		Well Graded SAND, Light Brown, Wet.
6.5								
7						0.0		
7.5		CL-ML						SILTY CLAY, Dark Brown, Moist.
8		SP				0.0		Poorly Graded SAND, Light Brown, Wet.
8.5								
9								
9.5						0.0		
10								
10.5					100%	0.0		
11		MH						Elastic SILT, Strong Brown, Dry
11.5						0.0		
12		SP-ML						SAND with SILT, Brown, Moist.

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-43

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/24/2010 - 0851 | Page 1 of 1

Date / Time End 2/24/2010 - 0925

Water Depth/Time 7.0' - 0905 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Saturated, snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML				0.0		SANDY SILT, Strong Brown, Dry
1		SP				0.0		Poorly Graded SAND, Brown, Moist.
1.5		MH			100%			Elastic SILT, Strong Brown, Dry.
2						0.0		Municipal Waste.
2.5								
3								
3.5								
4								
4.5					0%			
5								
5.5								
6								
6.5						0.0		
7				MML-SBG43-P-6.0-9.0				
7.5		SM			100%	0.0		SILTY SAND, Light Brown, Wet.
8								
8.5						0.0		SANDY SILT, Strong Brown, Wet.
9		ML						
9.5						0.0		
10								
10.5		CL-ML			100%	0.0		SILTY CLAY, Redish Brown, Moist.
11				MML-SBG43-P10.0-11.5				
11.5		CH				0.0		Fat CLAY, Strong Brown, Moist.
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-44

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/24/2010 - 0948 | Page 1 of 1

Date / Time End 2/24/2010 - 1045

Water Depth/Time 2.0' - 0955 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Saturated, snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		CL-ML		MML-SBG44-P-0.0-1.5		0.0		SILTY CLAY, Brown, Wet.
1								
1.5		ML			100%	0.0		SANDY SILT, Brown, Dry.
2				MML-SBG44-P-1.5-3.0				
2.5		CL				0.0		SANDY Lean CLAY, Brown, Wet.
3								
3.5		CL-ML			15%	0.0		SILTY CLAY, Strong Brown, Wet.
4								
4.5								
5								
5.5								
6								
6.5					0%			Sleeve full of water
7								
7.5								
8								
8.5								
9								
9.5					0%			Sleeve full of water.
10								
10.5								
11								
11.5								
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-28

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/24/2010 - 1055 | Page 1 of 1

Date / Time End 2/24/2010 -1140

Water Depth/Time 2.0 - 1100 | Water Depth/Time 6.5 - 1110

Drilling Method: Geoprobe Macrocore | Surface Conditions: Saturated, snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML		MML-SBG45-P-0.0-2.0	100%	0.0		SANDY SILT, Light Brown, Wet
1								
1.5						0.0		Municipal Waste
2								
2.5		CL-ML				0.0		SILTY CLAY, Light Brown, Wet.
3								
3.5				MML-SBG45-P-3.5-4.5		0.0		
4								
4.5					60%	0.0		
5		CH						Fat CLAY, Strong Brown, Dry. Note Hyrdocarbon Smell.
5.5		ML						SANDY SILT, Light Brown, Dry.
6								
6.5						0.0		
7		SP-SM						Poorly Graded SAND with SILT, Strong Brown, Wet.
7.5					100%	0.0		
8								
8.5		ML				0.0		SANDY SILT, Redish Brown, Wet.
9								
9.5						0.0		
10								
10.5		CL		MML-SBG45-P-10.0-12.0	100%	0.0		Lean CLAY, Redish Brown, Dry.
11								
11.5						0.0		
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-46

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/24/2010 - 1330 | Page 1 of 1

Date / Time End 2/24/2010 - 1412

Water Depth/Time 6.0' - 1340 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5						0.0		Surface Soil Sample
1		ML			100%	0.0		SANDY SILT, Brown, Moist to Wet.
1.5								
2						0.0		
2.5		CL-ML						SILTY CLAY, Strong Brown, Moist.
3		SP				0.0		Poorly Graded SAND with SILT, Brown, Moist.
3.5								
4						0.0		
4.5		CL			30%			Lean CLAY, Redish Brown, Dry
5								
5.5								
6								
6.5		ML				0.0		SANDY SILT, Brown, Wet.
7						0.0		
7.5		SP		MML-SBG46-P-7.5-9.5	100%			Poorly Sorted SAND, Light Brown, Saturated.
8						0.0		
8.5		CL-ML						SILTY CLAY, Brown, Moist.
9								
9.5						0.0		
10								
10.5		CH		MML-SBG46-P10.0-12.0	100%	0.0		Fat CLAY, Redish Brown, Moist.
11								
11.5		SM				0.0		SILTY SAND, Brown, Moist.
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-47

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/24/2010 - 1425 | Page 1 of 1

Date / Time End 2/24/2010 - 1520

Water Depth/Time N/A | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		ML				0.0		SANDY SILT, Brown, Moist.
1								
1.5		SW			100%	0.0		Well Graded SAND, Brown, Moist.
2				MML-SBG47-P-2.0-3.0				
2.5						0.0		
3		SP-SM						Poorly Graded SAND with SILT, Strong Brown, Moist
3.5						0.0		
4		SM						SILTY SAND, Brown, Moist.
4.5					100%	0.0		
5		ML						SANDY SILT, Brown, Moist
5.5		SW				0.0		Well Graded SAND, Light Brown, Moist.
6								
6.5						0.0		
7								
7.5					100%	0.0		Municipal Waste including concrete and rubble.
8								
8.5						0.0		
9								
9.5		GW				0.0		Well Graded GRAVEL, Gray, Moist.
10								
10.5		SW		MML-SBG47-P-10.0-12.0	100%	0.0		Well Graded SAND, Light Brown, Moist.
11								
11.5						0.0		
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-48

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/25/2010 - 0850 | Page 1 of 1

Date / Time End 2/25/2010 - 0925

Water Depth/Time 6.0' - 0910 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Saturated, snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5						0.0		SILTY CLAY, Brown, Dry.
1		CL-ML						
1.5				MML-SBG48-P-1.0-3.0	100%	0.0		
2								
2.5						0.0		Fat CLAY, Reddish Brown, Dry.
3								
3.5								
4		CH						
4.5					0%			
5								
5.5								
6								
6.5		ML				0.0		SANDY SILT, Light Brown, Saturated.
7								
7.5					100%	0.0		Well Graded SAND with SILT, Brown, Saturated.
8		SW-SM		MML-SBG48-P-8.0-9.0				
8.5						0.0		
9								
9.5								**REFUSAL**
10								
10.5								
11								
11.5								
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-49

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 2/25/2010 - 0940 | Page 1 of 1

Date / Time End 2/25/2010 - 1020

Water Depth/Time 6.0' - 0958 | Water Depth/Time 9.5' - 1005

Drilling Method: Geoprobe Macrocore | Surface Conditions: Wet.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.
0.5		MH		MML-SBG49-P-2.0-3.0	100%	0.0		Elastic SILT, Light Brown, Moist.
1						0.0		
1.5								
2						0.0		
2.5								
3		CL-ML				0.0		SILTY CLAY, Brown, Moist.
3.5				MML-SBG49-P-3.0-4.0				
4		SP			60%	0.0		Poorly Graded SAND with SILT, Strong Brown, Moist.
4.5								
5						0.0		
5.5								
6								
6.5		SW			100%	0.0		Well Graded SAND, Light Gray, Wet.
7								
7.5						0.0		
8								
8.5						0.0		Municipal Waste.
9		SP				0.0		Poorly Graded SAND, Light Brown, Moist.
9.5								
10		SW			30%	0.0		Well Graded SAND Brown, Wet.
10.5								
11						0.0		
11.5								
12								

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Soil Boring Log

Boring No: GP-50

Boring Location info:

Project: Middlesex Municipal Landfill | Project Number: 08-3800.08

Date / Time Start 3/1/2010 - 0750 | Page 1 of 1

Date / Time End 3/1/2010 - 0845

Water Depth/Time 7.5' - 0810 | Water Depth/Time N/A

Drilling Method: Geoprobe Macrocore | Surface Conditions: Saturated, Snow.

Company: EPI | Diameter: 1.75"

Driller: Scott | Elevation:

Description: textures, color, moisture, odor, firmness, fractures, strata, cavities, fossils, contamination, etc.

depth (show units)	Soil Texture	USCS Symbol	sample depth	sample. no.	% recovery	OVA (ppm)	GM Scan (cpm)	Description
0.5		ML				0.0		SANDY SILT, Brown, Moist.
1		SP			100%	0.0		Poorly Graded SAND, Brown, Dry.
1.5								
2								
2.5		CL-ML		MML-SBG50-P-2.0-3.0		0.0		SILTY CLAY, Strong Brown, Dry.
3								
3.5		SP-SM				0.0		Poorly Graded SAND with SILT, Strong Brown, Moist.
4								
4.5					60%	0.0		
5		MH						Elastic SILT, Redish Brown, Dry.
5.5								
6								
6.5						0.0		Municipal Waste.
7								
7.5					100%	0.0		
8		SM						SILTY SAND, Dark Brown, Wet.
8.5						0.0		Well Graded SAND, Brown, Moist to Saturated.
9								
9.5						0.0		
10		SW						
10.5					15%			
11								
11.5								
12								

APPENDIX D
DAILY QUALITY CONTROL REPORTS

CABRERA SERVICES, INC.
DAILY QUALITY CONTROL REPORT

1. SITE LOCATION: Middlesex, New Jersey **DATE:** 12/2/09
PROJECT NAME: Middlesex Municipal Landfill FUSRAP Site **REPORT No.:** 120209-01

CONTRACT #: W912DQ-08-D-0003/0003 **CABRERA PROJECT #:** 08-3800.08
TASK(S) #: 2.1

FIELD OPERATIONS LEAD: Greg Bright **CQCSM: Greg Bright**

2. TODAY'S WEATHER: *Temp Range:* 34 – 44 degrees
Precipitation Last 24 Hours: N/A *Type:* N/A *Amount:* N/A
Weather Delays: ☒No ☐Yes *Hours:* N/A

3. SUMMARY OF WORK PERFORMED TODAY:

- Cabrera personnel mobilized to job site.
- Phillips & Sons onsite to perform brush clearing.
- Performed quality control on radiological instrumentation.
- Met with Pastor of church to get permission to perform gamma walkover survey of outdoor church property. He approved us to perform survey at any time.
- Cabrera and subcontractors demobilized from site.
- Cabrera Project Manager and USACE Project Manager met with representatives from the Middlesex Borough to provide project briefing.

4. MATERIALS & EQUIPMENT BROUGHT ON SITE:

- Brush clearing equipment (mowers, tractors, ATV, wood chipper)
- Radiological instrumentation

INSPECTIONS & TESTING

5. INSPECTIONS:

TYPE	DESCRIPTION	ACTION
N/A		

ARE ANY DEFICIENCIES NOTED IN FOLLOW UP INSPECTIONS? ☐NO ☐YES – IF YES, EXPLAIN:

6. DEFICIENCIES CORRECTED THIS DATE:

DEFICIENCY NO.	QC REPORT REFERENCE	DESCRIPTION	ACTION
N/A			

7. TESTS PERFORMED:

SPECIFICATION SECTION/ REFERENCE	TYPE	TEST AND RESULTS
N/A		

ARE TEST RESULTS ATTACHED? ☐NO ☐YES – IF NO, EXPLAIN:

MANPOWER & EQUIPMENT REPORT

8. PRIME CONTRACTOR ON SITE TODAY: CABRERA SERVICES, INC.

EMPLOYEE NAME	TITLE	TASKS PERFORMED	HOURS WORKED: TODAY
Chris Boes	Project Manager	Mobilization	8.0
Greg Bright	Field Site Manager	Mobilization/instrument QC	9.5
Shawn Googins	Certified Health Physicist	Mobilization/instrument QC	4.0
Althea Williams	HP Tech	Mobilization/instrument QC	9.5
		Total Hours	31.0

9. SUBCONTRACTORS ON SITE TODAY:

SUBCONTRACTOR NAME	JOB DUTY	NO. MEN	TASKS PERFORMED TODAY	HOURS WORKED: TODAY
Phillips & Sons	Brush Clearing	8	Brush Clearing	9.5
			Total Hours	76.0

10. EQUIPMENT / MATERIALS ON SITE:

VENDOR	EQUIPMENT	ACTIVE/ IDLE
N/A		

WASTE & SAMPLING REPORT

11. WASTE GENERATED/STORED ON SITE TODAY:

CONTAINER ID	SOLID, LIQUID OR MIXED	AMOUNT (CY or TONS)	CONTAINER TYPE	DESCRIPTION OF WASTE	DISPOSITION OR LOCATION OF CONTAINER
N/A					
	TOTAL				

ATTACH SEPARATE PAGES AS NEEDED. SEPARATE PAGES INCLUDED? ☐NO ☐YES

12. SAMPLE COLLECTION & ANALYSIS:

SAMPLE ID	MEDIA TYPE (SOIL, WATER. OTHER)	SAMPLER INITIALS	ON-SITE or OFF-SITE LAB.?	ANALYSES	DATE RESULTS DUE	FREIGHT TRACKING NO.
N/A						

ATTACH SEPARATE PAGES AS NEEDED. SEPARATE PAGES INCLUDED? ☐NO ☐YES

13. CHANGES IN SITE CONDITIONS/DELAYS/CONFLICTS (EXPLAIN):
N/A

14. DID A DELAY OR WORK STOPPAGE OCCUR TODAY? ☐No ☐Yes – If Yes, Explain:
N/A

15. HAS ANYTHING DEVELOPED IN THE WORK, WHICH MAY LEAD TO A CHANGE?
☒No ☐Yes – If Yes, Explain:

16. VERBAL INSTRUCTIONS RECEIVED:
Pastor from Church directed Cabrera to perform gamma walkover survey of Church property at any time.

17. REMARKS:

18. CONTRACTOR VERIFICATION STATEMENT:

This report is complete and correct and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above.

Greg Bright	**12/2/09**
Contractor Quality Control System Manager or Authorized Representative	**Date**

19. USACE QUALITY ASSURANCE REPORT:

Quality Assurance Representative's Remarks and/or Exceptions to the Report

USACE Quality Assurance Representative	**Date**

HEALTH & SAFETY REPORT

20. SITE INFORMATION:

SITE NAME	SITE ADDRESS	CITY	STATE	ZIP CODE
Middlesex Municipal Landfill	Mountain Ave.	Middlesex	NJ	08846

21. H&S SUMMARY:

WERE THERE ANY ACCIDENTS ON SITE TODAY ? ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY NEAR MISSES ON SITE TODAY ? ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY HEALTH OR SAFETY INCIDENTS ON SITE TODAY?: ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY HEALTH OR SAFETY ISSUES / OBSERVATIONS?: ☐ YES ☒ NO
DESCRIPTION:

RECOMMENDATION(S) FOR HEALTH OR SAFETY ISSUES / OBSERVATIONS: **N/A**

22. SUMMARY OF WORK PERFORMED:

TYPE OF WORK: Brush Clearing
CHEMICALS USED: Gasoline, Diesel Fuel
PPE LEVEL: Level D

23. INCIDENT REPORT:

TYPE	NAME OF PERSON	REPORTED TO	INCIDENT DESCRIPTION*
First Aid			
OSHA Recordable			
Vehicle Accident			
Lost Time			

* ATTACHMENTS:

CABRERA Incident Investigation Form ☐ YES ☒ NO

USACE Accident Investigation Report (ENG FORM 3394) ☐ YES ☒ NO

CABRERA SERVICES, INC.
DAILY QUALITY CONTROL REPORT

1. SITE LOCATION: Middlesex, New Jersey **DATE:** 12/3/09
PROJECT NAME: Middlesex Municipal Landfill FUSRAP Site **REPORT No.:** 120309-02

CONTRACT #: W912DQ-08-D-0003/0003 **CABRERA PROJECT #:** 08-3800.08
TASK(S) #: 2.1

FIELD OPERATIONS LEAD: Greg Bright **CQCSM: Greg Bright**

2. TODAY'S WEATHER: *Temp Range:* 34 – 44 degrees
Precipitation Last 24 Hours: N/A *Type:* N/A *Amount:* N/A
Weather Delays: ☒No ☐Yes *Hours:* N/A

3. SUMMARY OF WORK PERFORMED TODAY:

- Cabrera personnel mobilized to job site
- Phillips & Sons onsite to perform brush clearing
- Performed quality control on radiological instrumentation
- Qualified personnel on use of the CLASS surveying equipment
- Performed gamma walkover surveys of areas not able to be driven with the CLASS attached to an ATV.
- Cabrera and subcontractors demobilized from site.

4. MATERIALS & EQUIPMENT BROUGHT ON SITE:

- Brush clearing equipment (mowers, tractors, ATV, wood chipper)
- Radiological instrumentation

INSPECTIONS & TESTING

5. INSPECTIONS:

TYPE	DESCRIPTION	ACTION
Surveys	Gamma Walkover Surveys	In Areas Inaccessible to Gator

ARE ANY DEFICIENCIES NOTED IN FOLLOW UP INSPECTIONS? ☐NO ☐YES – IF YES, EXPLAIN:

6. DEFICIENCIES CORRECTED THIS DATE:

DEFICIENCY NO.	QC REPORT REFERENCE	DESCRIPTION	ACTION
N/A			

7. TESTS PERFORMED:

SPECIFICATION SECTION/ REFERENCE	TYPE	TEST AND RESULTS
N/A		

ARE TEST RESULTS ATTACHED? ☐NO ☐YES – IF NO, EXPLAIN:

MANPOWER & EQUIPMENT REPORT

8. PRIME CONTRACTOR ON SITE TODAY: CABRERA SERVICES, INC.

EMPLOYEE NAME	TITLE	TASKS PERFORMED	HOURS WORKED: TODAY
Greg Bright	Field Site Manager	Mobilization/Instrument QC	8.5
Shawn Googins	Certified Health Physicist	Mobilization/ Instrument QC	8.5
Althea Williams	HP Tech	Mobilization/ Instrument QC	8.5
		Total Hours	25.5

9. SUBCONTRACTORS ON SITE TODAY:

SUBCONTRACTOR NAME	JOB DUTY	NO. MEN	TASKS PERFORMED TODAY	HOURS WORKED: TODAY
Phillips & Sons	Brush Clearing	7	Brush Clearing	8.5
			Total Hours	59.5

10. EQUIPMENT / MATERIALS ON SITE:

VENDOR	EQUIPMENT	ACTIVE/ IDLE
N/A		

WASTE & SAMPLING REPORT

11. WASTE GENERATED/STORED ON SITE TODAY:

CONTAINER ID	SOLID, LIQUID OR MIXED	AMOUNT (CY or TONS)	CONTAINER TYPE	DESCRIPTION OF WASTE	DISPOSITION OR LOCATION OF CONTAINER
N/A					
	TOTAL				

ATTACH SEPARATE PAGES AS NEEDED. SEPARATE PAGES INCLUDED? ☐NO ☐YES

12. SAMPLE COLLECTION & ANALYSIS:

SAMPLE ID	MEDIA TYPE (SOIL, WATER. OTHER)	SAMPLER INITIALS	ON-SITE or OFF-SITE LAB.?	ANALYSES	DATE RESULTS DUE	FREIGHT TRACKING NO.
N/A						

ATTACH SEPARATE PAGES AS NEEDED. SEPARATE PAGES INCLUDED? ☐NO ☐YES

13. CHANGES IN SITE CONDITIONS/DELAYS/CONFLICTS (EXPLAIN):
N/A

14. DID A DELAY OR WORK STOPPAGE OCCUR TODAY? ☐No ☐Yes – If Yes, Explain:
N/A

15. HAS ANYTHING DEVELOPED IN THE WORK, WHICH MAY LEAD TO A CHANGE?
☒No ☐Yes – If Yes, Explain:

16. VERBAL INSTRUCTIONS RECEIVED:
N/A

17. REMARKS:
N/A

18. CONTRACTOR VERIFICATION STATEMENT:

This report is complete and correct and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above.

Greg Bright	**12/2/09**
Contractor Quality Control System Manager or Authorized Representative	**Date**

19. USACE QUALITY ASSURANCE REPORT:

Quality Assurance Representative's Remarks and/or Exceptions to the Report

USACE Quality Assurance Representative	**Date**

HEALTH & SAFETY REPORT

20. SITE INFORMATION:

SITE NAME	SITE ADDRESS	CITY	STATE	ZIP CODE
Middlesex Municipal Landfill	Mountain Ave.	Middlesex	NJ	08846

21. H&S SUMMARY:

WERE THERE ANY ACCIDENTS ON SITE TODAY ? ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY NEAR MISSES ON SITE TODAY ? ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY HEALTH OR SAFETY INCIDENTS ON SITE TODAY?: ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY HEALTH OR SAFETY ISSUES / OBSERVATIONS?: ☐ YES ☒ NO
DESCRIPTION:

RECOMMENDATION(S) FOR HEALTH OR SAFETY ISSUES / OBSERVATIONS: **N/A**

22. SUMMARY OF WORK PERFORMED:

TYPE OF WORK: Brush Clearing
CHEMICALS USED: Gasoline, Diesel Fuel
PPE LEVEL: Level D

23. INCIDENT REPORT:

TYPE	NAME OF PERSON	REPORTED TO	INCIDENT DESCRIPTION*
First Aid			
OSHA Recordable			
Vehicle Accident			
Lost Time			

* ATTACHMENTS:

CABRERA Incident Investigation Form ☐ YES ☒ NO

USACE Accident Investigation Report (ENG FORM 3394) ☐ YES ☒ NO

CABRERA SERVICES, INC.
DAILY QUALITY CONTROL REPORT

1. SITE LOCATION: Middlesex, New Jersey **DATE:** 12/4/09
PROJECT NAME: Middlesex Municipal Landfill FUSRAP Site **REPORT No.:** 120409-03

CONTRACT #: W912DQ-08-D-0003/0003 **CABRERA PROJECT #:** 08-3800.08
TASK(S) #: 2.1

FIELD OPERATIONS LEAD: Greg Bright **CQCSM: Greg Bright**

2. TODAY'S WEATHER: *Temp Range:* 38 – 48 degrees
Precipitation Last 24 Hours: N/A *Type:* N/A *Amount:* N/A
Weather Delays: ☒No ☐Yes *Hours:* N/A

3. SUMMARY OF WORK PERFORMED TODAY:

- Cabrera personnel mobilized to job site
- Phillips & Sons onsite to perform brush clearing
- Performed quality control on radiological instrumentation
- Finished instrument QC on the CLASS surveying equipment
- Prepared for starting CLASS surveys next week by collecting key GPS locations
- Phillips & Sons complete brush clearing
- Cabrera and subcontractors demobilized from site

4. MATERIALS & EQUIPMENT BROUGHT ON SITE:

- Brush clearing equipment (mowers, tractors, ATV, wood chipper)
- Radiological instrumentation

INSPECTIONS & TESTING

5. INSPECTIONS:

TYPE	DESCRIPTION	ACTION
N/A		

ARE ANY DEFICIENCIES NOTED IN FOLLOW UP INSPECTIONS? ☐NO ☐YES – IF YES, EXPLAIN:

6. DEFICIENCIES CORRECTED THIS DATE:

DEFICIENCY NO.	QC REPORT REFERENCE	DESCRIPTION	ACTION
N/A			

7. TESTS PERFORMED:

SPECIFICATION SECTION/ REFERENCE	TYPE	TEST AND RESULTS
N/A		

ARE TEST RESULTS ATTACHED? ☐NO ☐YES – IF NO, EXPLAIN:

MANPOWER & EQUIPMENT REPORT

8. PRIME CONTRACTOR ON SITE TODAY: CABRERA SERVICES, INC.

EMPLOYEE NAME	TITLE	TASKS PERFORMED	HOURS WORKED: TODAY
Greg Bright	Field Site Manager	Mobilization/Instrument QC	8.5
Shawn Googins	Certified Health Physicist	Mobilization/ Instrument QC	3.0
Althea Williams	HP Tech	Mobilization/ Instrument QC	8.5
		Total Hours	20.0

9. SUBCONTRACTORS ON SITE TODAY:

SUBCONTRACTOR NAME	JOB DUTY	NO. MEN	TASKS PERFORMED TODAY	HOURS WORKED: TODAY
Phillips & Sons	Brush Clearing	7	Brush Clearing	8.5
			Total Hours	59.5

10. EQUIPMENT / MATERIALS ON SITE:

VENDOR	EQUIPMENT	ACTIVE/ IDLE
N/A		

WASTE & SAMPLING REPORT

11. WASTE GENERATED/STORED ON SITE TODAY:

CONTAINER ID	SOLID, LIQUID OR MIXED	AMOUNT (CY or TONS)	CONTAINER TYPE	DESCRIPTION OF WASTE	DISPOSITION OR LOCATION OF CONTAINER
N/A					
	TOTAL				

ATTACH SEPARATE PAGES AS NEEDED. SEPARATE PAGES INCLUDED? ☐NO ☐YES

12. SAMPLE COLLECTION & ANALYSIS:

SAMPLE ID	MEDIA TYPE (SOIL, WATER. OTHER)	SAMPLER INITIALS	ON-SITE or OFF-SITE LAB.?	ANALYSES	DATE RESULTS DUE	FREIGHT TRACKING NO.
N/A						

ATTACH SEPARATE PAGES AS NEEDED. SEPARATE PAGES INCLUDED? ☐NO ☐YES

13. CHANGES IN SITE CONDITIONS/DELAYS/CONFLICTS (EXPLAIN):
N/A

14. DID A DELAY OR WORK STOPPAGE OCCUR TODAY? ☐No ☐Yes – If Yes, Explain:
N/A

15. HAS ANYTHING DEVELOPED IN THE WORK, WHICH MAY LEAD TO A CHANGE?
☒No ☐Yes – If Yes, Explain:

16. VERBAL INSTRUCTIONS RECEIVED:
N/A

17. REMARKS:
N/A

18. CONTRACTOR VERIFICATION STATEMENT:

This report is complete and correct and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above.

Greg Bright	**12/2/09**
Contractor Quality Control System Manager or Authorized Representative	**Date**

19. USACE QUALITY ASSURANCE REPORT:

Quality Assurance Representative's Remarks and/or Exceptions to the Report

USACE Quality Assurance Representative	**Date**

HEALTH & SAFETY REPORT

20. SITE INFORMATION:

SITE NAME	SITE ADDRESS	CITY	STATE	ZIP CODE
Middlesex Municipal Landfill	Mountain Ave.	Middlesex	NJ	08846

21. H&S SUMMARY:

WERE THERE ANY ACCIDENTS ON SITE TODAY ? ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY NEAR MISSES ON SITE TODAY ? ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY HEALTH OR SAFETY INCIDENTS ON SITE TODAY?: ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY HEALTH OR SAFETY ISSUES / OBSERVATIONS?: ☐ YES ☒ NO
DESCRIPTION:

RECOMMENDATION(S) FOR HEALTH OR SAFETY ISSUES / OBSERVATIONS: **N/A**

22. SUMMARY OF WORK PERFORMED:

TYPE OF WORK: Brush Clearing
CHEMICALS USED: Gasoline, Diesel Fuel
PPE LEVEL: Level D

23. INCIDENT REPORT:

TYPE	NAME OF PERSON	REPORTED TO	INCIDENT DESCRIPTION*
First Aid			
OSHA Recordable			
Vehicle Accident			
Lost Time			

* ATTACHMENTS:

CABRERA Incident Investigation Form ☐ YES ☒ NO

USACE Accident Investigation Report (ENG FORM 3394) ☐ YES ☒ NO

CABRERA SERVICES, INC.
DAILY QUALITY CONTROL REPORT

1. SITE LOCATION: Middlesex, New Jersey **DATE:** 12/4/09
PROJECT NAME: Middlesex Municipal Landfill FUSRAP Site **REPORT No.:** 120409-03

CONTRACT #: W912DQ-08-D-0003/0003 **CABRERA PROJECT #:** 08-3800.08
TASK(S) #: 2.1

FIELD OPERATIONS LEAD: Greg Bright **CQCSM: Greg Bright**

2. TODAY'S WEATHER: *Temp Range:* 38 – 48 degrees
Precipitation Last 24 Hours: N/A *Type:* N/A *Amount:* N/A
Weather Delays: ☒No ☐Yes *Hours:* N/A

3. SUMMARY OF WORK PERFORMED TODAY:

- Cabrera personnel mobilized to job site
- Phillips & Sons onsite to perform brush clearing
- Performed quality control on radiological instrumentation
- Finished instrument QC on the CLASS surveying equipment
- Prepared for starting CLASS surveys next week by collecting key GPS locations
- Phillips & Sons complete brush clearing
- Cabrera and subcontractors demobilized from site

4. MATERIALS & EQUIPMENT BROUGHT ON SITE:

- Brush clearing equipment (mowers, tractors, ATV, wood chipper)
- Radiological instrumentation

INSPECTIONS & TESTING

5. INSPECTIONS:

TYPE	DESCRIPTION	ACTION
N/A		

ARE ANY DEFICIENCIES NOTED IN FOLLOW UP INSPECTIONS? ☐NO ☐YES – IF YES, EXPLAIN:

6. DEFICIENCIES CORRECTED THIS DATE:

DEFICIENCY NO.	QC REPORT REFERENCE	DESCRIPTION	ACTION
N/A			

7. TESTS PERFORMED:

SPECIFICATION SECTION/ REFERENCE	TYPE	TEST AND RESULTS
N/A		

ARE TEST RESULTS ATTACHED? ☐NO ☐YES – IF NO, EXPLAIN:

MANPOWER & EQUIPMENT REPORT

8. PRIME CONTRACTOR ON SITE TODAY: CABRERA SERVICES, INC.

EMPLOYEE NAME	TITLE	TASKS PERFORMED	HOURS WORKED: TODAY
Greg Bright	Field Site Manager	Mobilization/Instrument QC	8.5
Shawn Googins	Certified Health Physicist	Mobilization/ Instrument QC	3.0
Althea Williams	HP Tech	Mobilization/ Instrument QC	8.5
		Total Hours	20.0

9. SUBCONTRACTORS ON SITE TODAY:

SUBCONTRACTOR NAME	JOB DUTY	NO. MEN	TASKS PERFORMED TODAY	HOURS WORKED: TODAY
Phillips & Sons	Brush Clearing	7	Brush Clearing	8.5
			Total Hours	59.5

10. EQUIPMENT / MATERIALS ON SITE:

VENDOR	EQUIPMENT	ACTIVE/ IDLE
N/A		

WASTE & SAMPLING REPORT

11. WASTE GENERATED/STORED ON SITE TODAY:

CONTAINER ID	SOLID, LIQUID OR MIXED	AMOUNT (CY or TONS)	CONTAINER TYPE	DESCRIPTION OF WASTE	DISPOSITION OR LOCATION OF CONTAINER
N/A					
	TOTAL				

ATTACH SEPARATE PAGES AS NEEDED. SEPARATE PAGES INCLUDED? ☐NO ☐YES

12. SAMPLE COLLECTION & ANALYSIS:

SAMPLE ID	MEDIA TYPE (SOIL, WATER. OTHER)	SAMPLER INITIALS	ON-SITE or OFF-SITE LAB.?	ANALYSES	DATE RESULTS DUE	FREIGHT TRACKING NO.
N/A						

ATTACH SEPARATE PAGES AS NEEDED. SEPARATE PAGES INCLUDED? ☐NO ☐YES

13. CHANGES IN SITE CONDITIONS/DELAYS/CONFLICTS (EXPLAIN):
N/A

14. DID A DELAY OR WORK STOPPAGE OCCUR TODAY? ☐No ☐Yes – If Yes, Explain:
N/A

15. HAS ANYTHING DEVELOPED IN THE WORK, WHICH MAY LEAD TO A CHANGE?
☒No ☐Yes – If Yes, Explain:

16. VERBAL INSTRUCTIONS RECEIVED:
N/A

17. REMARKS:
N/A

18. CONTRACTOR VERIFICATION STATEMENT:

This report is complete and correct and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above.

Greg Bright	**12/2/09**
Contractor Quality Control System Manager or Authorized Representative	**Date**

19. USACE QUALITY ASSURANCE REPORT:

Quality Assurance Representative's Remarks and/or Exceptions to the Report

USACE Quality Assurance Representative	**Date**

HEALTH & SAFETY REPORT

20. SITE INFORMATION:

SITE NAME	SITE ADDRESS	CITY	STATE	ZIP CODE
Middlesex Municipal Landfill	Mountain Ave.	Middlesex	NJ	08846

21. H&S SUMMARY:

WERE THERE ANY ACCIDENTS ON SITE TODAY ? ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY NEAR MISSES ON SITE TODAY ? ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY HEALTH OR SAFETY INCIDENTS ON SITE TODAY?: ☐ YES ☒ NO
DESCRIPTION:

WERE THERE ANY HEALTH OR SAFETY ISSUES / OBSERVATIONS?: ☐ YES ☒ NO
DESCRIPTION:

RECOMMENDATION(S) FOR HEALTH OR SAFETY ISSUES / OBSERVATIONS: **N/A**

22. SUMMARY OF WORK PERFORMED:

TYPE OF WORK: Brush Clearing
CHEMICALS USED: Gasoline, Diesel Fuel
PPE LEVEL: Level D

23. INCIDENT REPORT:

TYPE	NAME OF PERSON	REPORTED TO	INCIDENT DESCRIPTION*
First Aid			
OSHA Recordable			
Vehicle Accident			
Lost Time			

* ATTACHMENTS:

CABRERA Incident Investigation Form ☐ YES ☒ NO

USACE Accident Investigation Report (ENG FORM 3394) ☐ YES ☒ NO

DAILY QUALITY CONTROL REPORT		***Date:***	December 7, 2009
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	120709-04
Contract No.:	W912DQ-08-D-0003	***Wind:***	light
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	20-31° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Greg Bright, Althea Williams, Dennis Criswell		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation		
Work Performed:	- Cabrera personnel mobilized to job site - Performed quality control on radiological instrumentation - Office trailer, Storage container, and Rough-Terrain vehicle (to be used for drive-over surveys) onsite - Performed gamma survey of wood chip pile – gamma activity levels did not exceed background levels - Cabrera demobilized from site		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	None		
Tomorrow's Expectations:	Begin gamma survey.		
By: *Greg Bright*	TITLE: Field Site Manager (Cabrera Services) (m) 781-264-4445		

DAILY QUALITY CONTROL REPORT		***Date:***	December 8, 2009
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	120809-05
Contract No.:	W912DQ-08-D-0003	***Wind:***	light
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	24-39° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Greg Bright, Althea Williams, Dennis Criswell		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	John from Hertz (delivering adapter to trailer hitch), Keith Steele from Power Solutions (preparing quote for providing electricity to trailer)		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation		
Work Performed:	- Cabrera personnel mobilized to job site - Performed quality control on radiological instrumentation - Started drive-over gamma survey - Cabrera demobilized from site		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	None		
Tomorrow's Expectations:	Continue drive-over gamma survey		
By: *Greg Bright*	TITLE: Field Site Manager (Cabrera Services) (m) 781-264-4445		

DAILY QUALITY CONTROL REPORT		***Date:***	December 9, 2009
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	120909-06
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-20 mph
Delivery Order No.:	0003	***Humidity:***	high
Cabrera Project No.:	08-3800.08	***Weather:***	Constant rain in AM, 34-44° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Greg Bright, Althea Williams, Dennis Criswell		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation		
Work Performed:	- Cabrera personnel mobilized to job site - Performed quality control on radiological instrumentation - Sealed up detector and GPS connections from the rain - Continued drive-over gamma survey - Cabrera demobilized from site		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	It rained all day, but by sealing up connections and electronics on the CLASS system with plastic, we were able to continue the drive-over survey.		
Tomorrow's Expectations:	Continue drive-over gamma survey		
By: *Greg Bright*	TITLE: Field Site Manager (Cabrera Services) (m) 781-264-4445		

DAILY QUALITY CONTROL REPORT		***Date:***	December 10, 2009
		Day:	Thursday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121009-07
Contract No.:	W912DQ-08-D-0003	***Wind:***	10-20 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	32-42° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Greg Bright, Althea Williams, Dennis Criswell		
Subcontractors On Site:	None		
USACE Personnel On Site:	Jough Donakowski – USACE KC		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation		
Work Performed:	- Performed quality control on radiological instrumentation - Continued drive-over gamma survey - Performed walkover surveys in inaccessible areas to the RTV		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	None		
Tomorrow's Expectations:	Continue drive-over gamma survey		
By: *Greg Bright*	TITLE: Field Site Manager (Cabrera Services) (m) 781-264-4445		

DAILY QUALITY CONTROL REPORT		***Date:***	December 11, 2009
		Day:	Friday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121109-08
Contract No.:	W912DQ-08-D-0003	***Wind:***	10-20 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	20-36° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Greg Bright, Althea Williams, Dennis Criswell		
Subcontractors On Site:	Barry Phillips (onsite to collect lost keys)		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation		
Work Performed:	- Performed quality control on radiological instrumentation - Continued drive-over gamma survey - Performed walkover surveys in inaccessible areas to the RTV		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	None		
Tomorrow's Expectations:	Continue drive-over gamma survey		
By: *Greg Bright*	TITLE: Field Site Manager (Cabrera Services) (m) 781-264-4445		

DAILY QUALITY CONTROL REPORT		***Date:***	December 14, 2009
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121409-09
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	40-48° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Greg Bright, Althea Williams, Dennis Criswell		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation		
Work Performed:	- Performed quality control on radiological instrumentation - Continued drive-over gamma survey - Performed walkover surveys on church/Municipal Building property, where wet conditions could cause the RTV to damage the lawn		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	None		
Tomorrow's Expectations:	Continue drive-over gamma survey		
By: *Greg Bright*	TITLE: Field Site Manager (Cabrera Services) (m) 781-264-4445		

DAILY QUALITY CONTROL REPORT		***Date:***	December 16, 2009
		Day:	Wednesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-11
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	25-35° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Althea Williams, Dennis Criswell, Kevin Kosko		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation		
Work Performed:	- Performed quality control on radiological instrumentation - Continued drive-over gamma survey - Investigated possibilities on how best to perform gamma walk-over surveys in wooded areas.		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:			
Tomorrow's Expectations:	Continue drive-over gamma survey		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	December 17, 2009
		Day:	Thursday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-12
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	22-30° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Althea Williams, Dennis Criswell, Kevin Kosko		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Continued drive-over gamma survey - Investigated possibilities on how best to perform gamma walk-over surveys in wooded areas.		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – cold stress.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:			
Tomorrow's Expectations:	Continue drive-over gamma survey		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	December 18, 2009
		Day:	Friday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-113
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	24-34° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Continued drive-over gamma survey		
Quality Control Activities:	None		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – slips/trips/falls.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:			
Tomorrow's Expectations:	Continue drive-over gamma survey as weather permits, potential heavy snow over the weekend.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 4, 2010
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-114
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	15-24° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Althea Williams, Dennis Criswell, Kevin Kosko		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Routine surveys - Walk Over surveys		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Be aware of your walking surface.		
Problems Encountered/ Corrective Action Taken:	GPS on the CLASS System malfunctioned. Initially the team and SME thought it was a battery problem but after 2 hours of charging the unit remained inoperable. Replacement parts would not arrive on site until at least 1030 hrs 1/05/10 so the decision was made to send Dennis Criswell to the East Hartford office to retrieve replacement parts.		
Special Notes:	None		
Tomorrow's Expectations:	Correct CLASS System GPS issue and continue drive-over surveys.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 5, 2010
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-115
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	18-30° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Althea Williams, Dennis Criswell, Kevin Kosko		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Performed maintenance on equipment - Routine surveys - Drive over surveys Over surveys		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Be aware of your surroundings.		
Problems Encountered/ Corrective Action Taken:	GPS on the CLASS System malfunctioned; the team contacted Cabrera SME Joe Weismann and corrected the problem. Drive over surveys resumed at 0900 with no additional issues.		
Special Notes:	None		
Tomorrow's Expectations:	Continue drive-over surveys.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 6, 2010
		Day:	Wednesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-116
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	24-32° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Althea Williams, Dennis Criswell, Kevin Kosko		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Routine surveys - Drive over surveys		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Avoid Pinch Points.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	None		
Tomorrow's Expectations:	Continue drive-over surveys.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 11, 2010
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-118
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-5 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	24-32° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Althea Williams, Dennis Criswell, Kevin Kosko, Ann Jacobs		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Routine surveys - Drive over surveys - Walk over surveys		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Driving safety while operating CLASS in public areas.		
Problems Encountered/ Corrective Action Taken:	The CLASS system malfunctioned; we contacted J Weisman and the manufacture for troubleshooting assistance. The unit was brought online ~1200hrs.		
Special Notes:	None		
Tomorrow's Expectations:	Continue drive-over/walk-over surveys.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 12, 2010
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-119
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	24-35° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Drive over surveys of field and church - Walk over surveys		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Review of NJDEP requirements for intrusive work at MML.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	None		
Tomorrow's Expectations:	Complete drive-over/walk-over surveys in the church yard and begin survey of municipal property.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 13, 2010
		Day:	Wednesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-120
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	25-42° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs, Althea Williams		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	Rob from the Borough Maintenance crew stopped by to coordinate moving vehicles that will facilitate GWS of Municipal Building parking lot.		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Drive over surveys of field, municipal building lot and church lot - Walk over surveys		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Interacting with public		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	Met with Ms. Kathy Anello Middlesex Borough Clerk to discuss the possibility of moving emergency vehicles, trailers and trash dumpsters on the Municipal building property in order to access areas for survey. Ms Anello stated that she would arrange to have everything that will start moved beginning tomorrow morning.		
Tomorrow's Expectations:	Complete drive-over/walk-over surveys in the Municipal Building yard and Recycle Plant.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 18, 2010
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-122
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	27-47° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Chris Boes, Ann Jacobs, Althea Williams		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Drive over surveys of field, and southern perimeter between Mountain Rd and fence - Walk over surveys in woods. - Lay out survey grids in woods. - Completed drive-over survey.		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Dangerous footing in woods.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:			
Tomorrow's Expectations:	Demobilize RTV, continue walk-over surveys in woods and continue to establish grids in the woods.		
By: *Chris Boes*	TITLE: Project Manager (Cabrera Services) 410-371-2267 (cell)		

DAILY QUALITY CONTROL REPORT		***Date:***	January 19, 2010
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-123
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	32-44° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Chris Boes, Ann Jacobs, Althea Williams, Kevin Kosko		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- RTV - Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Walk over surveys in woods. - Lay out survey grids in woods. - Prepared RTV for demobilization and performed release survey.		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Dangerous footing in woods.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:			
Tomorrow's Expectations:	Release of RTV and demobilize. Conduct walk-over surveys in woods and continue to establish grids in the woods. Initiate surface soil sampling.		
By: *Chris Boes*	TITLE: Project Manager (Cabrera Services) 410-371-2267 (cell)		

DAILY QUALITY CONTROL REPORT		***Date:***	January 20, 2010
		Day:	Wednesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-124
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	32-44° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs, Stephan Owe, Althea Williams		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	Mr. John – portable restroom service		
Equipment On Site:	- Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Walk over survey of the woods in the northwest area of the property. - Prepare for surface soil sampling by locating and flagging all sample locations and organizing sampling containers.		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – continue working safely, being mindful of the surrounding; watch out for ice and other fall hazards;		
Problems Encountered/ Corrective Action Taken:	Experienced problems uploading waypoints to GPS receiver. Problem was rectified by using a printout of the waypoints and manually locating the points with the GPS unit.		
Special Notes:	Kevin Kosko, the field site lead, departed the site early due to a family emergency. He will return on-site on Monday, and is still accessible by phone.		
Tomorrow's Expectations:	Continue walkover survey of wooded area and begin surface soil sampling.		
By: *Althea Williams*	TITLE: Site Radiation Lead (Cabrera Services) (w) (410)-332-8177		

DAILY QUALITY CONTROL REPORT		***Date:***	January 21, 2010
		Day:	Thursday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-125
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	32-44° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Ann Jacobs, Stephan Owe, Althea Williams		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- Office Trailer - Storage Container - Radiological instrumentation - Generator		
Work Performed:	- Performed quality control on radiological instrumentation - Completed gamma walkover survey of MML woods. - Collect and shipped 27 (25 sample locations, 2 duplicates) surface soil samples. Five of the samples were analyzed for TAL and chemicals (VOCs, SVOCS, PCBs, etc) and 2 were analyzed for TCLP.		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – slips, trips and falls.		
Problems Encountered/ Corrective Action Taken:	Readings were collected with a PID and methane meter at all surface sample locations. These reading did not return any values. Chris Boes (project manager) and Joe Weismann (project health physicist) were contacted and they selected the locations that required chemical analysis and TCLP analysis based on previous investigations and data.		
Special Notes:	Due to the completion of the gamma walkover surveys and the surface soil samples and the availability of the geoprobe and excavation contractors the crew will be working from Tuesday to Friday of next week.		
Tomorrow's Expectations:	Begin preparations for test pitting and excavation.		
By: *Althea Williams*	TITLE: Site Radiation Lead (Cabrera Services) (w) (410)-332-8177		

DAILY QUALITY CONTROL REPORT		***Date:***	January 26, 2010
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-126
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-5 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	30-45° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs, Althea Williams, John Oliver		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	Hertz and Bobcat equipment delivery		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Generator - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Walk over surveys to fill in gaps - Lay out survey grids in woods.		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A tailgate health and safety meeting was conducted prior to the start of work activities. All work was performed in Level D. Health and Safety topic – Safe operations around heavy equipment.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	Due to heavy rains over the weekend areas a substantial portion of the wooded area is under water.		
Tomorrow's Expectations:	Start Geo-probe and test pits		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 27, 2010
		Day:	Wednesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-127
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	30-42° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs, Althea Williams, John Oliver		
Subcontractors On Site:	EPI Drillers		
USACE Personnel On Site:	None		
Visitors On Site:	Pine Environmental equipment delivery		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Completed test pits 1,5 and 6 - Began geo-probing at location C-6		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions, was completed. Rad Awareness training was given to the geo-probe crew.		
Problems Encountered/ Corrective Action Taken:	IH instrumentation that had been ordered was not delivered thereby delaying geo-probe activities. The rotary cutter on skidsteer did not work, contacted Bobcat of Central NJ to schedule repairs.		
Special Notes:	Due to heavy rains over the weekend areas a substantial portion of the wooded area is under water.		
Tomorrow's Expectations:	Continue test pits, geo-probing and brush clearing.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	January 28, 2010
		Day:	Thursday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-128
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	30-42° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs, Althea Williams, John Oliver		
Subcontractors On Site:	EPI Drillers (Scott Crawford, Warren Atkinson)		
USACE Personnel On Site:	None		
Visitors On Site:	Bobcat of Central New Jersey – mechanic for skidsteer.		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Completed test pits 3, 8 and 9. - Completed geo-probes C6 and C8. - Continued brush clearing. - Staked surface soil locations in wooded area and remaining test pits.		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions, was completed.		
Problems Encountered/ Corrective Action Taken:	Excavation of TP-3 temporarily suspended due to elevated methane levels. Area was evacuated until levels diminished; no additional delays resulted. Experiencing difficulties with inserting PVC casing for downhole gamma logging in geo-probes due to borehole diameter and borehole collapse. Scheduled delivery of larger drill rig to be brought on site and geo-probe operations suspended. The rotary cutter on skidsteer did not work, Bobcat of Central NJ on site for repairs.		
Special Notes:	During excavation of TP-9 encountered a radium dial clock and piece of concrete. The piece of concrete had a count rate of approximately 40,000 cpm. Due to heavy rains over the weekend areas a substantial portion of the wooded area is under water. Groundwater was encountered in the geo-probe location C8 at a depth of 8 to 12 ft bgs.		
Tomorrow's Expectations:	Continue test pits, complete brush clearing. Surface soil samples will be collected from wooded area.		

By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	January 29, 2010
		Day:	Friday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-129
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	30-42° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs, Althea Williams, John Oliver		
Subcontractors On Site:	EPI Driller Scott Crawford		
USACE Personnel On Site:	None		
Visitors On Site:	Bobcat to pick up skidsteer		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Completed test pits 2,4,7 and 10 - Continued GWS to fill in gaps - Released skidsteer back to Bobcat		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions, was completed.		
Problems Encountered/ Corrective Action Taken:	None		
Special Notes:	None		
Tomorrow's Expectations:	Surface soil sampling; complete GWS in previously inaccessible areas of the woods.		
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655		

DAILY QUALITY CONTROL REPORT		***Date:***	February 2, 2010
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-130
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-5 mph
Delivery Order No.:	0003	***Humidity:***	low
Cabrera Project No.:	08-3800.08	***Weather:***	30-42° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs, Althea Williams, John Oliver, Stephan Owe		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	Pine Environmental to drop off a PID meter		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Generators (3)		
Work Performed:	- Performed quality control on radiological instrumentation - Completed (8) soil samples in wooded area and prepared for shipment - Completed GWS survey		
Quality Control Activities:	Instrumentation daily QC		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Explosive monitoring performed during soil sampling activities, no elevated readings observed.		
Problems Encountered/ Corrective Action Taken:	The surface soil sampling team encountered a football sized sandstone in wooded grid #1. The rock read 62,910 cpm (using a 3x3 detector). Dave Hays was notified and he suggested sampling under the rock, marking with a locator flag and returning the rock to its original location. The team complied with his suggestion and a picture of the rock which is included below for reference. Surface soil samples were taken in areas of elevated activity as defined in the original gamma walk-over surveys. In most areas elevated readings were still present (on remaining ground surface) which could be indicative of subsurface contamination.		
Special Notes:	Scanned copies of the test pit logs are attached for review. They detail radiological, PID and LEL readings every 6" lift as well as a description of the soil's physical properties. Direct readings of the ground surface before and after surface soil sampling (in the woods) is included in a chart below.		

Tomorrow's Expectations:	Ship soil samples, begin geo-probe operations with new (larger) rig, and perform release survey on excavator.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

Sample Location	Reading before sample (cpm)	Reading after sample (cpm)	Comments
MML-SSW01-P-0.0-0.5	19K	21K	Sample taken under rock that read 62,910 cpm.
MML-SSW02-P-0.0-0.5	29K	31K	
MML-SSW03-P-0.0-0.5	27K	27K	
MML-SSW04-P-0.0-0.5	140K	163K	
MML-SSW05-P-0.0-0.5	131K	168K	
MML-SSW06-P-0.0-0.5	56K	72K	
MML-SSW07-P-0.0-0.5	18K	20K	Sample taken in directed location that did not exhibit elevated radiological readings.
MML-SSW07-P-0.0-0.5	29K	34K	

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Project: Middlesex Municipal Landfill	**TEST PIT LOG**
Project Location: Middlesex Borough, NJ	**No.:** TP-Ø1
Project Number: 08-3800.08	

Date(s) Excavated: 1/27/10	Logged By: J. Oliver	Checked By: A. Williams
Length of Excavation: 8'	Width of Excavation: 2'	Depth of Excavation: 7.8'
Excavation Equipment: Mini Excavator	Excavation Contractor: EPI	Approx. Surface Elev.: NA
Water Observations:		Weather: Sunny Cold
Test Pit Location: 492830.6 / 635387.7 (feet)		Surface Condition: Grassy, wet

Depth, Feet	Sample Type	Sample Number	**MATERIAL DESCRIPTION** Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*	**TESTS**
0			Sandy Clay, veryfine, brown. Organic Material. Wet, Soft.	14-16k LeLØ PIDØ
~~1~~ .5			Veryfine Sandy Clay. Some Silt. Dense. Slightly moist. DK Brown.	14-17K. LeLØ PIDØ
~~2~~ 1			Veryfine Sand. Some Silt. Dense. Some mottling. Slightly moist. DK. Brown	15-21K LeLØ PIDØ
~~3~~ 1.5			Veryfine Sand. Some clay. DK. Brown. mottled Trace Gravel. moist. Plastic.	15-17K LeLØ PIDØ
~~4~~ 2			Very fine Sand. Some Clay. moist. Plastic. DK Brown. mottled. Trace gravel.	14-17K LeL Ø PIDØ
~~5~~ 2.5			Very fine Sand. Some clay. Dense. plastic mottling DK. Brown. Wet. Trace Gravel. construction Debris	15-19K LeL Ø PIDØ
~~6~~ 3			fine Sand. Some silt. Trace Clay loose. Saturated. medium Brown Trace fine gravel. small amounts of trash.	15-19K LeL Ø PIDØ
~~7~~ 3.5			medium Sand. Clay lenses. DK Brown, very moist, Plastic. Heavily mottled. Some coarse gravel ½" Angular Construction Debris. Pulling up Trash (ie chains, legs, municipal waste)	19-26K 25132cpm LeL Ø PIDØ
~~8~~ 4			Coarse Sand. Significant amounts of Trash. moist. loose. DK Brown. Trash is becoming more prominent	15-20K LeLØ PIDØ 10 uremon Dirt Pile 7 urem @ hole.
~~9~~ 4.5			Coarse Sand. Significant trash. moist loose DK Brown.	16-20K LeLØ PIDØ
~~10~~ 5			Coarse Sand. Significant trash. Wet loose. DK Brown	16-19K LeL Ø PIDØ
~~11~~ 5.5			Fine Sand. Some Silt. Clay Streaks. Heavily mottled Red/Gray + lt. brown. Wet. Some fine gravel + municipal waste prominent throughout.	16-18K LeL Ø PIDØ
~~12~~ 6			Med Sand; some silt and clay; dark brown, wet, debris/Trash, organic odor present	14-16K LeL Ø PID Ø
~~13~~ 6.5			Med Sand, some silty clay, trash, dark brown, wet, organic odor present	~~14-16K~~ 16-17K LeL Ø PID Ø
~~14~~ 7				
			TD @ 7.8 ft bgs	

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Project: Middlesex Municipal Landfill
Project Location: Middlesex Borough, NJ
Project Number: 08-3800.08

TEST PIT LOG
No.: TP-02

Date(s) Excavated: 1/29/10	Logged By: S. Owe	Checked By: A. Williams
Length of Excavation: 8 ft	Width of Excavation: 2 ft	Depth of Excavation: 8 ft bgs
Excavation Equipment: Mini Excavator	Excavation Contractor: EPI	Approx. Surface Elev.: NA
Water Observations		Weather: Cold
Test Pit Location: 492661.3 / 635251.7 (feet)		Surface Condition: Grassy

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.)	TESTS
0			Sand, fine to very fine, some silt, some OM, brown, dry	14-16 K LeI Ø PID Ø
0.5		1	↓	14-16 K LeI Ø PID Ø
1.0		2	Mostly Glass debris, Sand, fine to very fine, some silt, some large	14-16 K LeI Ø PID Ø
1.5		3	↓ angular gravel, brown, dry	14-15 K LeI Ø PID Ø
2.0		4	Sand, fine to very fine, brown, large angular gravel, debris	13-15 K LeI Ø PID Ø
2.5		5	↓ Reddish brown	14-16 K LeI Ø PID Ø
3.0		6	Sand, fine to very fine, reddish brown, loose, trace silt, moist	14-16 K LeI Ø PID Ø
3.5		7	↓	14-16 K LeI Ø PID Ø
4.0		8	↓	15-17 K LeI Ø PID Ø
4.5		9	Sand, fine to very fine, reddish brown, loose, moist, trace silt	15-17 K LeI Ø PID Ø
5.0		10	Sand, fine to very fine, reddish brown, loose, moist	15-17 K LeI Ø PID Ø
5.5		11	↓ some pea gravel, rounded	15-17 K LeI Ø PID Ø
6.0		12	↓	15-17 K LeI Ø PID Ø
6.5		13	Sand, fine to very fine, reddish brown, loose, moist, trace med rounded gravel	15-17 K LeI Ø PID Ø
7.0		14	↓	14-16 LeI Ø PID Ø
7.5			↓	14-16 K LeI Ø PID Ø
8.0				

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-03

Date(s) Excavated	1/28/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Snow, Cold
Test Pit Location	492751.7 / 635173.2 (feet)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	CPM / % / PPM TESTS
0		Clay, some sand, with coarse gravel, reddish brown, OM	21-22K Lel Ø PID Ø
0.5 1		Clay, some sand, with coarse gravel, reddish brown	23-24K Lel Ø PID Ø
1.0 2		Sandy Silt, very fine, olive green, firm	20-21K Lel Ø PID Ø
1.5 3		Sandy Gravel, medium, dark brown	20-23K Lel Ø PID Ø
2.0 4		Silty Sand, dark brown, loose,	21-22K Lel 7% PID 0.5
2.5 5			21-23K Lel 6% PID 0.2
3.0 6		debris	21-23K Lel 5% PID 0.1
3.5 7		debris	20-21K Lel 3% PID 0.3
4.0 8		Sand, some silt, fine to med, debris	20-22K Lel >10% PID 0.6
4.5 9			19-21K Lel 3% PID 0.6
5.0 10		Sandy, some silt, trace gravel, fine to medium, debris	18-19K Lel 12% PID 1.1
5.5 11		Sand, fine to very fine, some clay, brown, debris/trash	17-19K Lel 1% PID 2.1
6.0 12		Clayey sand, very fine, brown, debris	17-18K Lel 0% PID 0.7
6.5 13		Sand, medium to fine, well sorted, brown, debris	17-19K Lel 0% PID 3.3
7.0 14		Sand, medium to coarse, loose, brown, debris	18-20K Lel Ø PID 1.6
7.5		Sandy, medium to coarse, loose, brown, debris	17-19K Lel Ø PID 1.0
		TD @ 8.0 ft bgs	

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Project: Middlesex Municipal Landfill	TEST PIT LOG
Project Location: Middlesex Borough, NJ	No.: TP-04
Project Number: 08-3800.08	

Date(s) Excavated 1/29/10	Logged By S. Owe	Checked By A. Williams
Length of Excavation 8ft	Width of Excavation 2ft	Depth of Excavation 8ft bgs
Excavation Equipment Mini Excavator	Excavation Contractor EPI	Approx. Surface Elev. NA
Water Observations		Weather Cold
Test Pit Location 492682.7 / 635206.5 (feet)		Surface Condition Grassy

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.)	TESTS
0			Silty Sand, very fine, brown, some OM, dry	17-19K LeI Ø PID Ø
0.5 1			Silty Sand, very fine, some coarse, brown, some OM, dry	16-18K LeI Ø PID Ø
1.0 2			Silty Sand very fine, some coarse, brown, dry	17-18K LeI Ø PID Ø
1.5 3			Sand, fine to medium, loose, reddish brown, dry	17-18K LeI Ø PID Ø
2.0 4			Gravelly Sand, fine to medium, large angular gravel, loose, dk brown	15-17K LeI Ø PID Ø
2.5 5			↓	15-17K LeI Ø PID Ø
3.0 6			↓	14-16K LeI Ø PID Ø
3.5 7			Gravelly Sand, fine to med, large gravel brown, loose, angular, dry	15-17K LeI Ø PID Ø
4.0 8			Sand, fine to med, loose, significant trash, dry	15-17K LeI Ø PID Ø
4.5 9			Sand, fine to medium, loose, Trash, gray brown, dry	16-18K LeI Ø PID Ø
5.0 10			↓ + Medium rounded gravel and trace coarse sand	16-18K LeI Ø PID Ø
5.5 11			Sand, fine to medium, some rounded gravel, trash, Petroleum odor, moist	17-19K LeI Ø PID 1.8
6.0 12			↓ Petroleum odor	17-19K LeI Ø PID 3.8
6.5 13			↓ Some clay	15-17K LeI Ø PID 2.5
7.0 14			Sand, fine to med, brown, trash Some clay, Petroleum odor	15-17K LeI Ø PID 0.4
7.5			↓	15-17K LeI Ø PID 0.4
8.0				

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-05

Date(s) Excavated	1/27/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8.0 ft bgs
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Sunny Cold
Test Pit Location	492885.0 / 635118.4			Surface Condition	Grassy

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	TESTS
0			Sandy Clay, very fine, soft, brown moist	18-20 K LeL 0 PID 0
0.5 / 1			dark brown	19-20 K LeL 0 PID 0
1 / 2			Sandy Clay, very fine, soft, dark brown, moist, trace organic Material	19-22 K LeL 0 PID 0
1.5 / 3			= sandy Silt layer, very fine, dense, olive color @ 1.7'	19-22 K LeL 0 PID 0
2 / 4				18-21 K LeL 0 PID 0
2.5 / 5			Sandy Clay, very fine, soft, dark brown moist, trace OM (Sandy silt layer, very fine dense, olive @ 2.7')	18-21 K LeL 0 PID 0
3 / 6			Silty Sand, med to fine, loose, moist	15-19 K LeL 0 PID 0
3.5 / 7			Silty Sand, fine to medium, well graded, gray	17-19 K LeL 1% PID 0
4 / 8				17-20 K LeL 1% PID 0
4.5 / 9			Sandy Silt, very fine, hard, dense, dry	17-19 K LeL 1% PID 0
5 / 10			and trash / debris	17-19 K LeL 1% PID 0
5.5 / 11			and trash / debris, organic odor	17-19 K LeL 9% PID 0
6 / 12			Sand, fine to coarse, well sorted, dark brown, loose, lots of debris	16-19 K LeL 3% PID 0
6.5 / 13				15-16 K LeL 3% PID 0
7 / 14			Clayey Sand, fine, OM, debris, wet	15-16 K LeL 3% PID 0
7.5			Sand, fine to med, debris, wet	15-17 K LeL 6% PID 0
8.0			TD @ 8.0 ft bgs	

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-06

Date(s) Excavated	1/27/10	Logged By	J. Oliver	Checked By	A. Williams
Length of Excavation	8'	Width of Excavation	2'	Depth of Excavation	8.0'
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Sunny, cold
Test Pit Location	492979.6 / 635233.6 (feet)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	TESTS
0		Silty Clay, med density, dark brown	19-21K LeL 0 PID 0
.5 1		Silty Clay, med density, some organic material	~~14-17K~~ 20-24K LeL 0 PID 0
1 2		Silty Clay, trace gravel, slightly moist, reddish brown	20-23K LeL 0 PID 0
1.5 3		Silty Clay, trace fine gravel, slightly moist, reddish brown	21-24K LeL 0 PID 0
2 4		Sand, fine, trace med gravel, debris/trash	20-24K LeL 0 PID 0
2.5 5		Silty Clay, mottled, heavily brittle, dark brown, trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
3 6		Silty Clay, mottled, heavily brittle, dark brown, trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
3.5 7		Silty Clay, mottled, heavily, brittle, dark brown trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
4 8		Silty Clay, mottled, heavily brittle, dark, brown, trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
4.5 9		Silty Clay, mottled, brittle, dark, brown, trash/debris, trace fine gravel and large cobbles	19-22K LeL 5% PID 0
5 10		Silty Clay, mottled, brittle, dark brown, trace large cobbles and fine gravel	19-22K LeL 6% PID 0
5.5 11		Silty Clay, heavily mottled, brittle, large amount of trash/debris, dark brown, trace large cobbles, trace gravel	19-22K LeL 5% PID 0
6 12		Sandy clay, dark brown, very soft, fine to med, well sorted	18-22K LeL 5% PID 0
6.5 13		↓	18-22K LeL 10% (drop to 8% after 15min) PID 0
7 14		Sandy clay, dark brown, organic matter, trash/debris	19-22K LeL 11% PID 0
7.5 8.0	TD@ 8.0 ft bgs ↓		19-22K LeL 8% PID 0

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-07

Date(s) Excavated	1/29/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft bgs
Excavation Equipment	Min. Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Cold
Test Pit Location	493613.4 / 634837.5 (ft)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*	TESTS
0		Silty clay, medium density, strong brown; dry	16-20K Lel Ø PID Ø
0.5 1		Silty Clay, medium density, strong brown, dry, trace gravel	17-20K Lel Ø PID Ø
1.0 2		Silty sand, soft, loose, dry, very fine, some med Gravel and cobbles	16-21K Lel Ø PID Ø
1.5 3		Clay, fat, dense, hard, very plastic, trace medium sand, debris	17-21K Lel Ø PID Ø
2.0 4		Sand, some silt, loose, soft, moist, dark brown, significant trash	16-19K Lel Ø PID Ø
2.5 5		wet, organic odor	16-18K Lel Ø PID Ø
3.0 6		mostly trash / debris	13-17K Lel Ø PID Ø
3.5 7		mostly trash / debris	14-18K Lel Ø PID Ø
4.0 8		Sand, fine, dark brown, trash, moist	14-17K Lel Ø PID Ø
4.5 9		Sand, fine, loose, dark brown, some cobbles, angular, trace gravel, significant debris	13-16K Lel Ø PID Ø
5.0 10			13-17K Lel Ø PID Ø
5.5 11			15-19K Lel Ø PID Ø
6.0 12		Gravelly Sand, med to fine, loose, soft, gray, rounded gravels, debris	13-17K Lel Ø PID Ø
6.5 13			13-18K Lel Ø PID Ø
7.0 14		wet LEL @ 7%	14-18K Lel 7% PID Ø
7.5		LEL @ 13%	16-19K Lel 13% PID Ø
8.0		TD @ 8 ft bgs	

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-08

Date(s) Excavated	1/28/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Snow / Cold
Test Pit Location	493756.2 / 634687.6 (feet)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	TESTS
0		Silty Clay, some sand, brown, organic material	14-15K Lel Ø PID 0.2
0.5 1		Sandy Clay, fine to coarse, poorly sorted, brown, debris	14-15K Lel Ø PID 0.3
1.0 2		Sandy Gravel, some clay, fine to coarse, brown	15-16K Lel Ø PID 0.3
1.5 3		Sandy clay, fine to medium, soft, wet	17-18K Lel Ø PID Ø
2.0 4		Sandy Clay, fine to medium, med density, wet, debris, perched water	18-19K Lel Ø PID Ø
2.5 5		↓	16-18K Lel Ø PID Ø
3.0 6		Clayey Sand, fine to coarse, some gravel, brown, wet debris	16-17K Lel Ø PID Ø
3.5 7		Sand, fine to medium, some clay, brown, significant debris	16-17K Lel Ø PID Ø
4.0 8		Sand, fine to medium, loose, dry significant debris	17-18K Lel Ø PID Ø
4.5 9		↓	17-18K Lel Ø PID Ø
5.0 10		↓	17-18K Lel Ø PID Ø
5.5 11		↓	15-17K Lel Ø PID Ø
6.0 12		Sandy Clay, some gravel, dark brown, very soft, OM, debris	16-17K Lel Ø PID Ø
6.5 13		↓	15-16K Lel Ø PID Ø
7.0 14		↓	15-16K Lel Ø PID Ø
7.5		↓	15-16K lel Ø PID Ø
8.0		TD @ 8 ft bgs	

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-09

Date(s) Excavated	1/28/10	Logged By	J. Oliver	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Snow, Cold
Test Pit Location	493972.8 / 634697.1 (ft)			Surface Condition	Grassy

Depth, Feet	Sample Type / Sample Number	MATERIAL DESCRIPTION (Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*)	TESTS
0		Clay and Silt, strong brown, fairly loose, trace med sand, significant OM, Some Cobbles	22-45K Hot spot = 48,459 cpm Lel Ø PID Ø
0.5		Silty Clay, strong brown, fairly loose, Some cobbles. Concrete piece found, elevated cpm	21-26K Concrete = 41,327 cpm Lel = Ø PID Ø
1.0		Sandy Clay, Strong brown, dry, fairly loose, coarse, poorly sorted, med plasticity, some cobbles and coarse to fine gravel	23-26K Lel Ø PID Ø
1.5		↓ and trash/debris	23-28K Lel Ø PID Ø
2.0		Sand, fine to very fine, loose, well sorted, dry, trace gravel	21-23K Lel Ø PID Ø
2.5		↓	~~18-19K~~ 21-23K Lel Ø PID Ø
3.0		↓ Some silt	21-23K Lel Ø PID Ø
3.5			18-19K Lel Ø PID Ø
4.0		↓ moist	17-19K Lel Ø PID Ø
4.5		Sand, medium to very fine, loose, dry, brown, trace gravel	20-25K Lel Ø PID Ø
5.0		Clay, fat, moist, very plastic, soft, dense, trace medium gravel, trace very fine sand	17-18K Lel Ø PID Ø
5.5		Sand, very fine, cemented, brown, dry, debris	17-18K Lel Ø PID Ø
6.0		Silty Clay, trace sand and gravel, mottled, dry, strong brown	18-19K Lel Ø PID Ø
6.5		↓ Instrument dial found ~70K cpm	18-19K (Dial 70K cpm) Lel = Ø PID = Ø
7.0			18-19K Lel Ø PID Ø
7.5			18-19K Lel Ø PID Ø
8.0			

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Project: Middlesex Municipal Landfill **Project Location:** Middlesex Borough, NJ **Project Number:** 08-3800.08	**TEST PIT LOG** **No.:** TP-10

Date(s) Excavated	1/29/10	Logged By	S. Owe	Checked By	A. Williams
Length of Excavation	8 ft	Width of Excavation	2 ft	Depth of Excavation	8 ft
Excavation Equipment	Mini Excavator	Excavation Contractor	EPI	Approx. Surface Elev.	NA
Water Observations				Weather	Cold
Test Pit Location	494051.3 / 634756.6 (ft)			Surface Condition	Grassy

Depth, Feet	Sample Type	Sample Number	MATERIAL DESCRIPTION Group Name, Group Symbol, Consistency, Density, Color, Moisture, Structure. *Eg. Well-graded SAND with GRAVEL (SW), medium dense, brown to light gray, wet, little coase GRAVEL, few fines, weak cementation, stratified.*	TESTS
0			Silty Sand, fine to medium, brown, OM, trace gravel, Angular	14-16 K Lel Ø PID Ø
0.5			Silty Sand, very fine, loose, brown, dry, debris	13-14 K Lel Ø PID Ø
1.0			Silty Sand, fine, ~~to med, some coarse~~, ~~some~~, debris, loose	13-14 K Lel Ø PID Ø
1.5			Silty Sand, fine to medium, some coarse, OM, debris	13-14 K Lel Ø PID Ø
2.0			↓	12-14 K Lel Ø PID Ø
2.5			Silty Sand, fine, trace large gravel, OM, dry, debris	15-16 K Lel Ø PID Ø
3.0			↓ + significant debris	14-15 K Lel Ø PID Ø
3.5			↓ + significant debris	13-15 K Lel Ø PID Ø
4.0			Sandy Clay, very fine, some pea gravel, rounded, reddish brown, soft debris, moist	13-15 K Lel Ø PID Ø
4.5			Organic debris / matter	13-14 K Lel Ø PID Ø
5.0			Sand, fine to medium, light brown organic matter and debris, wet	13-15 K Lel Ø PID Ø
5.5			Sandy Clay, very fine, reddish, brown, medium, OM / debris, moist	12-14 K Lel Ø PID Ø
6.0			↓	13-14 K Lel Ø PID Ø
6.5			↓	13-14 K Lel Ø PID Ø
7.0			Organic Material / Debris	12-14 K Lel Ø PID Ø
7.5			↓	12-14 K Lel Ø PID Ø
8.0				

DAILY QUALITY CONTROL REPORT		***Date:***	February 3, 2010
		Day:	Wednesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-131
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-5 mph
Delivery Order No.:	0003	***Humidity:***	High
Cabrera Project No.:	08-3800.08	***Weather:***	26-36° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Ann Jacobs, Althea Williams, John Oliver, Stephan Owe		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3)		
Work Performed:	- Performed quality control on radiological instrumentation - Performed geo-probe investigation at locations GP-2, GP-15 and GP-17 - Completed incoming survey of geo-probe rig		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Read directly from applicable sections of the QAPP, PWP and AHAs.		

Problems Encountered/ Corrective Action Taken:	GP- 15 geo-probe operation began at 1005 hrs - At 1010 hrs (10' bgs) the explosive monitor alarmed and flashed "over" (which indicates that the instrument is maxed out or sensor is over range). Work was stopped and the workers exited the immediate work area. - At 1030 the area (flush with top of casing) was monitored and still read "over" - At 1045 the area was monitored again and still read "over" the team abandoned the geo-probe (left metal casing in the ground) and proceeded to GP-17 location - At 1135 the area was monitored again and still read "over" - At 1322 the area was checked again and read 17% LEL. - At 1450 we returned to the GP-15 location and monitored the hole (flush with casing) and found 0% LEL. Due to the fact it had taken gas levels in this location so long to dissipate to acceptable levels I was hesitant to try to go any deeper (we achieved 10'bgs) or to attempt to drive the oversize casing in order to do down-hole monitoring. We did however retrieve samples from 0-10' bgs, the samples were frisked directly, the highest two areas were retained as laboratory samples. - The steel casing was removed and the hole covered with plastic and a rock while a decision is made as to the path forward for this location. GP-17 geo-probe operation began at 1102 - At 1105 (5'bgs) the explosive monitor alarmed "high" (which indicates concentrations greater than the alarm limit but not saturated) and read 58% LEL. Work was stopped and the immediate work area evacuated. - At 1120 the area was checked again and still alarmed "high" 31% LEL - At 1130 the area was checked again and read 18% LEL so the work team broke for lunch. - At 1310 the area was checked again and read 0% LEL so work proceeded and the probe was advanced another 5' (achieved10' bgs) - At 1320 the explosive monitor alarmed and read "over" and the immediate work area was again evacuated. - At 1335 the area was checked and read "over" - At 1350 the area was monitored again and found to be less than 10% LEL, the geo-probe was inserted to 12" and the core was removed with no further alarms. Then the larger metal casing (with tip) was installed into the probe hole and inserted to 12' without incident or alarm. - Down-hole monitoring completed and the crew proceeded to GP-2 location (western portion of the site) to see if similar gas concentrations are encountered GP-2 geo-probe operations commenced at 1510 hrs - The geo-probe was advanced 5' with no alarms - At 1517 the core from 5'-10' bgs was removed the explosive gas monitor read "high" @ 66% LEL and the crew stepped away from the immediate work area. - At 1527 the area was monitored again and the LEL reading was "over"; the crew continued to wait away from the immediate work area. - At 1537 the area was monitored again and found to be "over " - At 1547 the LEL read 2% and we restarted operations - At 1610 (12' bgs) the LEL monitored again alarmed @ 85% the crew stepped away from the immediate work area. - At 1625 the area was re-monitored and alarmed "high" at 15% - At 1630 the meter read 3% and work resumed. The crew retrieved the remaining core sample and drove the plastic casing in the ground. Down-hole monitoring was completed without incident or additional alarms. The team encountered limited core recovery issues thereby calling into question the validity of down-hole readings correlating directly to a given spot on the core sample itself. The team represented the information as accurately as possible and also scanned the cores directly in order to determine the highest area of activity prior to placing the core into sample containers. Several discussions with Dave Hays ensued in order to inform him that we hit methane concentrations exceeding our action level as well as steps taken by the crew in response to the alarms.

Special Notes:	A conference call will be requested for Thursday 02/04/10 to discuss an operational path forward given methane issues.
Tomorrow's Expectations:	Continue geo-probe activities.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	February 15, 2010
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-134
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	Low
Cabrera Project No.:	08-3800.08	***Weather:***	26-40° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Snow Removal - Performed geo-probe investigation at locations GP-07, GP-09, GP-10, GP-11 and GP-12. Please see details below. - Performed Equipment pre-operational checks		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Read directly from applicable sections of the QAPP, PWP and AHAs.		

Problems Encountered/ Corrective Action Taken:	Approximately 10" of snow was removed from the trailer area and paths were made using a skid steer to gain access to geo-probe locations. **GP-07** - Down-hole gamma survey completed no methane issues to report. **GP-12** - Geo-probe activities commenced at 0940hrs. Methane was encountered (7' bgs) with maximum concentrations @10% LEL. Work in this location was completed at 1055 with no other issues or alarms encountered. **GP-1** - This location is adjacent to the daycare (~ 8' from building) and due to snow covering the ground it was unclear if NJ One Call had marked potential buried utilities. The team moved to another location until this information could be ascertained. **GP-09** - Geo-probe activities commenced at 1125hrs. Methane gas was encountered several times at various depths. The explosive meter read "over" on several occasions and the field team backed out of the immediate area and allowed gas to dissipate to concentrations below 10% LEL before continuing work. **GP-10** - Geo-probe activities commenced at 1440hrs. Methane encountered at several locations, maximum reading "over" at 12" bgs. Crew backed out of area and waited for concentrations to dissipate. Work at GP-10 complete at 1534hrs. **GP-11** - Geo-probe activities commenced at 1546hrs with the highest methane concentration 16%. Work completed at 1640hrs. Throughout the day when the LEL exceeded 10% workers added dry ice pellets and a small amount of water to the bore hole. This practice was relatively successful in dissipating methane gas more expeditiously than natural venting. Maximum methane concentration 12" downwind of bore casing was 3% LEL. Dave Hays was informed of the conditions and progress.
Special Notes:	As a result of the conference call with USACE and Cabrera personnel it was decided to monitor for LEL at that casing plane (as has been done in the past) as well as a down wind reading at 12" from the hole. Additionally, the probe pushes were shortened (to 2' and then 3') in order to determine if recovery would improve. After implementing this plan it was determined that recovery using 3ft pushes is nearly 100% depending on soil type.
Tomorrow's Expectations:	Continue geo-probe activities.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	February 16, 2010
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-135
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	Low
Cabrera Project No.:	08-3800.08	***Weather:***	26-43° F Light Snow
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Snow Removal - Performed geo-probe investigation at locations GP-19, GP-28, GP-29, GP-30, GP-35 and GP-36. Please see details below. - Performed Equipment pre-operational checks		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Read directly from applicable sections of the QAPP, PWP and AHAs.		

Problems Encountered/ Corrective Action Taken:	**GP- 35** - Work commenced at 0740hrs, maximum methane concentration was 35% LEL. **GP-36** - Geo-probe activities commenced at 0840hrs. Methane was encountered (10' bgs) with maximum concentrations exceeding the upper range of the explosive meter. Unlike other probe locations methane concentrations were "over" up to 3' away from the casing. Dave Hays was notified and the hole properly abandoned. **GP-19** - Geo-probe activities commenced at 0922hrs. Methane gas was encountered at various depths. The explosive meter read "over" on several occasions and the field team backed out of the immediate area and allowed gas to dissipate to concentrations below 10% LEL before continuing work. **GP-28** - Geo-probe activities commenced at 1115hrs. Methane gas was encountered with the maximum observed concentration @ 27% LEL. **GP-29** - Geo-probe activities commenced at 1428hrs maximum observed methane concentration was 6% LEL. The geo-probe hit refusal at 10'bgs. **GP-30** - Geo-probe activities commenced at 1541hrs. Methane gas was encountered at various depths. The explosive meter read "over" on several occasions and the field team backed out of the immediate area and allowed gas to dissipate to concentrations below 10% LEL before continuing work. Throughout the day when the LEL exceeded 10% workers added dry ice pellets and a small amount of water to the bore hole. This practice was relatively successful in dissipating methane gas more expeditiously than natural venting. Dave Hays was informed of the conditions and progress.
Special Notes:	As a result of the conference call with USACE and Cabrera personnel it was decided to monitor for LEL at that casing plane (as has been done in the past) as well as a down wind reading at 12" from the hole. Additionally, the probe pushes were shortened (to 2' and then 3') in order to determine if recovery would improve. After implementing this plan it was determined that recovery using 3ft pushes is nearly 100% depending on soil type.
Tomorrow's Expectations:	Continue geo-probe activities.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	February 17, 2010
		Day:	Wednesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-136
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	High
Cabrera Project No.:	08-3800.08	***Weather:***	24-45° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	Jough Donakowski		
Visitors On Site:	Pine Environmental dropped off calibration gas		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Snow Removal - Performed geo-probe investigation at locations GP-19, GP-28, GP-29, GP-30, GP-35 and GP-36. Please see details below. - Performed Equipment pre-operational checks		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Read directly from applicable sections of the QAPP, PWP and AHAs.		

Problems Encountered/ Corrective Action Taken:	**GP- 33** - Work commenced at 0815hrs, maximum methane concentration was 32% LEL. Note: there is a monitoring well 15' east of the geo-probe location. **GP-32** - Geo-probe activities commenced at 0945hrs. Maximum methane concentration was 26% LEL. **GP-31** - Geo-probe activities commenced at 1125hrs. Methane gas was encountered at various depths. The explosive meter read "over" and the field team backed out of the immediate area and allowed gas to dissipate to concentrations below 10% LEL before continuing work. Poor sample recovery. **GP-21** - Geo-probe activities commenced at 1415hrs. No methane problems were encountered. Geo-probe hit refusal at 10'. **GP-18** - Geo-probe activities commenced at 1525hrs No methane problems were encountered. Poor sample recovery in this area so a second attempt was made approximately 5' feet southwest and the probe hit refusal at 7'. The down-hole monitoring revealed elevated gamma readings of ~20,000 cpm. Suggest this area for test pit. Throughout the day when the LEL exceeded 10% workers added dry ice pellets and a small amount of water to the bore hole. This practice was relatively successful in dissipating methane gas more expeditiously than natural venting. The dry ice when mixed with water creates an ice slug that oftentimes decreases the recovery of core sample material. The Field Site Manager contacted the Cabrera PM, USACE Rep (Dave Hays) and Cabrera Corporate Safety Manager to discuss using nitrogen to inert the bore holes. All agreed with the concept and email notification of the revised engineered control was sent to the USACE PM. Dave Hays was informed of the conditions and progress.
Special Notes:	GP- 1 is located approximately 8' from the daycare.
Tomorrow's Expectations:	Continue geo-probe activities.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	February 18, 2010
		Day:	Thursday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-137
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-15 mph
Delivery Order No.:	0003	***Humidity:***	High
Cabrera Project No.:	08-3800.08	***Weather:***	24-44° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	Bobcat mechanic to repair skidsteer (bad battery)		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Snow Removal - Performed geo-probe investigation at locations GP-25, GP-26, and GP-27, Performed Equipment pre-operational checks		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Read directly from applicable sections of the QAPP, PWP and AHAs.		

Problems Encountered/ Corrective Action Taken:	**GP- 27** - Work commenced at 0810hrs, No methane concentrations .10% LEL encountered. Two attempts were made at this location due to poor recovery. **GP-25** - Geo-probe activities commenced at 1024hrs. Maximum methane concentration was 91% LEL. Used compressed nitrogen to inert probe hole with good success. **GP-26** - Geo-probe activities commenced at 1342hrs. Methane gas was encountered at various depths. The explosive meter read "over" and the field team backed out of the immediate area and allowed gas to dissipate to concentrations below 10% LEL before continuing work. Ran out of nitrogen gas, thereby this hole took an appreciable amount of time to complete. Throughout the day when the LEL exceeded 10% workers used nitrogen to inert the bore holes. This approach worked very well but the team ran out of nitrogen during work on GP-26. Dave Hays was informed of the conditions and progress.
Special Notes:	Per conference call the team will ensure NJ "one Call" has labeled underground utilities @ GP-1 location adjacent to the daycare. Work at the daycare will take place during off hours.
Tomorrow's Expectations:	Continue geo-probe activities.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	February 22, 2010
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-138
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	High
Cabrera Project No.:	08-3800.08	***Weather:***	26-44° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver, Mike Barsa		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Performed geo-probe investigation at locations GP-23, GP-24, GP-34 and attempted to complete GP-15 (second attempt) - Completed test pits in grid 4 (woods) and adjacent to GP-18 - Completed GWS of area between the eastern boundary fence and Pershing Ave (see attached map). - Completed down-hole monitoring log spreadsheet of all geo-probe locations completed to date.		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed.		

Problems Encountered/ Corrective Action Taken:	**GP- 24** Work commenced at 0730hrs, methane gas was encountered at various depths. The explosive meter read "over" and the field team backed out of the immediate area and utilized nitrogen gas to dissipate concentrations to below 10% LEL before continuing work. **GP-23** Work commenced at 0915 hrs, methane gas was encountered at various depths. The explosive meter read "over" and the field team backed out of the immediate area and utilized nitrogen gas to dissipate concentrations to below 10% LEL before continuing work. Elevated gamma readings (5080cpm) were found to exist at 1.5' bgs. **GP-34** Geo-probe activities commenced at 0945hrs. Methane gas was encountered at various depths. The explosive meter read "over" and the field team backed out of the immediate area and allowed gas to dissipate to concentrations below 10% LEL before continuing work. Elevated gamma readings (21,252cpm max) were found to exist 3' to 6' bgs. **GP-15** Geo-probe activities commenced at 1135hrs. The initial attempt to complete geo-probe activities at this location was made earlier in the project prior to developing engineered controls. Methane gas was encountered at 3'bgs. The explosive meter read "over" and the field team backed out of the immediate area and applied engineering controls (nitrogen gas and dry ice) with no success. Test pits were completed in zone 4 (wooded area) and adjacent to GP-18 near the eastern boundary fence adjacent to Pershing Ave. Excavation in zone 4 unearthed 2 small hot spots reading 110K cpm and 588K cpm @ 0-6" bgs, both locations were sampled. The test pit adjacent to GP-18 unearthed several large pieces of concrete exhibiting direct readings of up to 200K cpm (see attached pictures). Also in this area the team encountered an approximate 8" cast iron pipe that appears to be a water line, this pipe was not marked by NJ One Call even though they were notified and have marked other lines in the area. Geo-probe locations GP-1, 20, 21 and 22 could not be worked today as NJ One Call has not marked utilities on church property. One Call marking of the church property is expected to be complete Wednesday morning. Dave Hays was informed of the conditions and progress.
Special Notes:	Per conference call the team will ensure NJ "one Call" has labeled underground utilities on the church property prior to work. Work at the daycare will take place during off hours. The Cabrera FSM contacted Ms. Kathy Anello the Middlesex Borough Clerk to ensure the Right of Entry included the narrow strip of property (~ 4' wide) located between the eastern site boundary and Pershing Ave. It was verified that the ROE did indeed cover the property in question and a gamma walk over survey was performed in this area. Direct readings of up to 241K were found to exist, see attached walk-over data. A spreadsheet detailing down-hole gamma readings (taken to date) is attached.

Tomorrow's Expectations:	Continue geo-probe and test pit activities.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655


Hertz Equipment Rental
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DAILY QUALITY CONTROL REPORT		***Date:***	February 23, 2010
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-139
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	Rain with periods of heavy rain.
Cabrera Project No.:	08-3800.08	***Weather:***	33-44° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver, Mike Barsa		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Performed geo-probe investigation at locations GP-37, GP-38, GP-39, GP-40 and GP-42. - Completed test pit between surface soil locations C-12 and C-13 - Completed Test pit adjacent to GP-34 - Updated down-hole monitoring log spreadsheet of all geo-probe locations completed to date. - Completed release survey on skidsteer		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Methane levels at GP-37 consistently exceeded the upper range of the explosive monitor even though engineering controls were applied. A temporary cover was placed over the hole and an additional attempt to complete sampling will be made tomorrow. Work was halted in the area adjacent to Pershing Ave when it was unclear if NJ One Call had performed utility marking in the area (between the project east boundary fence and Pershing Ave). NJ One call was notified, the area will be available to work Monday.		

Problems Encountered/ Corrective Action Taken:	**GP- 37** Work commenced at 1615 hrs, methane gas was encountered at various depths. The explosive meter read "over" and the field team backed out of the immediate area and utilized nitrogen gas and dry ice in an attempt to dissipate the gas. Engineered controls were unsuccessful and a temporary cover placed on the hole. Additional attempts will be made tomorrow. **GP-38** No problems or issues to report. **GP-39** Geo-probe hit refusal at 3'. Additional attempts will be made after it is clear that NJ One Call has performed a utility survey. **GP-40** No problems or issues to report. **GP-42** No problems or issues to report. A test pit was completed between surface soil samples 12 and 13 (TP-13) maximum gamma reading 28Kcpm @ surface. During excavation of the test pit adjacent to GP-34 (TP-14) the team unearthed a pool ball size rock (that appears to be pitch blend ore) at a depth of 5'. The rock (see attached picture) read ~1,000,000 cpm (8 mR/hr) and was placed in a sample container. Geo-probe locations GP-1, 20, 21 and 22 could not be worked today as NJ One Call has not marked utilities on church property. One Call marking of the church property is expected to be complete Wednesday morning. Dave Hays was informed of the conditions and progress.
Special Notes:	Per conference call the team will ensure NJ "One Call" has labeled underground utilities on the church property prior to work. Work at the daycare will take place during off hours. A conference call was held between USACE representatives and Cabrera personnel. Meeting minutes will be submitted under a separate cover.
Tomorrow's Expectations:	Continue geo-probe activities and complete release survey of excavator.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655


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DAILY QUALITY CONTROL REPORT		***Date:***	February 24, 2010
		Day:	Wednesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-140
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-5 mph
Delivery Order No.:	0003	***Humidity:***	Humid, light periodic rain
Cabrera Project No.:	08-3800.08	***Weather:***	33-44° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver, Mike Barsa		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	- Performed quality control on radiological instrumentation - Performed geo-probe investigation at locations GP-22, GP-37 (started 2/23/10), GP-43, GP-44, GP-45, GP-46 GP-47 and GP-1. - Updated down-hole monitoring log spreadsheet of all geo-probe locations completed to date.		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Waiting NJ One Call to perform utility marking in the area (between the project east boundary fence and Pershing Ave). The area will be available to work Monday.		

Problems Encountered/ Corrective Action Taken:	**GP- 37** Work continued at this location (started 2/23/10) @0735hrs, methane gas was encountered at various depths. The explosive meter read "over" and the field team backed out of the immediate area and utilized nitrogen gas and dry ice to dissipate the gas. Engineered controls were successful, sampling and down-hole monitoring was completed without incident. **GP-43** Hit refusal at 10.5' bgs. **GP-44** Methane gas was encountered @ various depths, max reading 88%LEL. **GP-45** No problems or issues to report. **GP-46** While geo-probing at this location the team encountered a quarter sized rock at ~12" bgs that read 2.5mr/hr (see photo). Dave Hays was notified and a discussion ensued as to what to do with the 2 radioactive rocks that were recently found. The Cabrera FSM contacted ALS laboratory and spoke with Lance Steere the PM. Lance indicated that they could indeed receive and analyze the samples. Preparations are being made to properly ship the samples to ALS. **GP-47** No problems or issues to report. **GP-1** No problems or issues to report. **GP-22** No problems or issues to report. It was noted that down hole gamma readings at GP-42 were significantly elevated from 1'bgs to 12'bgs with a maximum reading of 44,526cpm. During excavation of the test pit adjacent to GP-34 (TP-14) the team unearthed a pool ball size rock (that appears to be pitch blend ore) at a depth of 5'. The rock (see attached picture) read ~1,000,000 cpm (8 mR/hr) and was placed in a sample container. Dave Hays was informed of the conditions and progress.
Special Notes:	Geo-probing in the church yard is complete.

Tomorrow's Expectations:	Continue geo-probe activities and complete release survey of excavator.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	February 25, 2010
		Day:	Thursday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-141
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-20 mph
Delivery Order No.:	0003	***Humidity:***	Humid, heavy snow
Cabrera Project No.:	08-3800.08	***Weather:***	28-33° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver, Mike Barsa		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	None		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	Performed geo-probe investigation at locations GP-20, GP-21, GP-48, and GP-49.		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed.		
Health And Safety Levels And Activities:	A detailed morning briefing that covered work scope, monitoring requirements, action levels, job control methods, AHA review, RWP review and job instructions was completed. Waiting NJ One Call to perform utility marking in the area (between the project east boundary fence and Pershing Ave) the area will be available to work Monday.		
Problems Encountered/ Corrective Action Taken:	Methane was not an issue in any of the boreholes completed today all readings <10% LEL. A severe winter storm warning was posted for the area. The crew was released early. Dave Hays was informed of the conditions and progress.		

Special Notes:	Geo-probing in the church yard is complete.
Tomorrow's Expectations:	Complete geo-probe activities and release surveys of excavator, skidsteer and geo-probe.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	March 1, 2010
		Day:	Monday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-142
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-10 mph
Delivery Order No.:	0003	***Humidity:***	Low
Cabrera Project No.:	08-3800.08	***Weather:***	33-45° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver		
Subcontractors On Site:	Scott Crawford EPI (geo-probe operator)		
USACE Personnel On Site:	None		
Visitors On Site:	Bobcat of NJ to pick-up skidsteer		
Equipment On Site:	- Trackhoe - Office Trailer - Storage Container - Radiological instrumentation - Geo-probe rig - Generators (3) - Skidsteer		
Work Performed:	Performed geo-probe investigation at locations GP-39, GP-41, GP-48, and GP-50. Prepared soil samples for shipment, performed release surveys on skidsteer, geo-probe rig, excavator and generator. Took water sample at location GP-10 using low-flow sampling methods. Packaged hot rock samples in a new 7A drum and prepared for shipment, the drum reads 1.7mr/hr on contact, 0.2mr/hr at 12”and 40uR/hr at 1 meter (all maximum readings).		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed. Reviewed CoCs prior to shipping soil samples.		
Health And Safety Levels And Activities:	Methane was not an issue in any of the boreholes completed today all readings <10% LEL. Elevated gamma readings were encountered at GP-39 (50,250cpm @ 6” bgs) and GP-41 (42,324cpm @ 4.5’ bgs), and GP-50 (7518cpm @ 4.5’ bgs).		

Problems Encountered/ Corrective Action Taken:	There was still a question as to weather NJ one call had performed a utility survey adjacent to Pershing Ave as no markings were apparent. An emergency notification which is supposed to trigger a response within 2 hours was partially successful (the electrical guy came but the water representative did not). The team employed an old fashioned divining rod technique and it indicated that there was a pipe of some sort in the area. As a safety precaution, the team hand augured to 5' bgs at GP-39 and 4.5' bgs at GP-41 before hitting concrete refusal. Dave Hays was informed of the conditions and progress.
Special Notes:	The skidsteer and geo-probe rig were removed from site.
Tomorrow's Expectations:	Ship samples including "hot rocks", continue release surveys, and return instrumentation.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655

DAILY QUALITY CONTROL REPORT		***Date:***	March 2, 2010
		Day:	Tuesday
Project:	Middlesex Municipal Landfill FUSRAP Site Investigation	***Report No.:***	121509-143
Contract No.:	W912DQ-08-D-0003	***Wind:***	0-5 mph
Delivery Order No.:	0003	***Humidity:***	Low
Cabrera Project No.:	08-3800.08	***Weather:***	33-45° F
USACE Project Manager:	Helen Edge, NAN		
Cabrera Personnel On Site:	Dennis Criswell, Kevin Kosko, Althea Williams, John Oliver		
Subcontractors On Site:	None		
USACE Personnel On Site:	None		
Visitors On Site:	Hertz to pick-up Equipment		
Equipment On Site:	- Trackhoe (left today) - Office Trailer - Storage Container - Radiological instrumentation (most shipped out today) - Generator (2 were returned today)		
Work Performed:	Completed the remaining (14) surface soil samples in locations discussed with Dave Hays. Re-packaged hot rock samples into a new 7A drum and prepared for shipment, the drum now reads 2.0 mr/hr on contact and 80uR/hr at 1 meter (all maximum readings). Surveyed tools, equipment and soil sample coolers for release from site. Hertz Equipment picked-up 2 generators and the excavator. Shipped 5 coolers full of soil samples; the hot rock samples were not part of today's shipment.		
Quality Control Activities:	Instrumentation daily QC, field inspection to insure that procedures were being followed. Reviewed CoCs prior to shipping soil samples.		
Health And Safety Levels And Activities:	Carefully packaged hot rocks (up to 8mr/hr contact) in to 7A Type A container (see pictures).		
Problems Encountered/ Corrective Action Taken:	Several discussions took place between the Cabrera FSM, ALS (lab) Project Manager and the Cabrera Corporate RSO regarding shipment of hot rocks to the lab for analysis. Initially the lab indicated that they would accept the shipment then the laboratory RSO voiced concerns that the dose rate on the samples exceeded the upper range to their dose rate meter's capability. The lab requested the field team "break" the large rock into smaller pieces which could potentially spread contamination and was not a desirable option. The Cabrera FSM proposed to send one of our field instruments to the lab prior to shipping the higher activity samples and the lab agreed. Dave Hays was informed of the conditions and progress.		

Special Notes:	The excavator and 2 generators were removed from site.
Tomorrow's Expectations:	Ship samples including "hot rocks", continue release surveys, and return instrumentation.
By: *Kevin Kosko*	TITLE: Field Site Manager (Cabrera Services) (m) 330-397-1756, (937) 470-2655


RADIOACTIVE II
CONTENTS U-NAT
ACTIVITY 5.92 MBQ
0.1
TRANSPORT INDEX
7
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Chicago, IL 60646 (800) 621-5808 HMSL15
DANGER
DO NOT LOAD IN PASSENGER AIRCRAFT


RADIOACTIVE II
7
DANGER

Revision 2 | OP-001-02 Radiological Survey Sheet | Radiological Surveys

Location: Site: Middlesex Municipal Landfill	RWP# 08-3800.08 - 2	Survey #	Survey Type: SHIPPING	pg. 1 of 1

Smear (CPM/100 cm²) * / Direct Count (CPM/Direct Frisk) — circle one

No.	α	β	No.	α	β
1	2	80	26	NA	NA
2	4	97	27	"	"
3	NA	NA	28		
4	"	"	29		
5			30		
6			31		
7			32		
8			33		
9			34		
10			35		
11			36		
12			37		
13			38		
14			39		
15			40		
16			41		
17			42		
18			43		
19			44		
20			45		
21			46		
22			47		
23			48		
24			49		
25	"	"	50	"	"

TYPE 7A DRUM CONTAINING SAMPLES FROM M.M.L. PROJECT.

CONTAINER LABELLED:

RAD II

TRANSPORT INDEX = 0.1

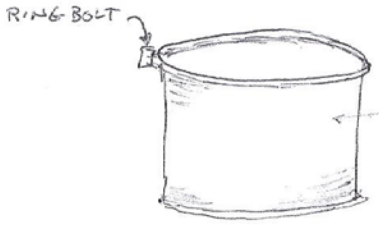
"DO NOT LOAD IN PASSENGER AIRCRAFT"

U.S.A. DOT 7A

TYPE A

UN. 2915

TOP
MAX CONTACT = 1600
@ 3' = 70



SIDES
MAX CONTACT = 1600
@ 3' = 70
MAX NOTED ON SIDE OPPOSITE OF RING BOLT.

BOTTOM
MAX. CONTACT = 2000
@ 3' = 80

SMEAR *
#1. OUTSIDE OF CONTAINER
#2. INSIDE OF CONTAINER

DOSE RATES NOTED IN MICROREM/hr

Comments	Surveyed By:	Date:	Instrument	Serial #	α Eff.	β Eff.	α Bkg.	β Bkg	γ Bkg	Cal. Due	Key
*	D. Grisuell	3-2-10	BICRON	1622	NA	→	→	→	→	10-18-10	
			2929	129566	0.313	0.236	0.1	40.2	NA	1-5-11	■ A/S Location
											⋰ Boundary
											○ Smear
											□ Dose Rate μR /hr
	Reviewed By:	Date:									* Direct Reading CPM/direct frisk
		3/2/10									△ Grab Sample

APPENDIX E
LABORATORY ANALYSIS RESULTS
(ON CD)

APPENDIX F
DATA QUALITY ASSESSMENT

EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Alpha Standard

S.O.# 3863
P.O.# 02-055

Description of Standard:

Model No. DNS-11 Serial No. 3973-02 Isotope Th-230

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi alpha emission rate was measured using an internal gas flow proportional chamber. Absolute counting of alpha particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated alpha source S/N 2393/91.

Measurement Result:

The observed alpha particles emitted from the surface of the disc per minute (cpm) on the calibration date was:

8,860 ± 265

The total disintegration rate (dpm) assuming 1.5% backscatter of alpha particles from the surface of the disc, was:

17,500 ± 523 (0.00786 μCi)

The uncertainty of the measurement is 3 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST Reviewed by:

Calibration Technician: Art Reust Q.A. Representative:

Calibration Date: 4-29-2002 Reviewed Date: 4-29-02

Analytical Services
7021 Pan American Freeway NE
Albuquerque, New Mexico 87109-4238
(505) 345-3461 Fax (505) 761-5416
Toll Free (866) RAD-LABS (723-5227)
www.eberlineservices.com

EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Beta Standard

S.O.# 3863
P.O.# 02-055

Description of Standard:

Model No. DNS-12 Serial No. 3975-02 Isotope Tc-99

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi beta emission rate was measured using an internal gas flow proportional chamber. Absolute counting of beta particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated beta source S/N 2148/90.

Measurement Result:

The observed beta count rate from the surface of the disc per minute (cpm) on the calibration date was:

11,000 ± 441

The total disintegration rate (dpm) assuming 25 % backscatter of beta particles from the surface of the disc, was:

17,700 ± 706 (0.00796 μCi)

The uncertainty of the measurement is 4 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST Reviewed by:

Calibration Technician: Q.A. Representati

Calibration Date: 4-25-2002 Reviewed Date: 4-29-02

Analytical Services
7021 Pan American Freeway NE
Albuquerque, New Mexico 87109-4238
(505) 345-3461 Fax (505) 761-5416
Toll Free (866) RAD-LABS (723-5227)
www.eberlineservices.com

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q** Inst. Model **CF-973T** Inst. s/n **16826**
Reference Inst. **HI-Q Model HFC-50C** Inst. s/n **4911**

Cal. Date **01 July 2009** Due Date **01 July 2010** Cal. Interval **1 year**

Barometric Press: Actual **29.50** Corrected to: **29.50 in. Hg**
Temperature: Actual **76°F** Corrected to: **76°F**
Filters Used: ☒Particulate ☐Charcoal/silver zeolite ☐Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.56	14.81	1.71%
2	24.26	24.68	1.71%
3	33.97	34.06	0.28%
4	43.67	42.95	-1.68%
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****Average percent deviation across the range = 0.50%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# **12716**.

Calibrated by: **Kurt D. Newton** _____ Date: **01 July 2009**

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C**
Air Sampler Model **HI-Q CF-973T**

Calibrator Serial No. **4911**
Air Sampler Serial No. **16826**

	AIR SAMPLER						CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	76	29.50	n/a	15.0	0.970	14.56	15.0	0.987	14.81
2	76	29.50	n/a	25.0	0.970	24.26	25.0	0.987	24.68
3	76	29.50	n/a	35.0	0.970	33.97	34.5	0.987	34.06
4	76	29.50	n/a	45.0	0.970	43.67	43.5	0.987	42.95
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Air Sampler Temp/Press Corr Factor $= \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$

Calibrator Temp/Press Corr Factor $= \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$

$\%\ \text{Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$

Corrected Flow = (Indicated Flow) x (Temp/Press Corr Factor)

Calibrated by: **Kurt D. Newton** _____ Date: **01 July 2009**

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q** Inst. Model **CF-973T** Inst. s/n **16829**
Reference Inst. **HI-Q Model HFC-50C** Inst. s/n **4911**

Cal. Date **26 May 2009** Due Date **26 May 2010** Cal. Interval **1 year**

Barometric Press: Actual **29.95** Corrected to: **29.95 in. Hg**
Temperature: Actual **76°F** Corrected to: **76°F**
Filters Used: ☒Particulate ☐Charcoal/silver zeolite ☐Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.67	14.92	1.68
2	24.45	24.87	1.68
3	34.23	33.83	-1.21
4	44.02	42.78	-2.89
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****Average percent deviation across the range = -0.18**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 12657.

Calibrated by: **Kurt D. Newton** Date: **26 May 2009**

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

Facility: RSA Laboratories, Inc. Customer: Cabrera Services, Inc.

Calibrator Model **HI-Q Model HFC-50C** Calibrator Serial No. 4911
Air Sampler Model **HI-Q CF-973T** Air Sampler Serial No. **16829**

	AIR SAMPLER						CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	76	29.95	n/a	15.0	0.978	14.67	15.0	0.995	14.92
2	76	29.95	n/a	25.0	0.978	24.45	25.0	0.995	24.87
3	76	29.95	n/a	35.0	0.978	34.23	34.0	0.995	33.83
4	76	29.95	n/a	45.0	0.978	44.02	43.0	0.995	42.78
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Air Sampler Temp/Press Corr Factor $= \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}$

Calibrator Temp/Press Corr Factor $= \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}$

$\%\ \text{Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$

Corrected Flow = (Indicated Flow) x (Temp/Press Corr Factor)

Calibrated by: Kurt D. Newton _____ Date: 26 May 2009

06/15/2009 12:54 8502280487 RSA PAGE 04

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q** Inst. Model **CF-973T** Inst. s/n **16830**
Reference Inst. **HI-Q Model HFC-50C** Inst. s/n **4911**

Cal. Date **15 May 2009** Due Date **15 May 2010** Cal. Interval **1 year**

Barometric Press: Actual **29.95** Corrected to: **29.95 in. Hg**
Temperature: Actual **70°F** Corrected to: **70°F**
Filters Used: ☒Particulate ☐Charcoal/silver zeolite ☐Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.75	15.01	1.68
2	24.59	25.01	1.68
3	34.43	34.52	0.26
4	44.26	44.52	0.58
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****Average percent deviation across the range = 1.05**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# **12639**.

Calibrated by: **Kurt D. Newton** _____ Date: **15 May 2009**

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C** Calibrator Serial No. **4911**
Air Sampler Model **HI-Q CF-973T** Air Sampler Serial No. **16830**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In·Hg)	Gauge Press (In·Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	70	29.95	n/a	15.0	0.984	14.75	15.0	1.000	15.01
2	70	29.95	n/a	25.0	0.984	24.59	25.0	1.000	25.01
3	70	29.95	n/a	35.0	0.984	34.43	34.5	1.000	34.52
4	70	29.95	n/a	45.0	0.984	44.26	44.5	1.000	44.52
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$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\%\ \text{Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

Corrected Flow = (Indicated Flow) x (Temp/Press Corr Factor)

Calibrated by: **Kurt D. Newton** _____ Date: **15 May 2009**

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q** Inst. Model **CF-973T** Inst. s/n **16831**
Reference Inst. **HI-Q Model HFC-50C** Inst. s/n **4911**

Cal. Date **01 July 2009** Due Date **01 July 2010** Cal. Interval **1 year**

Barometric Press: Actual **29.50** Corrected to: **29.50 in. Hg**
Temperature: Actual **76°F** Corrected to: **76°F**
Filters Used: ☒Particulate ☐Charcoal/silver zeolite ☐Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.56	14.81	1.71%
2	24.26	24.68	1.71%
3	33.97	34.06	0.28%
4	43.67	42.95	-1.68%
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****Average percent deviation across the range = 0.50%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 12717.

Calibrated by: **Kurt D. Newton** Date: **01 July 2009**

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

Facility: RSA Laboratories, Inc. Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C** Calibrator Serial No. **4911**
Air Sampler Model **HI-Q CF-973T** Air Sampler Serial No. **16831**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	76	29.50	n/a	15.0	0.970	14.56	15.0	0.987	14.81
2	76	29.50	n/a	25.0	0.970	24.26	25.0	0.987	24.68
3	76	29.50	n/a	35.0	0.970	33.97	34.5	0.987	34.06
4	76	29.50	n/a	45.0	0.970	43.67	43.5	0.987	42.95
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$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

Corrected Flow = (Indicated Flow) x (Temp/Press Corr Factor)

Calibrated by: **Kurt D. Newton** Date: **01 July 2009**

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q** Inst. Model **CF-973T** Inst. s/n **16832**
Reference Inst. **HI-Q Model HFC-50C** Inst. s/n **4911**

Cal. Date **30 July 2009** Due Date **30 July 2010** Cal. Interval **1 year**

Barometric Press: Actual **29.52** Corrected to: **29.52 in. Hg**
Temperature: Actual **77°F** Corrected to: **77°F**
Filters Used: ☒Particulate ☐Charcoal/silver zeolite ☐Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.55	14.80	1.71%
2	24.25	24.67	1.71%
3	33.95	33.55	-1.18%
4	43.65	42.93	-1.68%
5			
6			
7			
8			
9			
10			
11			
12			
13			

****Average percent deviation across the range = 0.14%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 12834.

Calibrated by: **Kurt D. Newton** _____ Date: **30 July 2009**

CERTIFICATE OF CALIBRATION
(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C** Calibrator Serial No. **4911**
Air Sampler Model **HI-Q CF-973T** Air Sampler Serial No. **16832**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	77	29.52	n/a	15.0	0.970	14.55	15.0	0.987	14.80
2	77	29.52	n/a	25.0	0.970	24.25	25.0	0.987	24.67
3	77	29.52	n/a	35.0	0.970	33.95	34.0	0.987	33.55
4	77	29.52	n/a	45.0	0.970	43.65	43.5	0.987	42.93
5									
6									
7									
8									
9									
10									
11									
12									
13									

$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530°R}{\text{Inlet temp (°F)} + 460°R} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

Corrected Flow = (Indicated Flow) x (Temp/Press Corr Factor)

Calibrated by: **Kurt D. Newton** Date: **30 July 2009**

MJW Technical Services
243 Root St.
Suite 100
Olean, New York 14760
Voice: (716) 372-5300
Fax: (716) 372-5307

Certificate Of Calibration

This Certificate will be accompanied by Calibration Charts or Readings where Applicable

Customer

Customer Name: Cabrera Services Inc

Address: 473 Silver Lane
East Hartford, CT 06118

Contact Name: Chuck Mikaitis

Customer PO/ CC. Number: 09-1402

Work Order Number: 2009-1308

Instrument

Manufacturer: Ludlum Measurements

Model: 2360 Serial Number: 193635

Detector Manufacturer: Ludlum Measurements

Det. Model: 43-10-1 Serial Number: PR202583

Calibration Method: Electronic

Instrument Received: ☑ Within Tolerance ☐ Out of Tolerance ☐ Repairs required ☐ Other (See Comments)

☑ Geotropism ☑ Meter Zero ☑ Mech. Ck. ☑ HV Readout ☑ Battery Check ☑ Reset

☑ Audio ☑ Window Status ☑ FS Response ☑ Linearity ☐ Background Subtract ☐ Alarm Set

Temperature: 72.9 F Humidity: 55 % Pressure: 713.7 mm Hg Altitude: 1450 ft

Instrument Calibration

Multiplier\Range	Calibration Point	Instrument Response	
		Before Calibration	After Calibration
X 1	100 cpm	98 cpm	98 cpm
X 1	400 cpm	400 cpm	400 cpm
X 10	1 kcpm	0.98 kcpm	0.98 kcpm
X 10	4 kcpm	4 kcpm	4 kcpm
X 100	10 kcpm	9.8 kcpm	9.8 kcpm
X 100	40 kcpm	40 kcpm	40 kcpm
X 1K	100 kcpm	97 kcpm	97 kcpm
X 1K	400 kcpm	400 kcpm	400 kcpm
Digital Scaler	40 cpm	40 cpm	40 cpm
Digital Scaler	400 cpm	400 cpm	400 cpm
Digital Scaler	4 kcpm	4001 kcpm	4001 kcpm
Digital Scaler	40 kcpm	40.012 kcpm	40.012 kcpm
Digital Scaler	400 kcpm	400.119 kcpm	400.119 kcpm

Reference instruments and / or Sources

Pulser: 500-2	220100		
Sr90	C7-661	Th230	C7-644
Tc99	C7-641	C14	C7-804

Comments

		Isotope	Efficiency	Distance
Inst. Voltage:	645 V			
Window Status		Sr90	44.2%	0 inch
Beta threshold:	4 mV	Th230	38.4%	0 inch
Beta window:	49 mV	Tc99	25.1%	0 inch
Alpha threshold:	154 mV	C14	8.8%	0 inch

Ref. Voltage 1: 645 V

Inst. Voltage 1: 645 V

Alpha crosstalk in the Beta channel is <10%

Beta crosstalk in the Alpha channel is <1%

Statement of Certification

MJW Technical Sevices, Inc certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ISO/IEC 17025 and ANSI N323. The Instrument listed above was inspected prior to shipment and it met all the manufacturer's published operating specifications. (MJW technical Services is not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: KT Ralyea

Reviewed By: [signature] Date 7-1-09

Calibration Date: 06/30/2009

Calibration Due: 06/30/2010

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
Ludlum	2360	198695	43-10-1	PR202583	6/30/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
10	2	Th-230 (1160)	Tc-99 (1161)	N/A	6/30/10

Date	12/9/09										
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	1/493	0/524	2/510	2/485	2/465	1/535	2/520	1/543	4/455	5/516	GB
Source #1	11547	11679	11830	11658	11623	11782	11897	11573	11734	11552	GB
Source #2	10845	10767	10788	10646	10838	10386	10653	10743	10714	10816	GB
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	dw

Daily QC's

Date	Bkgd	Source #1 (Th-230) α / β / γ	Source #2 (Tc-99) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
12/9/09	1/493	11648	10830	N/A	Yes / No	GB
12/10/09	2/511	11651	10828	N/A	Yes / No	GB
12/11/09	1/512	11573	10984	N/A	Yes / No	GB
12/14/09	4/544	11668	11005	N/A	Yes / No	GB
12/15/09	1/537	11576	10784	N/A	Yes / No	GB
01/04/10	2/526	11,672	10885	N/A	Yes / No	AW
01/11/10	1/507	11,757	10890	N/A	Yes / No	AW
01/13/10	4/484	11,626	10842	N/A	Yes / No	AW
Instrument was returned to instrumentation on 01/19/10 dw					Yes / No	
					Yes / No	
					Yes / No	
			NFE dw 1/19/10		Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

MJW Technical Services
243 Root St.
Suite 100
Olean, New York 14760
Voice: (716) 372-5300
Fax: (716) 372-5307

Certificate Of Calibration

This Certificate will be accompanied by Calibration Charts or Readings where Applicable

Customer

Customer Name: Cabrera Services Inc

Address: 473 Silver Lane
East Hartford, CT 06118

Contact Name: Chuck Mikaitis

Customer PO/
CC. Number: 10-0127

Work Order
Number: 2009-1612

Instrument

Manufacturer: Ludlum Measurements

Model: 2929 Serial Number: 129566

Detector Manufacturer: Ludlum Measurements

Det. Model: 43-10-1 Serial Number: PR132720

Calibration Method: Electronic

Instrument Received: ☐ Within Tolerance ☐ Out of Tolerance ☑ Repairs required ☐ Other (See Comments)

☐ Geotropism ☑ Meter Zero ☑ Mech. Ck. ☑ HV Readout ☐ Battery Check ☐ Reset

☑ Audio ☑ Window Status ☐ FS Response ☐ Linearity ☐ Background Subtract ☐ Alarm Set

Temperature: 70.7 F Humidity: 25 % Pressure: 28.4 in Hg Altitude: 1450 ft

Instrument Calibration

Multiplier\Range	Calibration Point	Instrument Response	
		Before Calibration	After Calibration
Alpha	40 cpm	40 cpm	40 cpm
Alpha	400 cpm	401 cpm	401 cpm
Alpha	4000 cpm	4003 cpm	4003 cpm
Alpha	40000 cpm	40025 cpm	40025 cpm
Alpha	400000 cpm	400159 cpm	400159 cpm
Beta-Gamma	40 cpm	40 cpm	40 cpm
Beta-Gamma	400 cpm	400 cpm	400 cpm
Beta-Gamma	4000 cpm	3999 cpm	3999 cpm
Beta-Gamma	40000 cpm	40036 cpm	40036 cpm
Beta-Gamma	400000 cpm	400197 cpm	400197 cpm

Reference instruments and / or Sources

Pulser: 500-2	220110		
Sr90	C7-661	Tc99	C7-641
Pu239	C7-639	C14	C7-804

Comments

Inst. Voltage:	660 V	Isotope	Efficiency	Distance
Window Status		Sr90	46.1%	0 inch
Beta threshold:	4 mV	Tc99	19.9%	0 inch
Beta window:	48 mV	Pu239	37.6%	0 inch
Alpha threshold:	182 mV	C14	4.3%	0 inch
Detector				
Operating voltage:	660 V	Ref. Voltage 1:	500 V	
		Inst. Voltage 1:	500 V	
		Ref. Voltage 2:	1500 V	
		Inst. Voltage 2:	1525 V	

660V = 2.74 on High Voltage dial

Alpha crosstalk in the Beta channel is <10% with insert in place

Beta crosstalk in the Alpha channel is <1% with insert in place

Statement of Certification

MJW Technical Sevices, Inc certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ISO/IEC 17025 and ANSI N323. The Instrument listed above was inspected prior to shipment and it met all the manufacturer's published operating specifications. (MJW technical Services is not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: [signature]

Reviewed By: K T Rakyca Date 1/5/10

Calibration Date: 01/05/2010

Calibration Due: 01/05/2011

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
Ludlum	2929	129566	43-10-1	PR132720	1/5/10
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
10	2	Th-230 (1160)	Tc-99 (1161)	N/A	1/5/11

Date 1/18/10 - 1/19/10

Intial QC's	1	2	3	4	5	6	7	8	9	10	Tech
Bkgd	1/401	0/378	0/397	2/402	2/396	0/371	0/396	2/428	0/379	2/391	dw
Source #1	11128	10919	10857	10806	11164	11054	10833	10856	11042	11060	dw
Source #2	8366	8332	8480	8297	8463	8254	8511	8330	8533	8625	dw
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Th-230) α / β / γ	Source #2 (Tc-99) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
1/19/10	0/373	11094	8521		Yes / No N/A	AW
1/20/10	0/403	10788	8481		Yes / No N/A	dw
1/26/10	0/384	11259	8410		Yes / No N/A	DC
1/27/10	1/371	10804	8365		Yes / No N/A	AW
1/28/10	0/365	11136	8401		Yes / No N/A	AW
1/29/10	1/381	11111	8460		Yes / No N/A	AW
2-3-10	~~2/391~~ AW 2/391	11124	8466	N A	Yes / No N/A	DC
2-4-10	0/420	11027	8578		Yes / No N/A	AW
2/5/10	3/417	11109	8511		Yes / No N/A	AW
2/15/10	0/383	11008	8631		Yes / No N/A	dw
2/16/10	0/396	10997	8477		Yes / No N/A	dw
2/17/10	1/410	10996	8555		Yes / No N/A	AW
2/18/10	2/412	11130	8589		Yes / No N/A	AW
2/23/10	~~1/393~~ AW 0/405	11139	8433		Yes / No N/A	AW
2/24/10	0/380	10955	8503		Yes / No N/A	AW
Project#~~08-380.08~~ AW 08 3800.08					Yes / No	

Project Name: Middlesex Municipal Landfill

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Daily QC's						
Date	Bkgd	Source #1 ( ) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
3/1/10	2/413	10811	8540	N/A	Yes / No N/A	AW
3/2/10	0/402	11189	8495	N/A	Yes / No N/A	AW
3/3/10	2/407	11163	8609	N/A	Yes / No N/A	dw
					Yes / No	
Project demobilized on 3/3/10 NFJ dw					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
		N			Yes / No	
			A		Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20138563/340918

Mfg. Ludlum Measurements, Inc. Model 2224-1 Serial No. 227244

Mfg. Ludlum Measurements, Inc. Model 43-93 Serial No. PR244545

Cal. Date 13-Aug-09 Cal Due Date 13-Aug-10 Cal. Interval 1 Year Meterface 202-848

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 57 % Alt 703.8 mm Hg

☐ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☑ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☐ F/S Resp. ck ☑ Reset ck. ☑ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC
☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 875 V Input Sens. Comment mV Det. Oper. 875 V at Comment mV Threshold Dial Ratio ____ = ____ mV

☑ HV Readout (2 points) Ref./Inst. 500 / 501 V Ref./Inst. 1000 / 1004 V

COMMENTS:

Alpha Input Sensitivity: 130 mV Beta Input Sensitivity: 3.5 mV Beta Window: 30 mV
Firmware: 390094 Overload set to simulate light leak. HV set with detector disconnected.

4 pi Eff. for Th230≈19,800dpm is:20% 4 pi Eff. for Tc99≈22,600dpm is:18.73%
Background: 3cpm Reading: 3,949cpm Background: 157cpm Reading: 4,391cpm

4 pi Eff. for SrY90≈54,726dpm is:24.94% 4 pi Eff. for Ni63≈289,606dpm is:0.05%
Background: 157cpm Reading: 13,808cpm Background: 157cpm Reading: 327 cpm

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	800k cpm	N/A	800
x1000	200k cpm		200
x100	80k cpm		800
x100	20k cpm		200
x10	8k cpm		800
x10	2k cpm		200
x1	800 cpm		800
x1	200 cpm		200

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout	800kcpm	N/A	799012cpm
	80kcpm		79913
	8kcpm		7991
	800cpm		799
	80cpm		80

Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646
Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☑ Alpha S/N Th230 E121495 ☑ Beta S/N Tc99 NI-EV, 4016, 4017 Sr90 Ni63 ☐ Other ____

☑ m 500 S/N 63893 ☐ Oscilloscope S/N ____ ☑ Multimeter S/N 93870637

Calibrated By: Jeremy Thompson Date 13-Aug-09

Reviewed By: Rhonda Ham Date 13 Aug 09

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc.
FORM C22A 10/15/2008

AC Inst. Only ☐ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed: ____

Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 43-93 Serial No. PR244545 Order #. 20138563/340918

Customer CABRERA SERVICES Alpha Input Sensitivity 130 mV

Counter 2224-1 Serial No. 227244 Beta Input Sensitivity 3.5 mV

Count Time 1Minute Beta Window 30 mV

Other _____ Distance Source to Detector Surface

High Voltage	Background		Isotope Th230 Size ≈19,800dpm		Isotope Tc99 Size 22,600dpm		Isotope Sr90 Size ≈54,726dpm		Isotope Ni 63 Size ≈289,606dpm	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
850	1	112	3384	409	7	3625	1	10695	3	190
*875	3	157	3949	511	9	4391	4	13808	3	227
900	6	199	4042	734	3	4924	2	15348	5	737

☐ Gas Proportional detector count rate decreased ≤ 10% after 15 hour static test using 39" cable.

☐ Gas proportional detector count rate decreased ≤ 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature Jeramy Thompson Date 13-Aug-09

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
Ludlum	2224-1	227244	43-93	PR244545	8/13/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
1	1	Th-230 (1160)	Tc-99 (1161)	N/A	8/13/10

Date	12/9/09										
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	0/199	2/225	4/238	1/234	0/219	1/221	0/233	1/219	3/202	0/203	GB
Source #1	3627	3612	3399	3597	3608	3724	3475	3552	3631	3582	GB
Source #2	3730	3470	3668	3300	3612	3475	3345	3582	3311	3780	GB
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Th-230) α / β / γ	Source #2 (Tc-99) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
12/9/09	0/232	3601	3471	N/A	Yes / No	GB
12/10/09	1/199	3659	3696	N/A	Yes / No	GB
12/14/09	0/193	3661	3752	N/A	Yes / No	GB
12/15/09	0/203	3712	3460	N/A	Yes / No	GB
~~1/18~~ AW 1/19/10	2/193	~~3532~~ 3566 AW	3558	N/A	Yes / No	AW
1-26-10	0/185	~~3566~~ AW 3566	3638	NA	Yes / No	DJC
1-22-10	1/195	3651	3532	NA	Yes / No	DJC
1/28/10	0/184	3642	3539	N/A	Yes / No	AW
1/29/10	1/190	3631	3506	N/A	Yes / No	AW
2-3-10	~~1/178~~ AW 1/200	3545	3669	NA	Yes / No	DJC
2/4/10	~~2/184~~ AW 2/194	3527	3553	N/A	Yes / No	
2-5-10	1/204	3582	3602	NA	Yes / No	DJC
2/15/10	2/207	3571	3712	N/A	Yes / No	AW
2/17/10	1/190	3557	3497	N/A	Yes / No	AW
3/23/10	1/193	3597	3769	N/A	Yes / No	AW
Project#~~08-380.08~~ AW 08-3800.08					Yes / No	

recounted bkgd AW

recounted bkgd AW

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Daily QC's						
Date	**Bkgd**	**Source #1 ( ) α / β / γ**	**Source #2 ( ) α / β / γ**	**Source #3 (N/A) α / β / γ**	**Battery OK**	**Tech**
3/1/10	0/198	3573	3601	N/A	(Yes) / No	AW
3/2/10	0/193	3541	3595	N/A	(Yes) / No	AW
3/3/10	0/197	3520	3613	N/A	(Yes) / No	AW
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
		NTE			Yes / No	
		Instrument was returned on 3/3/10 AW			Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

MJW Technical Services
243 Root St.
Suite 100
Olean, New York 14760
Voice: (716) 372-5300
Fax: (716) 372-5307

Certificate Of Calibration

This Certificate will be accompanied by Calibration Charts or Readings where Applicable

Customer

Customer Name: Cabrera Services Inc

Address: 473 Silver Lane
East Hartford, CT 06118

Contact Name: Chuck Mikaitis

Customer PO/ CC. Number: 09-1268

Work Order Number: 2009-1047

Instrument

Manufacturer: Ludlum Measurements

Model: 2241-3 Serial Number: 142299

Detector Manufacturer: Ludlum Measurements

Det. Model: 44-9 Serial Number: PR171184

Calibration Method: Electronic

Instrument Received: ☑ Within Tolerance ☐ Out of Tolerance ☐ Repairs required ☐ Other (See Comments)

☑ Geotropism ☑ Meter Zero ☑ Mech. Ck. ☐ HV Readout ☑ Battery Check ☑ Reset

☑ Audio ☐ Window Status ☑ FS Response ☐ Linearity ☐ Background Subtract ☐ Alarm Set

Temperature: 70.7 F Humidity: 27 % Pressure: 713.7 mm Hg Altitude: 1450 ft

Instrument Calibration

Multiplier\Range	Calibration Point	Instrument Response	
		Before Calibration	After Calibration
Ratemeter Mode	200 cpm	199 cpm	199 cpm
Ratemeter Mode	800 cpm	799 cpm	799 cpm
Ratemeter Mode	2 Kcpm	1.99 Kcpm	1.99 Kcpm
Ratemeter Mode	8 Kcpm	8 Kcpm	8 Kcpm
Ratemeter Mode	20 Kcpm	19.9 Kcpm	19.9 Kcpm
Ratemeter Mode	80 Kcpm	80 Kcpm	80 Kcpm
Ratemeter Mode	200 Kcpm	199 Kcpm	199 Kcpm
Ratemeter Mode	800 Kcpm	800 Kcpm	800 Kcpm
Scaler Mode	200 cpm	200 cpm	200 cpm
Scaler Mode	800 cpm	801 cpm	801 cpm
Scaler Mode	2 Kcpm	1.997 Kcpm	1.997 Kcpm
Scaler Mode	8 Kcpm	8.003 Kcpm	8.003 Kcpm
Scaler Mode	20 Kcpm	19.973 Kcpm	19.973 Kcpm
Scaler Mode	80 Kcpm	80.025 Kcpm	80.025 Kcpm
Scaler Mode	200 Kcpm	199.726 Kcpm	199.726 Kcpm
Scaler Mode	800 Kcpm	800.137 Kcpm	800.137 Kcpm

Reference instruments and / or Sources

Pulser: 500-2	220100		
C-14	C7-804	SrY-90	C7-661
Th-230	C7-644	Tc-99	C7-641

Comments

Voltage: 900 Input Sensitivity: 35

4pi efficiencies for detector model 44-9 #PR171184 @ 0.25"

Th230 9.1%

Tc99 9.7%

SrY90 21.5%

C14 3.0%

Limited Use:

Detector selections 2, 3, and 4 are not calibrated

Statement of Certification

MJW Technical Sevices, Inc certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ISO/IEC 17025 and ANSI N323. The Instrument listed above was inspected prior to shipment and it met all the manufacturer's published operating specifications. (MJW technical Services is not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: K T Rodgers

Reviewed By: [signature] Date 2-20-09

Calibration Date: 02/19/2009

Calibration Due: 02/19/2010

CABRERA SERVICES
GEOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
Ludlum	2241-3	142299	44-9	PR171184	2/19/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
1	1	Tc-99 1161	N/A	N/A	2/19/10

Date 12/2/09

Intial QC's	1	2	3	4	5	6	7	8	9	10	Tech
Bkgd	46	36	39	27	27	33	36	48	31	30	GB
Source #1	3206	3229	3220	3205	8143	3302	3246	3285	3137	3232	GB
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Tc-99) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
12/2/09	31	3312	N/A	N/A	Yes / No	AW
12/3/09	35	3129	N/A	N/A	Yes / No	AW
12/4/09	31	3100	N/A	N/A	Yes / No	AW
12/7/09	37	3165	N/A	N/A	Yes / No	AW
12/8/09	31	3308	N/A	N/A	Yes / No	AW
12/9/09	32	3311	N/A	N/A	Yes / No	GB
12/10/09	35	3262	N/A	N/A	Yes / No	GB
12/11/09	39	3365	N/A	N/A	Yes / No	GB
12/14/09	42	3481	N/A	N/A	Yes / No	GB
12/15/09	38	3376	N/A	N/A	Yes / No	GB
01/04/10 AW	37	3486	N/A	N/A	Yes / No	AW
01/21/10	36	3420	N/A	N/A	Yes / No	AW
02/2/10	33	3433	N/A	N/A	Yes / No	AW
2-3-10	34	3283	NA	NA	Yes / No	DJC
2/4/10	30	3442	N/A	N/A	Yes / No	AW
2-5	30	3390	NA	NA	Yes / No	DJC

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Daily QC's						
Date	**Bkgd**	**Source #1** (Tc-99) α / β / γ	**Source #2** (N/A) α / β / γ	**Source #3** (N/A) α / β / γ	**Battery OK**	**Tech**
2/15/10	33	3481	N/A	N/A	Yes / No	AW
2/16/10	34	3243	N/A	N/A	Yes / No	AW
2/17/10	36	3384	N/A	N/A	Yes / No	AW
2/18/10	32	3224	N/A	N/A	Yes / No	AW
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

MJW Technical Services
243 Root St.
Suite 100
Olean, New York 14760
Voice: (716) 372-5300
Fax: (716) 372-5307

Certificate Of Calibration

This Certificate will be accompanied by Calibration Charts or Readings where Applicable

Customer

Customer Name: Cabrera Services Inc

Address: 473 Silver Lane
East Hartford, CT 06118

Contact Name: Chuck Mikaitis

Customer PO/ CC. Number: 10-0072

Work Order Number: 2009-1482

Instrument

Manufacturer: Ludlum Measurements

Model: 2221 Serial Number: 161580

Detector Manufacturer: Ludlum Measurements

Det. Model: 44-20 Serial Number: PR254904

Calibration Method: Electronic

Instrument Received: ☐ Within Tolerance ☑ Out of Tolerance ☐ Repairs required ☐ Other (See Comments)

☑ Geotropism ☑ Meter Zero ☑ Mech. Ck. ☑ HV Readout ☑ Battery Check ☑ Reset

☑ Audio ☐ Window Status ☑ FS Response ☐ Linearity ☐ Background Subtract ☐ Alarm Set

Temperature: 71.3 F Humidity: 41 % Pressure: 726.4 mm Hg Altitude: 1450 ft

Instrument Calibration

Multiplier\Range	Calibration Point	Instrument Response	
		Before Calibration	After Calibration
X 1	100 cpm	90 cpm	100 cpm
X 1	400 cpm	395 cpm	400 cpm
X 10	1 kcpm	0.95 kcpm	1 kcpm
X 10	4 kcpm	3.95 kcpm	4 kcpm
X 100	10 kcpm	9.5 kcpm	10 kcpm
X 100	40 kcpm	39.5 kcpm	40 kcpm
X 1K	100 kcpm	95 kcpm	100 kcpm
X 1K	400 kcpm	395 kcpm	400 kcpm
Digital Ratemeter	40 cpm	40 cpm	40 cpm
Digital Ratemeter	400 cpm	400 cpm	400 cpm
Digital Ratemeter	4 kcpm	3.995 kcpm	3.995 kcpm
Digital Ratemeter	40 kcpm	39.96 kcpm	39.96 kcpm
Digital Ratemeter	400 kcpm	399.56 kcpm	399.56 kcpm
Digital Scaler	40 cpm	40 cpm	40 cpm
Digital Scaler	400 cpm	400 cpm	400 cpm
Digital Scaler	4 kcpm	3.996 kcpm	3.996 kcpm
Digital Scaler	40 kcpm	39.963 kcpm	39.963 kcpm
Digital Scaler	400 kcpm	399.631 kcpm	399.631 kcpm
Log Scale	50 cpm	50 cpm	50 cpm
Log Scale	500 cpm	450 cpm	500 cpm
Log Scale	5 kcpm	4.95 kcpm	5 kcpm
Log Scale	50 kcpm	47.5 kcpm	50 kcpm
Log Scale	500 kcpm	420 kcpm	450 kcpm

Reference instruments and / or Sources

Scaler: 2200	34451	Pulser: 500-2	220110
Cs137	C7-806	Am241	C7-660

Comments

Inst. Voltage: 850 V

Input Sensitivity: 10 mV

Isotope	Efficiency	Distance
Cs137	28.7%	0 inch
Am241	16.7%	0 inch

Detector

Operating voltage: 850 V

Ref. Voltage 1:	500 V
Inst. Voltage 1:	498 V
Ref. Voltage 2:	1500 V
Inst. Voltage 2:	1500 V

Model 2221 currently set for gross counts

High Voltage: 850V, detector connected with 4 foot cord

Threshold: 100 = 10mV

Window: OUT

Model 44-20 energy resolution = 10.8%, acceptable detector energy resolution is <13% for wind

Statement of Certification

MJW Technical Sevices, Inc certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ISO/IEC 17025 and ANSI N323. The Instrument listed above was inspected prior to shipment and it met all the manufacturer's published operating specifications. (MJW technical Services is not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: [signature]

Reviewed By: [signature] Date 10/21/2009

Calibration Date: 10/20/2009

Calibration Due: 10/20/2010

MJW Technical Services

Bench Test Data for Detector

Customer	Cabrera Services		PO #	10-007-2	
Detector	M44-20		Serial #	PR254904	
Counter	M2200		Serial #	34451	
Count time	6 seconds	Input sensitivity		10	mV
		Source to detector distance		contact	
Isotope 1	Am241		Activity	111301	4pi
Isotope 2	Cs137		Activity	99732	4pi
Isotope 3			Activity		
Isotope 4			Activity		
Comment	Model 44-20 energy resolution = 10.8%				
	acceptable detector energy resolution is <13% for window operation				

High Voltage	Background	Isotope 1	Isotope 2	Isotope 3	Isotope 4
400	69	73			
450	199	230			
500	301	375			
550	808	814			
600	1129	1147			
650	1358	2473			
700	1384	2839			
750	1430	3073	4293		
800	1439	3291	4343		
850	**1517**	**3371**	**4377**		
900	1578	3434	4503		
950	1644	3483	4509		
1000	2458	3512			
1050	3554	5838			
1100	25001	41028			
1150					
1200					

Signature _____ Date 10-21-08

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
Ludlum	2221	161585 → 44-20	~~161586~~	PR 254904	10/20/09

Bkgd Count	Source Count	Source #1 ID	Source #2 ID	Source #3 ID	CDD
1	1	Cs-137	N/A	N/A	10/20/10

Date	12/7/09										
Intial QC's	1	2	3	4	5	6	7	8	9	10	Tech
Bkgd	13425	13126	12912	12936	13233	13714	13221	13073	12933	13892	AW
Source #1	366952	394474	332600	346294	329855	346005	370375	369236	370567	369154	AW
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Cs-137) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
12/7/09	12940	341276			Yes / No	AW
12/8/09	13030	370098			Yes / No	AW
12/10/09	13360	843057			Yes / No	AW
12/11/09	13050	368321			Yes / No	GB
12/14/09	12879	342764			Yes / No	GB
12/15/09	12954	363335			Yes / No	GB
1/4/10	11709	365835	N/A	N/A	Yes / No	AW
1-11-10	13144	358493			Yes / No	DJC
1/13/10	12840	364322			Yes / No	AW
1/14/10	12880	351994			Yes / No	AW
1/18/10	14123	~~378616~~ 391428			Yes / No	SO
1/19/10	13822	344924			Yes / No	AW
1/20/10	14368	347492			Yes / No	AW
1/21/10	14379	354517			Yes / No	DJC
Instrument was returned to instrumentation on 2/2/10 AW					Yes / No	
		N/E			Yes / No	

Project#~~08-380.08~~ 09-3800.08

Project Name: Middlesex Municipal Landfill

MJW Technical Services
243 Root St.
Suite 100
Olean, New York 14760
Voice: (716) 372-5300
Fax: (716) 372-5307

Certificate Of Calibration

This Certificate will be accompanied by Calibration Charts or Readings where Applicable

Customer

Customer Name: Cabrera Services Inc

Address: 473 Silver Lane
East Hartford, CT 06118

Contact Name: Chuck Mikaitis

Customer PO/
CC. Number: 10-0094

Work Order
Number: 2009-1519

Instrument

Manufacturer: Ludlum Measurements

Model: 2221 Serial Number: 196087

Detector Manufacturer: Ludlum Measurements

Det. Model: 44-20 Serial Number: RN182712

Calibration Method: Electronic

Instrument Received: ☑ Within Tolerance ☐ Out of Tolerance ☐ Repairs required ☐ Other (See Comments)

☑ Geotropism ☑ Meter Zero ☑ Mech. Ck. ☑ HV Readout ☑ Battery Check ☑ Reset

☑ Audio ☐ Window Status ☑ FS Response ☐ Linearity ☐ Background Subtract ☐ Alarm Set

Temperature: 71.1 F Humidity: 50 % Pressure: 726.4 mm Hg Altitude: 1450 ft

Instrument Calibration

Multiplier\Range	Calibration Point	Instrument Response	
		Before Calibration	After Calibration
X 1	100 cpm	95 cpm	100 cpm
X 1	400 cpm	400 cpm	400 cpm
X 10	1 kcpm	0.95 kcpm	1 kcpm
X 10	4 kcpm	4 kcpm	4 kcpm
X 100	10 kcpm	9.5 kcpm	10 kcpm
X 100	40 kcpm	40 kcpm	40 kcpm
X 1K	100 kcpm	100 kcpm	100 kcpm
X 1K	400 kcpm	400 kcpm	400 kcpm
Digital Ratemeter	40 cpm	40 cpm	40 cpm
Digital Ratemeter	400 cpm	400 cpm	400 cpm
Digital Ratemeter	4 kcpm	4.009 kcpm	4.009 kcpm
Digital Ratemeter	40 kcpm	40.006 kcpm	40.006 kcpm
Digital Ratemeter	400 kcpm	400.089 kcpm	400.089 kcpm
Digital Scaler	40 cpm	40 cpm	40 cpm
Digital Scaler	400 cpm	399 cpm	399 cpm
Digital Scaler	4 kcpm	3.994 kcpm	3.994 kcpm
Digital Scaler	40 kcpm	39.939 kcpm	39.939 kcpm
Digital Scaler	400 kcpm	399.405 kcpm	399.405 kcpm
Log Scale	50 cpm	50 cpm	5 cpm
Log Scale	500 cpm	475 cpm	500 cpm
Log Scale	5 kcpm	5 kcpm	5 kcpm
Log Scale	50 kcpm	50 kcpm	50 kcpm
Log Scale	500 kcpm	500 kcpm	500 kcpm

Reference instruments and / or Sources

Scaler: 2200	34451	Pulser: 500-2	220110
Cs137	C7-806		

Comments

Inst. Voltage:	900 V	Isotope	Efficiency	Distance
Input Sensitivity:	10 mV	Cs137	26.8%	0 inch

Detector		Ref. Voltage 1:	500 V
Operating voltage:	900 V	Inst. Voltage 1:	496 V
		Ref. Voltage 2:	1500 V
		Inst. Voltage 2:	1497 V

Model 2221 currently set for gross counts
High Voltage: 900V detector connected with 20 foot cord
Threshold: 100 = 10mV
Window: OUT

Model 44-20 energy resolution = 10.6%, acceptable detector energy resolution is <13%

Statement of Certification

MJW Technical Sevices, Inc certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ISO/IEC 17025 and ANSI N323. The Instrument listed above was inspected prior to shipment and it met all the manufacturer's published operating specifications. (MJW technical Services is not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: [signature]

Reviewed By: K T Rabyca Date 10/30/09

Calibration Date: 10/30/2009

Calibration Due: 10/30/2010

MJW Technical Services

Bench Test Data for Detector

Customer	Cabrera Services		PO #	10-0094
Detector	M44-20		Serial #	RN182712
Counter	M2200		Serial #	34451
Count time	6 sec	Input sensitivity	10	mV
		Source to detector distance	contact	
Isotope 1	Am241		Activity	111301 4pi
Isotope 2	Cs137		Activity	99732 4pi
Isotope 3			Activity	
Isotope 4			Activity	
Comment	Model 44-20 energy resolution = 10.6%			
	acceptable detector energy resolution is <13% for window operation			

High Voltage	Background	Isotope 1	Isotope 2	Isotope 3	Isotope 4
400	140	142			
450	382	389			
500	454	780			
550	1035	1225			
600	1292	1990			
650	1426	2900			
700	1522	3069			
750	1530	3326			
800	1495	3414	4484		
850	1541	3517	4518		
900	1496	3523	4514		
950	1547	3544	4549		
1000	1530	3517	4543		
1050	1624	3549			
1100	1635	3582			
1150	1740	3682			
1200	1860	3773			

Signature _____ Date 10-20-09

ABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
Ludlum	2221	196087	44-20	RN 182712	10/30/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
	1	Cs-137	N/A	N/A	10/30/10

Date	12/7/09										
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	14720	14514	14432	14267	14554	14399	14194	14493	14196	14277	AW
Source #1	357582	383122	353310	382812	375345	376418	366517	366727	384069	374190	AW
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Cs-137) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
12/7/09	14401	381714			Yes / No	AW
(GP 12/10/09) 12/8/09	14261	377456			Yes / No	AW
12/10/09 ~~12/9/09~~	14262	358751			Yes / No	GP
12/14/09	15682	347105			Yes / No	CBA
01/13/10	13495	382250			Yes / No	AW
01/14/10	15034	359588			Yes / No	AW
1/18/10	14844	~~359588~~ 378010			Yes / No	SO
1/19/10	14792	381676	N/A	N/A	Yes / No	AS
1/20/10	15646	361023			Yes / No	AW
1/21/10	14714	373221			Yes / No	DJC
1-26-10	14999	389060			Yes / No	AS
1/27/10	15265	371728			Yes / No	AS
1/28/10	14875	359877			Yes / No	AS
1/29/10	14372	342293			Yes / No	AS
2/2/10	14888	363688			Yes / No	AW
2/3/10	14386	360760			Yes / No	AS

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Daily QC's						
Date	**Bkgd**	**Source #1** ( ) α / β / γ	**Source #2** ( ) α / β / γ	**Source #3** ( ) α / β / γ	**Battery OK**	**Tech**
2/4/10	15560	389708	N/A	N/A	(Yes) / No	[illegible]
2-5-10	14985	374551	NA	NA	(Yes) / No	DJL
2/15/10	14444	364287	N/A	N/A	(Yes) / No	AW
2/16/10	14753	386304	N/A	N/A	(Yes) / No	AW
2/24/10	14348	370,398	N/A	N/A	(Yes) / No	AW
2/25/10	~~15~~ 15192	370,830	N/A	N/A	(Yes) / No	[illegible]
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
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					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

CTI
Calibration Technology
A Division of RSCS, Inc.

Calibration Certificate
ID Number: 21855929832-0

Customer: Chuck Mikaitis
Cabrera Services, Inc.
473 Silver Lane
East Hartford, CT 06118-

Instrument	Serial Number
Ludlum Model 2221	218559
Probe Model	**Serial Number**
Ludlum 44-20	215468

Precision Check

Test 1	Test 2	Test 3	Mean	Results
9.98 Kcpm	9.97 Kcpm	9.97 Kcpm	9.97 Kcpm	Satisfactory

Accuracy Check

Range	Target Value	As Found	As Left
X1000	400 Kcpm	398.77 Kcpm #	398.77 Kcpm #
X1000	100 Kcpm	99.708 Kcpm #	99.708 Kcpm #
X100	40 Kcpm	39.876 Kcpm #	39.876 Kcpm #
X100	10 Kcpm	9.978 Kcpm #	9.978 Kcpm #
X10	4 Kcpm	3.989 Kcpm #	3.989 Kcpm #
X10	1 Kcpm	.997 Kcpm #	.997 Kcpm #
X1	400 cpm	399 cpm #	399 cpm #
X1	100 cpm	99 cpm #	99 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10% of Target value
Readings with # indicate ranges were calibrated using a pulser

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
44-20 215468	Co-57	0.1002 C/D	Co-57 (SN: 129584)	@1cm
44-20 215468	Cs-137	0.1409 C/D	Cs-137(Gamma) (SN: 14290)	@1cm

MTE Instrument Type	Model	CalDueDate
Pulser	Ludlum 500-4SN: 66151	01/21/2010

Outer Physical Check: *Pass*
Mechanical Zero: *Pass*
Tap Test: *Pass*
Geotropism Check: *Pass*

Electronics Checks	As Found	As Left
High Voltage	1071 Volts	1125 Volts
Low Level Discriminator #1	101	101
Window	4026	4026

Comments: Digital and analog displays show proper congruence.

Calibrated by: _____ QA Review: _____ Date: 06/18/2009
Expires: 06/18/2010

Atmospheric Conditions - Temperature: 77° F Humidity: 40% Barometric Pressure:30.05 in/hg

This calibration was performed by RSCS Inc. 91 Portsmouth ave, Stratham NH 03885 using a NIST Traceable radiation source, in conformance to the following standards: ANSI N323A (1997). RSCS New Hampshire Radioactive Material License Number: 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedure . This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are (cpm) or ur/hr

Make	Model	S/N	Probe	S/N	DOC
LUDLUM	~~DP 218~~ 2221	218559	44-20	215468	6/18/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
1 min	1 min	Cs 137	NA	NA	6/18/10

Date	1-11-10										
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	12773	12575	12729	12738	12768	12850	12580	12622	12825	12807	DJC
Source #1	347707	348080	348009	347632	346627	348218	348580	348467	348157	347931	DJC
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Cs 137) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
1-11-10	12661	347774			(Yes) / No	DJC
1/13/10	11998	363868			(Yes) / No	AW
1/14/10	12816	352981			(Yes) / No	AW
1/18/10	13746	353039			(Yes) / No	SO
1/19/10	13491	369466			(Yes) / No	AJ
1/20/10	14080	344849			(Yes) / No	AW
1/21/10	13959	348286			(Yes) / No	AJ
1/26/10	13755	355802	NA	NA	(Yes) / No	AJ
1/27/10	13645	342403			(Yes) / No	AJ
1/28/10	13658	341663			(Yes) / No	AJ
1/29/10	13422	362840			(Yes) / No	AJ
2/2/10	13710	356991			(Yes) / No	AW
2/3/10	13521	340921			(Yes) / No	AJ
2/4/10	13667	365881			(Yes) / No	AJ
2-16-10	12459	351053			(Yes) / No	DJC
2/17/10	12662	350365			(Yes) / No	AW

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Daily QC's

Date	Bkgd	Source #1 ( ) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
2/18/10	13219	361420	N/A	N/A	(Yes) / No	AW
2/22/10	13229	348140	N/A	N/A	(Yes) / No	AW
2/23/10	13430	358571	N/A	N/A	(Yes) / No	AW
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

Certificate of Calibration

Calibration and Voltage Plateau

Environmental Restoration Group, Inc.
8809 Washington St NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224
www.ERGoffice.com

Meter: Manufacturer: Ludlum | Model Number: 2221 | Serial Number: 71235

Detector: Manufacturer: Ludlum | Model Number: 44-20 | Serial Number: PR201774

☑ Mechanical Check ☑ Geotropism ☑ THR/WIN Operation ☑ Audio Check ☑ Battery Check (Min 4.4 VDC)

☑ F/S Response Check ☑ Meter Zeroed ☑ Reset Check HV Check (+/- 2.5%): ☑ 500 V ☑ 1000 V ☑ 1500 V

Source Distance: ☒ Contact ☒ 6 inches ☒ Other: Cable Length: ☐ 39-inch ☑ 72-inch ☐ Other:

Source Geometry: ☑ Side ☐ Below ☐ Other: Temperature: 73 °F Relative Humidity 20 %

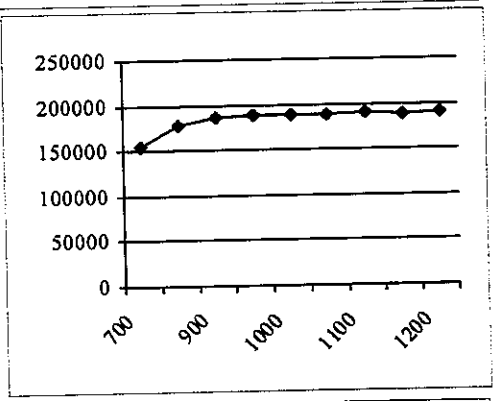
Threshold: 10 mV Window: Barometric Pressure: 24.3 inches Hg

Instrument found within tolerance: ☑ Yes ☐ No

Range/Multiplier	Reference Setting	"As Found Reading"	Meter Reading	Integrated 1-Min. Count	Log Scale Count
x 1000	400	400	400	399441	400
x 1000	100	100	100		100
x 100	40	400	400	39947	400
x 100	10	100	100		100
x 10	4	400	400	3995	400
x 10	1	100	100		100
x 1	400	400	400	399	400
x 1	100	100	100		100

High Voltage	Source Counts	Background
700	153995	
800	178957	
900	185782	
950	187745	
1000	188694	
1050	189054	
1100	189882	25673
1150	189354	
1200	190518	

Voltage Plateau



Comments: HV Plateau Scaler Count Time = 1-min. Recommended HV = 1100

Reference Instruments and/or Sources:

Ludlum pulser serial number: ☐ 97743 ☑ 201932

☐ Alpha Source: Th-230 @ 13,000 dpm (1/13/10) sn: 4098-03

☐ Beta Source: Tc-99 @ 17,700 dpm (1/13/10) sn: 4099-03

Fluke multimeter serial number: ☐ 87490128

☑ Gamma Source Cs-137 @ 5.37 uCi (1/13/10) sn: 4097-03

☐ Other Source:

Calibrated By: Calibration Date: 1-19-10 Calibration Due: 1-19-11

Reviewed By: Review Date: 1-19-10

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NMRCB Registration No. 481-3 * Calibration of Radiation Detection Instrument Devices

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
ludlum	2221	71235	44-10	PR201774	1-19-10
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
1	1	Cs-137	N/A	N/A	1-19-11

Date 1/20/10

Intial QC's	1	2	3	4	5	6	7	8	9	10	Tech
Bkgd	15216	15396	15392	15174	15200	15315	15533	15149	15251	15135	KJ
Source #1	335902	335500	336228	336971	336186	315797	315466	315035	314393	314500	KJ
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Cs-137) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
1/21/10	14768	336352	346829	N/A	Yes / No	KJ
1/26/10	14409	346829	N/A	N/A	Yes / No	KJ
1/27/10	14384	359576	N/A	N/A	Yes / No	KJ
1/28/10	14322	352516	N/A	N/A	Yes / No	KJ
1/29/10	13964	364969	N/A	N/A	Yes / No	KJ
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

Certificate of Calibration

Calibration and Voltage Plateau

Environmental Restoration Group, Inc.
8809 Washington St NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224
www.ERGoffice.com

Meter: Manufacturer: Ludlum | Model Number: 2221 | Serial Number: 190171

Detector: Manufacturer: Ludlum | Model Number: 44-20 | Serial Number: PR213432

☑ Mechanical Check ☑ Geotropism ☑ THR/WIN Operation ☑ Audio Check ☑ Battery Check (Min 4.4 VDC)

☑ F/S Response Check ☑ Meter Zeroed ☑ Reset Check HV Check (+/- 2.5%): ☑ 500 V ☑ 1000 V ☑ 1500 V

Source Distance: ☐ Contact ☑ 6 inches ☐ Other: Cable Length: ☐ 39-inch ☑ 72-inch ☐ Other:

Source Geometry: ☑ Side ☐ Below ☐ Other: Temperature: 73 °F Relative Humidity 20 %

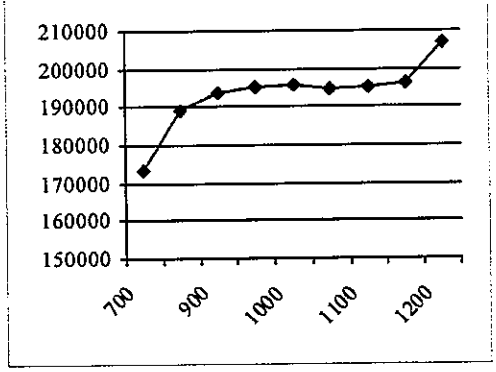
Threshold: 10 mV Window: N/A Barometric Pressure: 24.3 inches Hg

Instrument found within tolerance: ☑ Yes ☐ No

Range/Multiplier	Reference Setting	"As Found Reading"	Meter Reading	Integrated 1-Min. Count	Log Scale Count
x 1000	400	400	400	399874	400
x 1000	100	100	100		100
x 100	40	400	400	39992	400
x 100	10	100	100		100
x 10	4	400	400	4000	400
x 10	1	100	100		100
x 1	400	400	400	400	400
x 1	100	100	100		100

High Voltage	Source Counts	Background
700	173470	
800	189340	
900	193517	
950	195189	
1000	195995	
1050	194777	27135
1100	195181	
1150	196333	
1200	207079	

Voltage Plateau



Comments: HV Plateau Scaler Count Time = 1-min. Recommended HV = 1050

Reference Instruments and/or Sources:

Ludlum pulser serial number: ☐ 97743 ☑ 201932 Fluke multimeter serial number: ☐ 87490128

☐ Alpha Source: Th-230 @ 13,000 dpm (1/13/10) sn: 4098-03 ☑ Gamma Source Cs-137 @ 5.37 uCi (1/13/10) sn: 4097-03

☐ Beta Source: Tc-99 @ 17,700 dpm (1/13/10) sn: 4099-03 ☐ Other Source:

Calibrated By: _____ Calibration Date: 1-19-10 Calibration Due: 1-19-11

Reviewed By: _____ Review Date: 1-19-10

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NMRCB Registration No. 481-3 * Calibration of Radiation Detection Instrument Devices

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
ludlum	2221	190171	4420	PR213432	1/19/10
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
1	1	CS-137	N/A	N/A	1/19/11

Date	1/20/10										
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	15390	15503	15610	15744	15467	15563	15757	15635	15590	15924	AW
Source #1	386454	386882	387077	387259	387289	386811	386466	387731	386714	385206	AW
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Cs-137) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
1/21/10	15694	358904	N/A	N/A	(Yes) / No	AW
3/1/10 ~~3/11/10~~ stw	16328	386322	N/A	N/A	(Yes) / No	AW
3-2-10	13980	376303	NA	NA	(Yes) / No	DJC
3/3/10	15339	363089	N/A	N/A	(Yes) / No	AW
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

243 Root St.
Suite 100
Olean, New York 14760
Voice: (716) 372-5300
Fax: (716) 372-5307

Certificate Of Calibration

This Certificate will be accompanied by Calibration Charts or Readings where Applicable

Customer		Instrument	
Customer Name: Cabrera Services Inc		Manufacturer: Ludlum Measurements	
Address: 473 Silver Lane, East Hartford, CT 06118		Model: 2221	Serial Number: 196062
		Detector Manufacturer: Bicron	
Contact Name: Chuck Mikaitis		Det. Model: G1	Serial Number: C443E
Customer PO/ CC. Number: 10-0006	Work Order Number: 2009-1323	Calibration Method: Electronic	

Instrument Received: ☑ Within Tolerance ☐ Out of Tolerance ☐ Repairs required ☐ Other (See Comments)

☑ Geotropism ☑ Meter Zero ☑ Mech. Ck. ☐ HV Readout ☑ Battery Check ☑ Reset

☑ Audio ☐ Window Status ☑ FS Response ☑ Linearity ☐ Background Subtract ☐ Alarm Set

Temperature: 72.4 F Humidity: 48 % Pressure: 726.4 mm Hg Altitude: 1450 ft

Instrument Calibration

Multiplier\Range	Calibration Point	Instrument Response	
		Before Calibration	After Calibration
X 1	100 cpm	99 cpm	99 cpm
X 1	400 cpm	402 cpm	402 cpm
X 10	1 kcpm	0.99 kcpm	0.99 kcpm
X 10	4 kcpm	4.02 kcpm	4.02 kcpm
X 100	10 kcpm	10 kcpm	10 kcpm
X 100	40 kcpm	40.2 kcpm	40.2 kcpm
X 1K	100 kcpm	100 kcpm	100 kcpm
X 1K	400 kcpm	402 kcpm	402 kcpm
Digital Ratemeter	40 cpm	40 cpm	40 cpm
Digital Ratemeter	400 cpm	399 cpm	399 cpm
Digital Ratemeter	4 kcpm	3.996 kcpm	3.996 kcpm
Digital Ratemeter	40 kcpm	39.947 kcpm	39.947 kcpm
Digital Ratemeter	400 kcpm	399.412 kcpm	399.412 kcpm
Digital Scaler	40 cpm	40 cpm	40 cpm
Digital Scaler	400 cpm	400 cpm	400 cpm
Digital Scaler	4 kcpm	3.995 kcpm	3.995 kcpm
Digital Scaler	40 kcpm	39.943 kcpm	39.943 kcpm
Digital Scaler	400 kcpm	399.388 kcpm	399.388 kcpm
Log Scale	50 cpm	50 cpm	50 cpm
Log Scale	500 cpm	525 cpm	525 cpm
Log Scale	5 kcpm	5.3 kcpm	5.3 kcpm
Log Scale	50 kcpm	54.2 kcpm	54.2 kcpm
Log Scale	500 kcpm	540 kcpm	540 kcpm

Reference instruments and / or Sources

Pulser: 500-2	220100		
I129	C7-632	Co57	1181-15-5
Cs137	1159-6-1		

Comments

		Isotope	Efficiency	Distance
Inst. Voltage:	880 V			
Input Sensitivity:	10 mV	I129	8.3%	0 inch
		Co57	15.5%	0 inch
Detector		Cs137	5.4%	0 inch
Operating voltage:	880 V			

Model 2221 currently set for gross counts

High Voltage: 880V detector connected with 70 foot cord

Threshold: 100 (10mV)

Window: OUT

Statement of Certification

MJW Technical Sevices, Inc certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ISO/IEC 17025 and ANSI N323. The Instrument listed above was inspected prior to shipment and it met all the manufacturer's published operating specifications. (MJW technical Services is not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: KTRalyea Reviewed By: [signature] Date 7-15-09

Calibration Date: 07/15/2009 Calibration Due: 07/15/2010

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm

Make	Model	S/N	Probe	S/N	DOC
ludlum	2221	196062	G1	C436	7/15/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
	1				7/15/10

Date	1/20/10										
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	1400	1399	1445	1406	1454	1465	1369	1509	1405	1414	AJ
Source #1	109207	105650	103887	103981	103377	101845	100682	114888	113751	114129	AJ
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Cs-137) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
1/27/10	1345	118001	N/A	N/A	(Yes) / No	AJ
1/28/10	1483	106975	NA	NA	Yes / No	DJC
2/3/10	1418	106552	N/A	N/A	(Yes) / No	AJ
2/4/10	1441	103451	N/A	N/A	(Yes) / No	AJ
2-5-10	1421	105551	NA	NA	(Yes) / No	DJC
2/16/10	1381	107505	NA	N/A	(Yes) / No	AW
2/16/10	1367	104355	N/A	N/A	(Yes) / No	AW
2/17/10	1327	104459	N/A	N/A	(Yes) / No	AW
2-18-10	1475	104165	N/A	N/A	(Yes) / No	AW
2-22-10	1387	104705	N/A	N/A	(Yes) / No	AW
2-23-10	1447	104125	N/A	N/A	(Yes) / No	AW
3/1/10	1475	107458	N/A	N/A	(Yes) / No	AW
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

RSCS
Radiation Safety & Control Services

Calibration Certificate
ID Number: 19020532197-0

Customer: Chuck Mikaitis
Cabrera Services, Inc.
473 Silver Lane
East Hartford, CT 06118-

Instrument	Serial Number
Ludlum Model 2221	190205

Probe Model	Serial Number
Bicron G-1	C436E

Precision Check

Test 1	Test 2	Test 3	Mean	Results
4.08 Kcpm	4.06 Kcpm	4.04 Kcpm	4.06 Kcpm	Satisfactory

Accuracy Check

Range	Target Value	As Found	As Left
X1000	400 Kcpm	399.28 Kcpm #	399.28 Kcpm #
X1000	100 Kcpm	99.560 Kcpm #	99.560 Kcpm #
X100	40 Kcpm	40.670 Kcpm #	40.670 Kcpm #
X100	10 Kcpm	10.150 Kcpm #	10.150 Kcpm #
X10	4 Kcpm	4.070 Kcpm #	4.070 Kcpm #
X10	1 Kcpm	1.004 Kcpm #	1.004 Kcpm #
X1	400 cpm	401 cpm #	401 cpm #
X1	100 cpm	99.5 cpm #	99.5 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10% of Target value
Readings with # indicate ranges were calibrated using a pulser

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
G-1 C436E	Ba-133	0.1687 C/D	Ba-133 (SN: 380-39-1)	@1cm
G-1 C436E	Co-57	0.0965 C/D	Co-57 (SN: 129584)	@1cm
G-1 C436E	Cs-137	0.0447 C/D	Cs-137(Gamma) (SN: 14290)	@1cm
G-1 C436E	I-125	0.1149 C/D	I-129 (SN: NES-186S)	@1cm

MTE Instrument Type	Model	CalDueDate
Pulser	Ludlum 500-4SN: 66151	01/21/2010

Outer Physical Check: *Pass*
Internal Check: *Pass*
Geotropism Check: *Pass*
Mechanical Zero: *Pass*
Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	852 Volts	852 Volts
Low Level Discriminator #1	10.0 mv	10.0 mv
Window	Out	Out

Comments: Analog and digital displays reflect appropriate congruence.

Calibrated by: _____ QA Review: _____ Date: 10/09/2009
Expires: 10/09/2010

Atmospheric Conditions - Temperature: 78° F Humidity: 29% Barometric Pressure:29.95 in/hg

This calibration was performed by RSCS Inc. 91 Portsmouth ave, Stratham NH 03885 using a NIST Traceable radiation source, in conformance to the following standards: ANSI N323A (1997). RSCS New Hampshire Radioactive Material License Number: 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedure . This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
Ludlum	2221	190205	G-1	C436E	10/9/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
1	1	Cs-137	N/A	N/A	10/9/10

Date 2/2/10

Intial QC's	1	2	3	4	5	6	7	8	9	10	Tech
Bkgd	1558	1520	1452	1478	1533	1420	1493	1462	1439	1468	AW
Source #1	111258	111141	112436	111860	109136	111725	109870	108491	108039	111131	AW
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Daily QC's

Date	Bkgd	Source #1 (Cs-137) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
2/2/10	111515	→			(Yes) / No	AW
					Yes / No	
2/2/10	1505	111515			(Yes) / No	AW
2/3/10	1505	112554			(Yes) / No	AW
2/4/10	1510	102841			~~Yes~~ / No	AW
2/23/10	1543	109623			(Yes) / No	AW
2/24/10	1537	108695			(Yes) / No	AW
2/25/10	1550	109766			(Yes) / No	AW
3/1/10	1500	106196			(Yes) / No	AW
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

Project#~~08-380.08~~ 08-3800.08

Project Name: Middlesex Municipal Landfill

CTI
Calibration Technology
A Division of RSCS, Inc.

Calibration Certificate
ID Number: C854F27924-0

Customer: Hank Siegrist
Cabrera Services, Inc.
473 Silver Lane
East Hartford, CT 06118-

Instrument
Bicron Model MicroRem

Serial Number
C854F

Precision Check

Test 1	Test 2	Test 3	Mean	Results
16.00 mrem/hr	16.00 mrem/hr	16.00 mrem/hr	16.00 mrem/hr	Satisfactory

Accuracy Check

Range	Target Value	As Found	As Left
X1000	160 mrem/hr	165 mrem/hr	165 mrem/hr
X1000	40 mrem/hr	40 mrem/hr	40 mrem/hr
X100	16 mrem/hr	16 mrem/hr	16 mrem/hr
X100	4 mrem/hr	4 mrem/hr	4 mrem/hr
X10	1.6 mrem/hr	1.4 mrem/hr	1.6 mrem/hr
X10	0.4 mrem/hr	0.35 mrem/hr	0.4 mrem/hr
X1	160 µrem/hr	140 µrem/hr	160 µrem/hr
X1	40 µrem/hr	30 µrem/hr # *	40 µrem/hr #
X0.1	16 µrem/hr	13 µrem/hr #	16 µrem/hr #
X0.1	4 µrem/hr	3 µrem/hr # *	4 µrem/hr #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10% of Target value
Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Ludlum 500-4 SN: 66151	01/21/2010

Outer Physical Check: *Pass*
Internal Check: *Pass*
Geotropism Check: *Pass*
Mechanical Zero: *Pass*
Tap Test: *Pass*

Comments: All As Left readings taken subsequent to repair.

Calibrated by: _____ QA Review: _____

Calibration Date: 04/22/2009
Expires: 04/22/2010

Atmospheric Conditions - Temperature: 72°F Humidity: 36% Barometric Pressure: 29.63"hg
This calibration was performed by RSCS Inc. 91 Portsmouth ave, Stratham NH 03885 using a NIST Traceable radiation source (Cs-137 Beam Source SN: S-364), in conformance to the following standards: ANSI N323A (1997). RSCS New Hampshire Radioactive Material License Number: 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedure 2.4.2. This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc

ABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
	Bicron	C854F	N/A	N/A	4/22/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
N/A	N/A	Cs-137	N/A	N/A	4/22/10

Date	12/7/09										
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	6	5	7	5	5	6	6	6	5	6	AW
Source #1	70	80	80	60	60	70	80	70	90	80	AW
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 (Cs-137) α / β (γ)	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
12/7/09	6	80			(Yes) / No	AW
12/8/09	6	80			(Yes) / No	AW
1/4/10	6	70			(Yes) / No	AW
1/13/10	5	80			(Yes) / No	AW
1/19/10	5	80			(Yes) / No	AW
1/20/10	6	80			(Yes) / No	AW
1/26/10	5	70			(Yes) / No	AW
1/27/10	6	70	N A	N A	(Yes) / No	AW
1/29/10	5	70			(Yes) / No	AW
2/2/10	5	70			(Yes) / No	AW
~~3-1-10~~	~~4~~	~~80~~			~~(Yes) / No~~	~~DK~~
3-3-10	6	80			(Yes) / No	AW
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

recorded wrong S/N AW

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20135420/339001

Mfg. Ludlum Measurements, Inc. Model 2241-2 Serial No. 217869

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR229888

Cal. Date 18-Jun-09 Cal Due Date 18-Jun-10 Cal. Interval 1 Year Meterface 44-9

Check mark √ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 45 % Alt 698.8 mm Hg

☐ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☑ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☐ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation
☐ Audio ck. ☑ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC
☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set Comments V Input Sens. Comments mV Det. Oper. Comments V at comments mV Threshold Dial Ratio ____ = ____ mV

COMMENTS:

	Det 1	Det 2
Deadtime:	80 µSec	00 µSec
Cal Constant:	100 e-2	100 e-2
R Alarm:	50 kC/m	50 kcpm
R Alert:	20 kC/m	20 kcpm
High voltage:	900 v 35mv	900 v 35mv
Firmware:	P-06 10	

EFF:FOR TC-99 #5279 act.28,800dpm ct.6796cpm -Bg60 ct.6736cpm 23% 4Pi

NOA Sounds due to no Setups (Required 44-9)

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
AUTO			
AUTO			

*Uncertainty within ± 10% C.F. within ± 20%

All Range(s) Calibrated Electronically

Ratemeter Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	800K cpm		800 Kcpm
	200K cpm		200
	80K cpm		80
	20K cpm		20
	8K cpm		8
	2K cpm		2
	800 cpm		800cpm
	200 cpm		200

Scaler Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	800K cpm		800450
	200K cpm		200 10
	80K cpm		8010
	20K cpm		2000
	8K cpm		800
	2K cpm		200
	800 cpm		80
	200 cpm		20

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646

Cs-137 Gamma S/N ☐ 1162 ☑ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☑ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ____ ☐ Beta S/N ____ ☐ Other ____

☑ m 500 S/N 189506 ☐ Oscilloscope S/N ____ ☑ Multimeter S/N 93870637

Calibrated By: Dustin Jackson Date 18-Jun-09

Reviewed By: Rhonda Hinn Date 18 Jun 09

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Designer and Manufacturer of Scientific and Industrial Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CONVERSION CHART

Customer CABRERA SERVICES Date 18-Jun-09 Order #. 20135420/339001

Model 2241-2 Serial No. 217869 Detector Model 44-9 Serial No. PR229888

Source Cs-137 194.6 mCi Cs-137 20 mCi High Voltage 900 V

Count time Ratemeter Input Sensitivity 35 mV

Reference Point	"As Found" Readings (CPM): with Deadtime	w/o Deadtime	After Adjustment Readings (CPM): with Deadtime	w/o Deadtime
150 mR/hr	None	None	529 kcpm	Digital
50 mR/hr			170	
15 mR/hr			50.7	
5 mR/hr			15.4	
1.5 mR/hr			5.48	
1.0 mR/hr			3.26	

Signature: [signature] Date 18-Jun09

FORM C17-1C 04/09/2003

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
iudium	2241-2	217869	44-9	PR229888	6/18/09
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
1	1	Tc-99 (11161)	N/A	N/A	6/18/10

Date	2/18/10										
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	36	34	36	35	37	34	34	36	38	38	AW
Source #1	3175	3027	3144	3102	3099	3166	3178	3170	3152	3167	AW
Source #2					N						
Source #3						A					

Daily QC's

Date	Bkgd	Source #1 ( ) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
2/22/10	36	3123			Yes / No	AW
2/23/10	37	3149			Yes / No	AW
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
			N	N	Yes / No	
			A	A	Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

Designer and Manufacturer of Scientific and Industrial Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CERTIFICATE OF CALIBRATION

CUSTOMER ENVIRONMENTAL RESTORATION GROUP ORDER NO. 20142511/343304

Mfg. Thermo Model MICRO REM Serial No. 1622

Mfg. _____ Model _____ Serial No. _____

Cal. Date 18-Oct-09 Cal Due Date 18-Oct-10 Cal. Interval 1 Year Meterface 0-200µrem/

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 38 % Alt 702.8 mm Hg

☐ New Instrument Instrument Received ☐ Within Toler. +-10% ☑ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☐ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) _____ VDC

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set _____ V Input Sens. _____ mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

☐ HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x 1000	150 mR/hr	145	150
x 1000	50 mR/hr	45	48
x 100	15 mR/hr	145	150
x 100	5 mR/hr	45	48
x 10	1500 µR/hr	150	150
x 10	500 µR/hr	50	50
x 1	150 µR/hr	180	150
x 1	100 µR/hr	120	100
x0.1	15 µR/hr	150	150
x0.1			

*Uncertainty within ± 10% C.F. within ± 20% Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646

Cs-137 Gamma S/N ☐ 1162 ☑ G112 ☑ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☑ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N _____ ☐ Beta S/N _____ ☑ Other Cs-137 201uCi

☐ m 500 S/N _____ ☐ Oscilloscope S/N _____ ☐ Multimeter S/N _____

Calibrated By: Dwight Jackson Date 18-Oct-09

Reviewed By: Frank Hinn Date 18 Oct 09

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FORM C22A 10/15/2008

AC Inst. Only ☐ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed: _____

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

DAILY FIELD LOG
Instrument QC

units are cpm or ur/hr

Make	Model	S/N	Probe	S/N	DOC
Ludlum	Micro Rem	1622	N/A	N/A	/
Bkgd Count	**Source Count**	**Source #1 ID**	**Source #2 ID**	**Source #3 ID**	**CDD**
N/A	N/A	Cs137	N/A	N/A	

Date											
Intial QC's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Tech**
Bkgd	4	5	4	4	5	4	6	5	5	4	AW
Source #1	80	80	70	70	80	80	90	90	80	80	AW
Source #2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW
Source #3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AW

Daily QC's

Date	Bkgd	Source #1 ( ) α / β / γ	Source #2 ( ) α / β / γ	Source #3 ( ) α / β / γ	Battery OK	Tech
2/25/10 ~~2/26/10~~ AW	4	80			Yes / No	AW
3/1/10	4	80			Yes / No	DJC
3/2/10	5	80			Yes / No	AW
~~3/3/10~~	~~6~~	~~80~~			~~Yes / No~~	~~AW~~
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

N/A

N/A

AW recorded on the wrong instrument tab.

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

Counting Instrument:	2929	Detector:	43-10-1	Calibration Date:	1/5/2010
Serial #:	129566	Serial #:	PR132720	12 month calibration:	1/5/2011
Detector Active Area or Area Covered by Smear (cm^2):	100				

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.3130	Th-230	1160	17,500	4/29/2002	7.54E+04	1.75E+04	10	10	2	0.09	0.10	5485.9	66.01
Beta	0.2360	Tc-99	1161	17,700	4/29/2002	2.11E+05	1.77E+04	500	10	2	39.39	1.60	4170.2	60.20

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
1/19/2010	0	373	11094	8521	0.0	37.3	5547.0	4223.2	PASS	PASS	PASS	PASS	4.79	72	Yes	Yes	AW	AW
1/20/2010	0	403	10788	8481	0.0	40.3	5394.0	4200.2	PASS	PASS	PASS	PASS	4.79	75	Yes	Yes	AW	AW
1/26/2010	0	384	11259	8410	0.0	38.4	5629.5	4166.6	PASS	PASS	*QUESTION*	PASS	4.79	73	Yes	Yes	DJC	DJC
1/27/2010	1	371	10804	8365	0.1	37.1	5401.9	4145.4	PASS	PASS	PASS	PASS	7.37	72	Yes	Yes	AW	AW
1/28/2010	0	365	11136	8401	0.0	36.5	5568.0	4164.0	PASS	PASS	PASS	PASS	4.79	72	Yes	Yes	AW	AW
1/29/2010	1	381	11111	8460	0.1	38.1	5555.4	4191.9	PASS	PASS	PASS	PASS	7.37	73	Yes	Yes	AW	AW
2/3/2010	2	391	11174	8466	0.2	39.1	5586.8	4193.9	PASS	PASS	PASS	PASS	8.43	74	Yes	Yes	DJC	DJC
2/4/2010	0	420	11027	8578	0.0	42.0	5513.5	4247.0	PASS	PASS	PASS	PASS	4.79	76	Yes	Yes	AW	AW
2/5/2010	3	417	11109	8511	0.3	41.7	5554.2	4213.8	*QUESTION*	PASS	PASS	PASS	9.25	76	Yes	Yes	AW	AW
2/15/2010	0	383	11008	8631	0.0	38.3	5504.0	4277.2	PASS	PASS	PASS	PASS	4.79	73	Yes	Yes	AW	AW
2/16/2010	0	396	10997	8477	0.0	39.6	5498.5	4198.9	PASS	PASS	PASS	PASS	4.79	74	Yes	Yes	AW	AW
2/17/2010	1	410	10996	8555	0.1	41.0	5497.9	4236.5	PASS	PASS	PASS	PASS	7.37	75	Yes	Yes	AW	AW
2/18/2010	2	412	11130	8589	0.2	41.2	5564.8	4253.3	PASS	PASS	PASS	PASS	8.43	76	Yes	Yes	AW	AW
2/23/2010	0	405	11139	8433	0.0	40.5	5569.5	4176.0	PASS	PASS	PASS	PASS	4.79	75	Yes	Yes	AW	AW
2/24/2010	0	380	10955	8503	0.0	38.0	5477.5	4213.5	PASS	PASS	PASS	PASS	4.79	73	Yes	Yes	AW	AW
3/1/2010	2	413	10811	8540	0.2	41.3	5405.3	4228.7	PASS	PASS	PASS	PASS	8.43	76	Yes	Yes	AW	AW
3/2/2010	0	402	11189	8495	0.0	40.2	5594.5	4207.3	PASS	PASS	PASS	PASS	4.79	75	Yes	Yes	AW	AW
3/3/2010	2	407	11163	8609	0.2	40.7	5581.3	4263.8	PASS	PASS	PASS	PASS	8.43	75	Yes	Yes	AW	AW

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

Counting Instrument:	2224-1	Detector:	43-93	Calibration Date:	8/13/2009
Serial #:	227244	Serial #:	PR244545	12 month calibration:	8/13/2010
Detector Active Area or Area Covered by Smear (cm^2):	100				

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.2000	Th-230	1160	17,500	4/29/2002	7.54E+04	1.75E+04	50	1	1	1.20	1.40	3579.5	90.06
Beta	0.1873	Tc-99	1161	17,700	4/29/2002	2.11E+05	1.77E+04	2500	1	1	219.30	14.01	3308.0	179.72

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
12/9/2009	0	232	3601	3471	0.0	232.0	3601.0	3239.0	PASS	PASS	PASS	PASS	15.00	394	Yes	Yes	GB	GB
12/10/2009	1	199	3659	3696	1.0	199.0	3658.0	3497.0	PASS	PASS	PASS	PASS	38.26	366	Yes	Yes	GB	GB
12/14/2009	0	193	3661	3752	0.0	193.0	3661.0	3559.0	PASS	PASS	PASS	PASS	15.00	361	Yes	Yes	GB	GB
12/15/2009	0	203	3712	3460	0.0	203.0	3712.0	3257.0	PASS	PASS	PASS	PASS	15.00	370	Yes	Yes	GB	GB
1/19/2010	2	193	3532	3558	2.0	193.0	3530.0	3365.0	PASS	PASS	PASS	PASS	47.90	361	Yes	Yes	AW	AW
1/26/2010	0	185	3566	3638	0.0	185.0	3566.0	3453.0	PASS	*QUESTION*	PASS	PASS	15.00	354	Yes	Yes	DJC	DJC
1/27/2010	1	195	3651	3532	1.0	195.0	3650.0	3337.0	PASS	PASS	PASS	PASS	38.26	363	Yes	Yes	DJC	DJC
1/28/2010	0	184	3642	3539	0.0	184.0	3642.0	3355.0	PASS	*QUESTION*	PASS	PASS	15.00	353	Yes	Yes	AW	AW
1/29/2010	1	190	3631	3506	1.0	190.0	3630.0	3316.0	PASS	*QUESTION*	PASS	PASS	38.26	358	Yes	Yes	AW	AW
2/3/2010	1	200	3545	3669	1.0	200.0	3544.0	3469.0	PASS	PASS	PASS	PASS	38.26	367	Yes	Yes	DJC	DJC
2/4/2010	2	194	3527	3533	2.0	194.0	3525.0	3339.0	PASS	PASS	PASS	PASS	47.90	362	Yes	Yes	AJ	AJ
2/5/2010	1	204	3582	3602	1.0	204.0	3581.0	3398.0	PASS	PASS	PASS	PASS	38.26	371	Yes	Yes	DJC	DJC
2/15/2010	2	207	3571	3712	2.0	207.0	3569.0	3505.0	PASS	PASS	PASS	PASS	47.90	373	Yes	Yes	AW	AW
2/17/2010	1	190	3557	3497	1.0	190.0	3556.0	3307.0	PASS	*QUESTION*	PASS	PASS	38.26	358	Yes	Yes	AW	AW
2/23/2010	1	193	3597	3769	1.0	193.0	3596.0	3576.0	PASS	PASS	PASS	PASS	38.26	361	Yes	Yes	AW	AW
3/1/2010	0	198	3573	3601	0.0	198.0	3573.0	3403.0	PASS	PASS	PASS	PASS	15.00	366	Yes	Yes	AW	AW
3/2/2010	0	193	3541	3595	0.0	193.0	3541.0	3402.0	PASS	PASS	PASS	PASS	15.00	361	Yes	Yes	AW	AW
3/3/2010	0	197	3520	3613	0.0	197.0	3520.0	3416.0	PASS	PASS	PASS	PASS	15.00	365	Yes	Yes	AW	AW

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

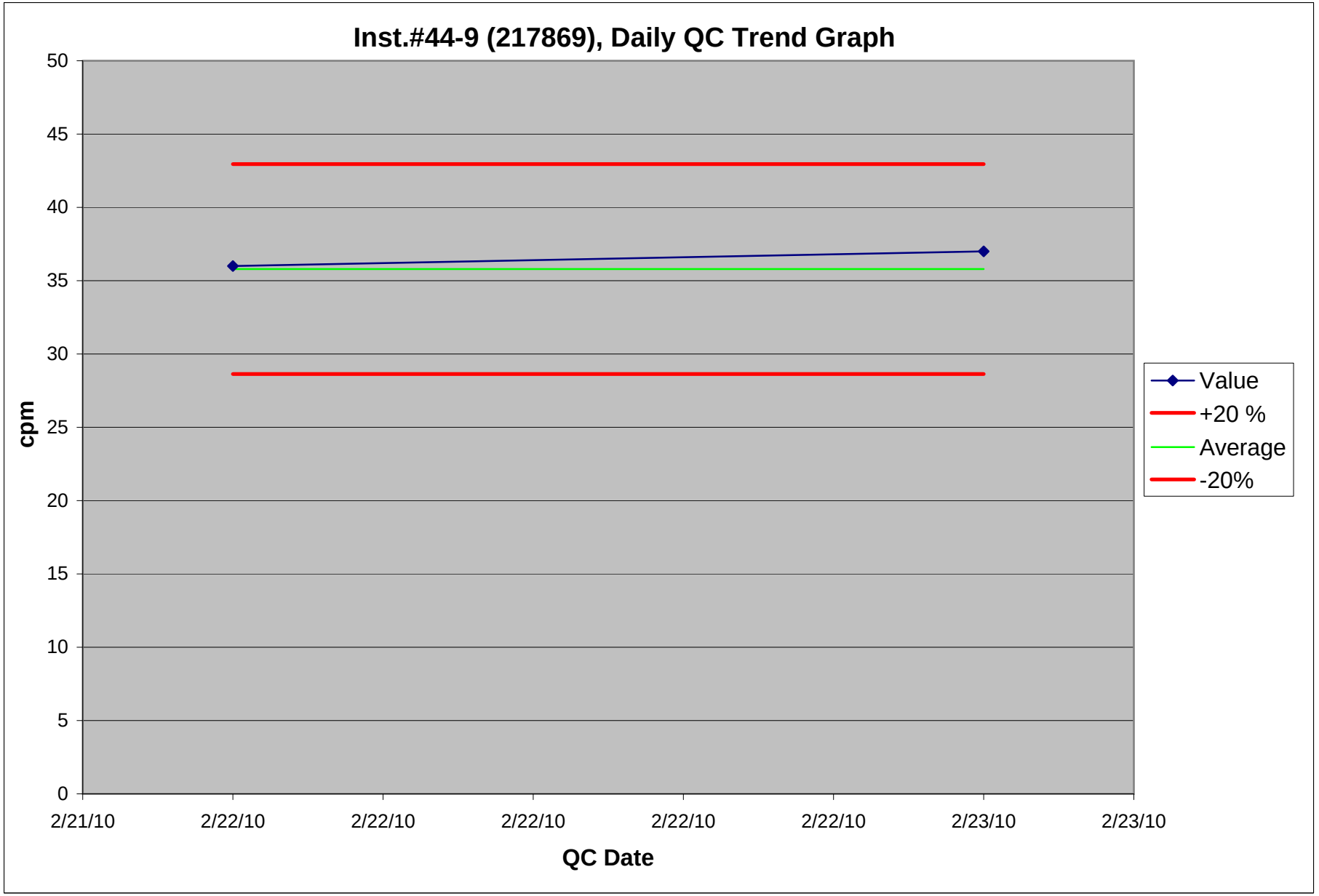
Counting Instrument:	2360	Detector:	43-10-1	Calibration Date:	6/30/2009
Serial #:	193635	Serial #:	PR202583	12 month calibration:	6/30/2010
Detector Active Area or Area Covered by Smear (cm^2):	100				

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.3840	Th-230	1160	17,500	4/29/2002	7.54E+04	1.75E+04	10	10	2	0.20	0.15	5846.6	59.43
Beta	0.2510	Tc-99	1161	17,700	4/29/2002	2.11E+05	1.77E+04	500	10	2	50.46	2.93	5321.3	69.30

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail				α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	MDA α (dpm)	MDA β (dpm)				
12/9/2009	1	493	11648	10830	0.1	49.3	5823.9	5365.7	PASS	PASS	PASS	PASS	6.00	77	Yes	Yes	GB	GB
12/10/2009	2	511	11651	10828	0.2	51.1	5825.3	5362.9	PASS	PASS	PASS	PASS	6.87	79	Yes	Yes	GB	GB
12/11/2009	1	511	11573	10984	0.1	51.1	5786.4	5440.9	PASS	PASS	PASS	PASS	6.00	79	Yes	Yes	GB	GB
12/14/2009	4	544	11668	11005	0.4	54.4	5833.6	5448.1	PASS	PASS	PASS	PASS	8.10	81	Yes	Yes	GB	GB
12/15/2009	1	537	11576	10784	0.1	53.7	5787.9	5338.3	PASS	PASS	PASS	PASS	6.00	80	Yes	Yes	GB	GB
1/4/2010	2	526	11672	10885	0.2	52.6	5835.8	5389.9	PASS	PASS	PASS	PASS	6.87	80	Yes	Yes	AW	AW
1/11/2010	1	507	11757	10890	0.1	50.7	5878.4	5394.3	PASS	PASS	PASS	PASS	6.00	78	Yes	Yes	AW	AW
1/3/2010	4	484	11626	10842	0.4	48.4	5812.6	5372.6	PASS	PASS	PASS	PASS	8.10	77	Yes	Yes	AW	AW

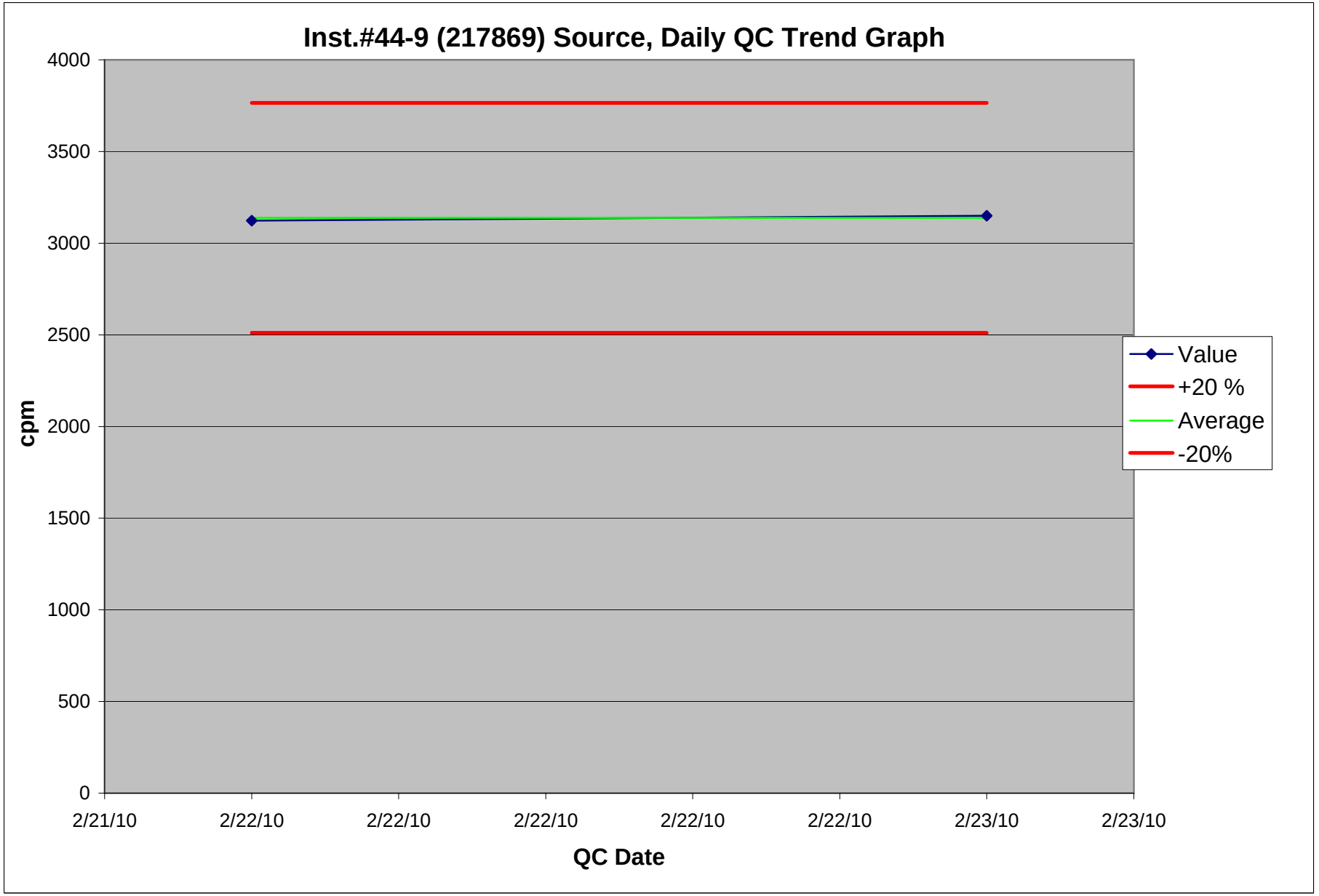
Inst.#44-9 (217869) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
2/22/2010	36	Pass
2/23/2010	37	Pass

Inst.#44-9 (217869) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
2/18/2010	36		
2/18/2010	34		
2/18/2010	36		
2/18/2010	35		
2/18/2010	37		
2/18/2010	34		
2/18/2010	34		
2/18/2010	36		
2/18/2010	38		
2/18/2010	38		
	Average		
	36		


Inst.#44-9 (217869), Daily QC Trend Graph
50
45
40
35
30
25
20
15
10
5
0
cpm
2/21/10
2/22/10
2/22/10
2/22/10
2/22/10
2/22/10
2/23/10
2/23/10
QC Date
Value
+20 %
Average
-20%

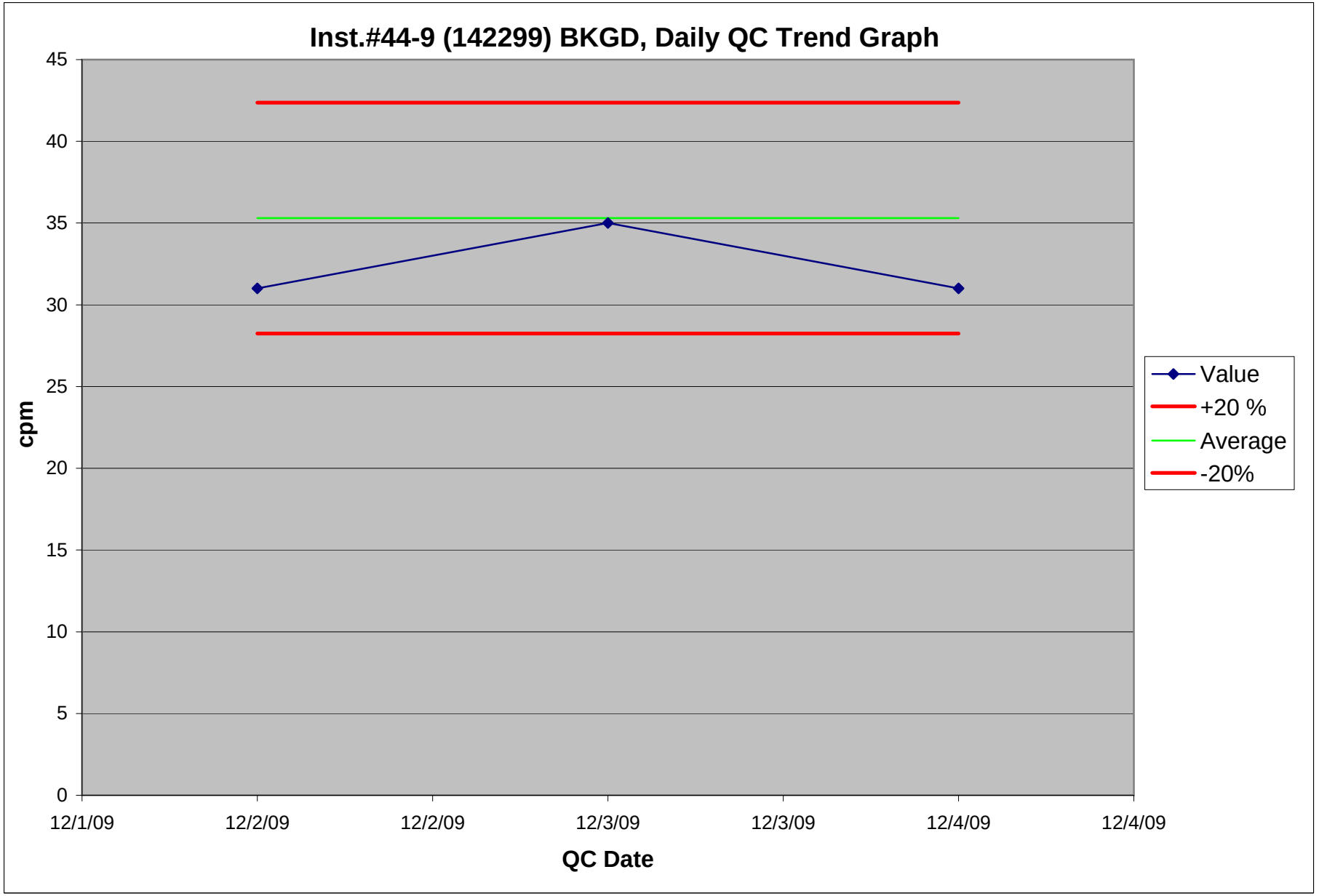
Inst.#44-9 (217869) Source		
QC Daily Source		
Date	Result (cpm)	P/F
2/22/2010	3123	Pass
2/23/2010	3149	Pass

Inst.#44-9 (217869) Source		Source Ser. #	1161
Initial Source Readings		Nuclide	Tc-99
Date	Result (cpm)		
2/18/2010	3175		
2/18/2010	3027		
2/18/2010	3144		
2/18/2010	3102		
2/18/2010	3099		
2/18/2010	3166		
2/18/2010	3178		
2/18/2010	3170		
2/18/2010	3152		
2/18/2010	3167		
	Average		
	3138		


Inst.#44-9 (217869) Source, Daily QC Trend Graph
4000
3500
3000
2500
2000
1500
1000
500
0
cpm
2/21/10
2/22/10
2/22/10
2/22/10
2/22/10
2/22/10
2/23/10
2/23/10
QC Date
Value
+20 %
Average
-20%

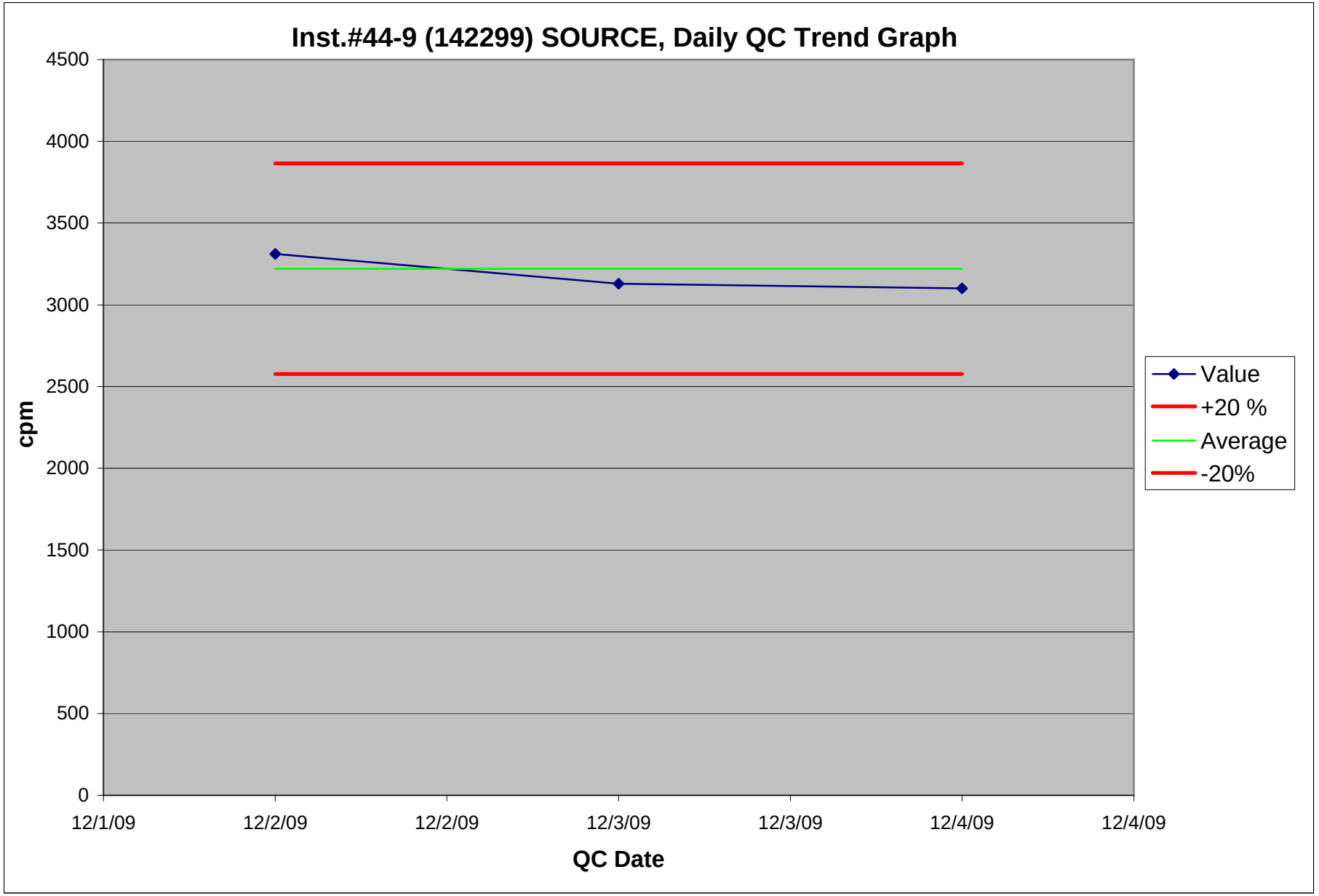
Inst.#44-9 (142299) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
12/2/2009	31	Pass
12/3/2009	35	Pass
12/4/2009	31	Pass

Inst.#44-9 (142299) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
12/2/2009	46		
12/2/2009	36		
12/2/2009	39		
12/2/2009	27		
12/2/2009	27		
12/2/2009	33		
12/2/2009	36		
12/2/2009	48		
12/2/2009	31		
12/2/2009	30		
	Average		
	35		


Inst.#44-9 (142299) BKGD, Daily QC Trend Graph
45
40
35
30
25
20
15
10
5
0
cpm
12/1/09
12/2/09
12/2/09
12/3/09
12/3/09
12/4/09
12/4/09
QC Date
Value
+20 %
Average
-20%

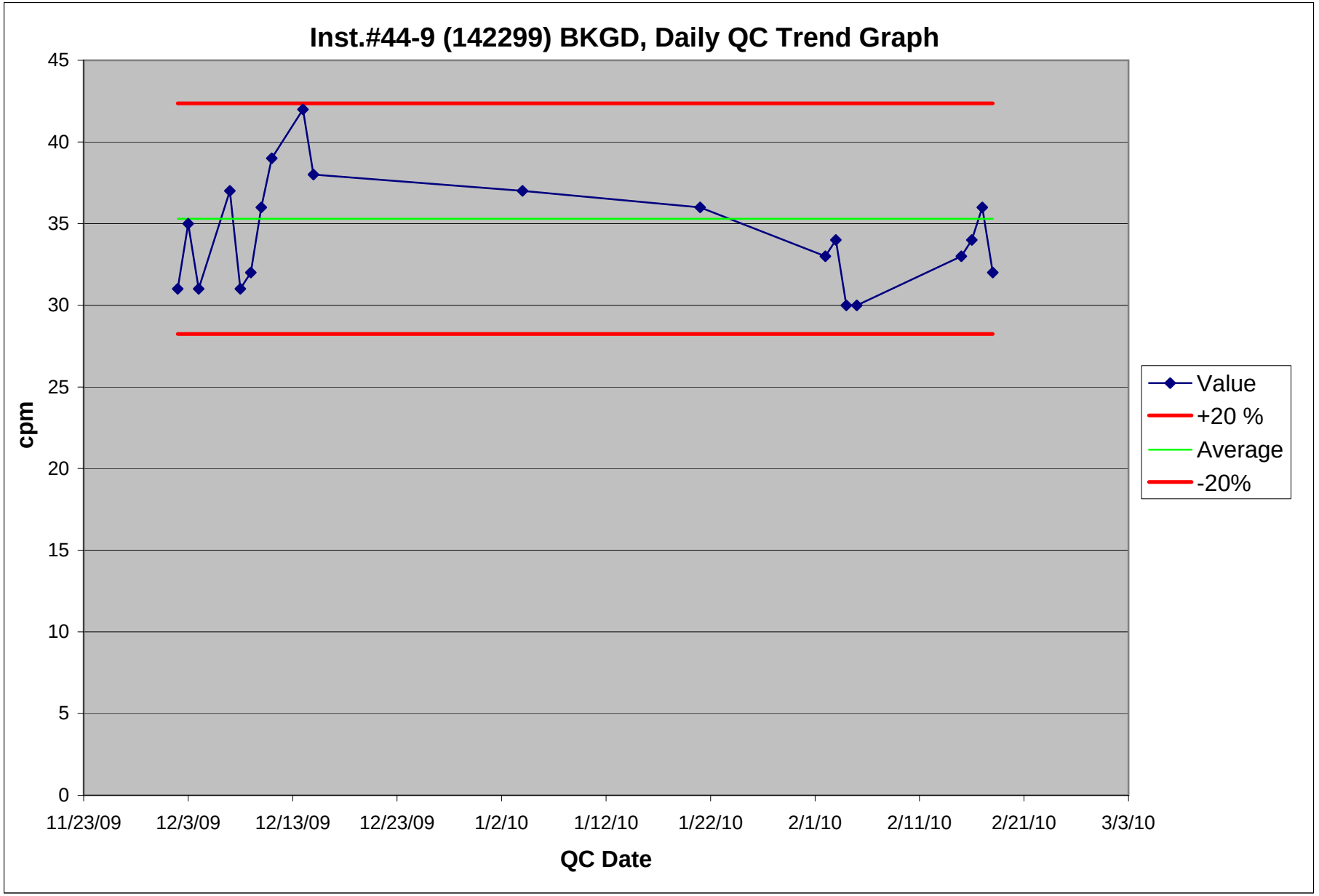
Inst.#44-9 (142299) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
12/2/2009	3312	Pass
12/3/2009	3129	Pass
12/4/2009	3100	Pass

Inst.#44-9 (142299) SOURCE		Source Ser. #	1161
Initial Source Readings		Nuclide	Tc-99
Date	Result (cpm)		
12/2/2009	3206		
12/2/2009	3229		
12/2/2009	3220		
12/2/2009	3205		
12/2/2009	3143		
12/2/2009	3302		
12/2/2009	3246		
12/2/2009	3285		
12/2/2009	3137		
12/2/2009	3232		
	Average		
	3221		


Inst.#44-9 (142299) SOURCE, Daily QC Trend Graph
4500
4000
3500
3000
2500
2000
1500
1000
500
0
cpm
12/1/09
12/2/09
12/2/09
12/3/09
12/3/09
12/4/09
12/4/09
QC Date
Value
+20 %
Average
-20%

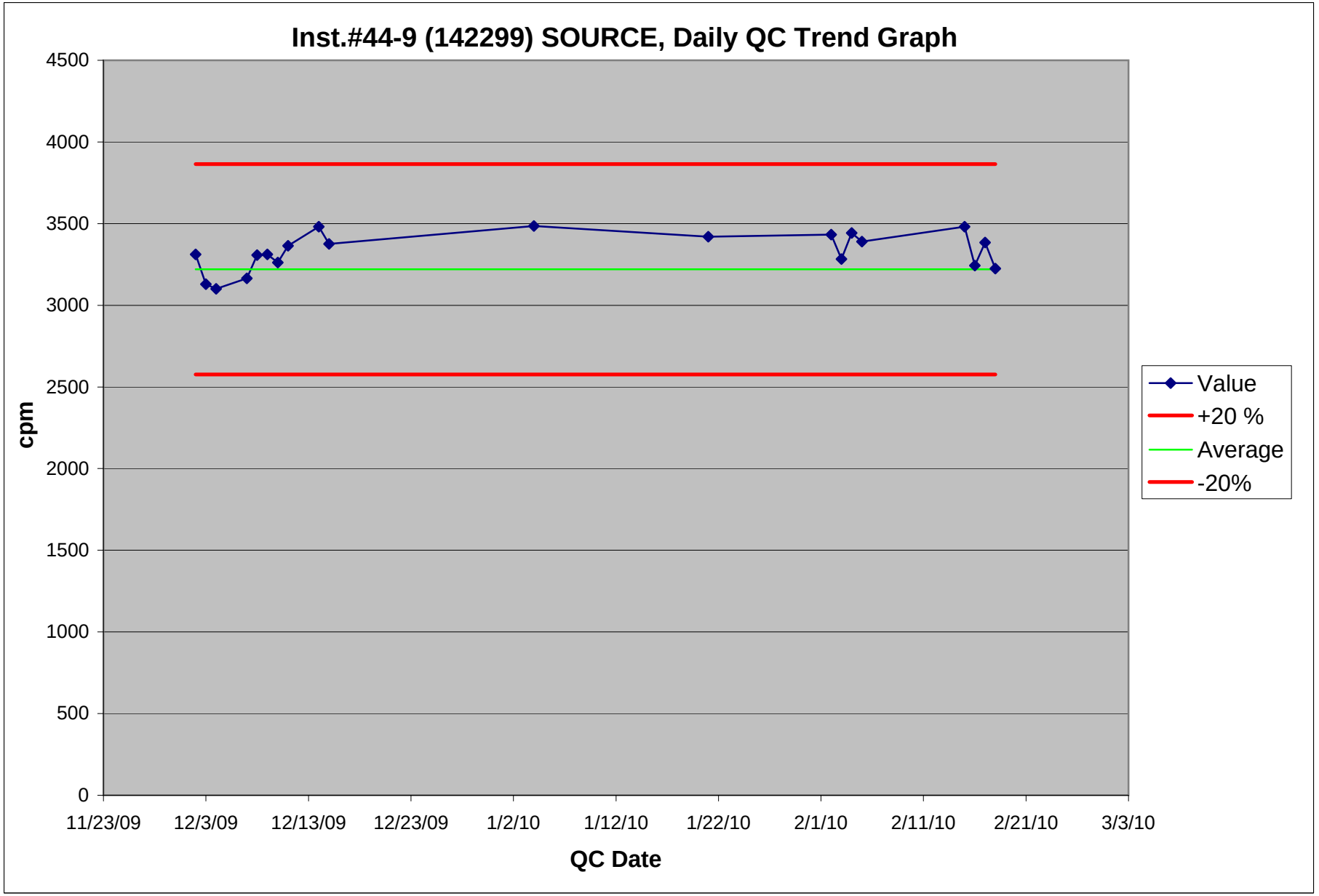
Inst.#44-9 (142299) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
12/2/2009	31	Pass
12/3/2009	35	Pass
12/4/2009	31	Pass
12/7/2009	37	Pass
12/8/2009	31	Pass
12/9/2009	32	Pass
12/10/2009	36	Pass
12/11/2009	39	Pass
12/14/2009	42	Pass
12/15/2009	38	Pass
1/4/2010	37	Pass
1/21/2010	36	Pass
2/2/2010	33	Pass
2/3/2010	34	Pass
2/4/2010	30	Pass
2/5/2010	30	Pass
2/15/2010	33	Pass
2/16/2010	34	Pass
2/17/2010	36	Pass
2/18/2010	32	Pass

Inst.#44-9 (142299) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
12/2/2010	46		
12/2/2010	36		
12/2/2010	39		
12/2/2010	27		
12/2/2010	27		
12/2/2010	33		
12/2/2010	36		
12/2/2010	48		
12/2/2010	31		
12/2/2010	30		
	Average		
	35		


Inst.#44-9 (142299) BKGD, Daily QC Trend Graph
45
40
35
30
25
20
15
10
5
0
cpm
11/23/09
12/3/09
12/13/09
12/23/09
1/2/10
1/12/10
1/22/10
2/1/10
2/11/10
2/21/10
3/3/10
QC Date
Value
+20 %
Average
-20%

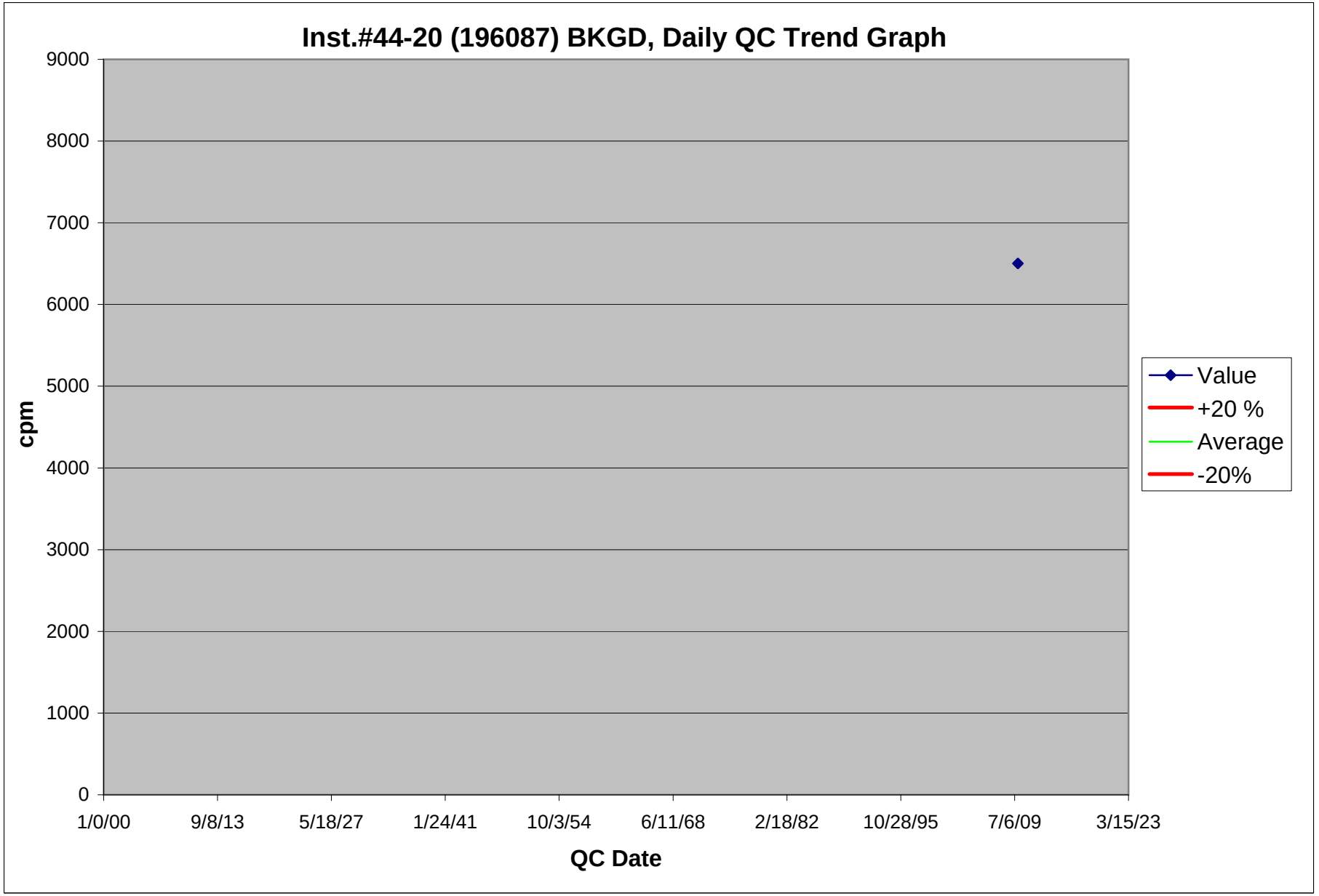
Inst.#44-9 (142299) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
12/2/2009	3312	Pass
12/3/2009	3129	Pass
12/4/2009	3100	Pass
12/7/2009	3165	Pass
12/8/2009	3308	Pass
12/9/2009	3311	Pass
12/10/2009	3262	Pass
12/11/2009	3365	Pass
12/14/2009	3481	Pass
12/15/2009	3376	Pass
1/4/2010	3486	Pass
1/21/2010	3420	Pass
2/2/2010	3433	Pass
2/3/2010	3283	Pass
2/4/2010	3442	Pass
2/5/2010	3390	Pass
2/15/2010	3481	Pass
2/16/2010	3243	Pass
2/17/2010	3384	Pass
2/18/2010	3224	Pass

Inst.#44-9 (142299) SOURCE		Source Ser. #	1161
Initial Source Readings		Nuclide	Tc-99
Date	Result (cpm)		
12/2/2010	3206		
12/2/2010	3229		
12/2/2010	3220		
12/2/2010	3205		
12/2/2010	3143		
12/2/2010	3302		
12/2/2010	3246		
12/2/2010	3285		
12/2/2010	3137		
12/2/2010	3232		
	Average		
	3221		


Inst.#44-9 (142299) SOURCE, Daily QC Trend Graph
4500
4000
3500
3000
2500
2000
1500
1000
500
0
cpm
11/23/09
12/3/09
12/13/09
12/23/09
1/2/10
1/12/10
1/22/10
2/1/10
2/11/10
2/21/10
3/3/10
QC Date
Value
+20 %
Average
-20%

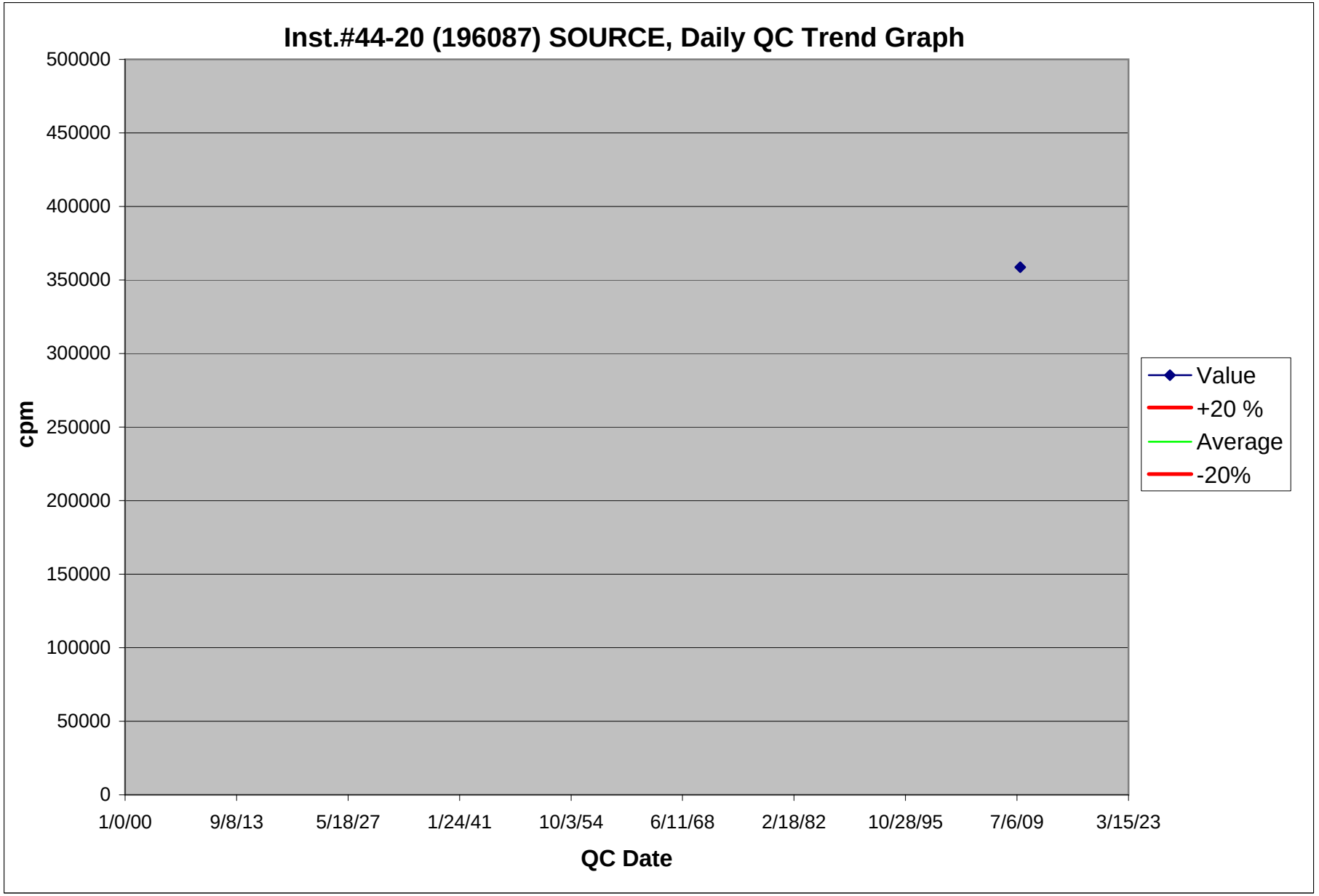
Inst.#44-20 (196087) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
12/2/2009	6501	Pass

Inst.#44-20 (196087) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
12/2/2009	6319		
12/2/2009	6290		
12/2/2009	6508		
12/2/2009	6344		
12/2/2009	6329		
12/2/2009	6353		
12/2/2009	6335		
12/2/2009	6399		
12/2/2009	6462		
12/2/2009	6522		
	Average		
	6386		


Inst.#44-20 (196087) BKGD, Daily QC Trend Graph
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
cpm
1/0/00
9/8/13
5/18/27
1/24/41
10/3/54
6/11/68
2/18/82
10/28/95
7/6/09
3/15/23
QC Date
Value
+20 %
Average
-20%

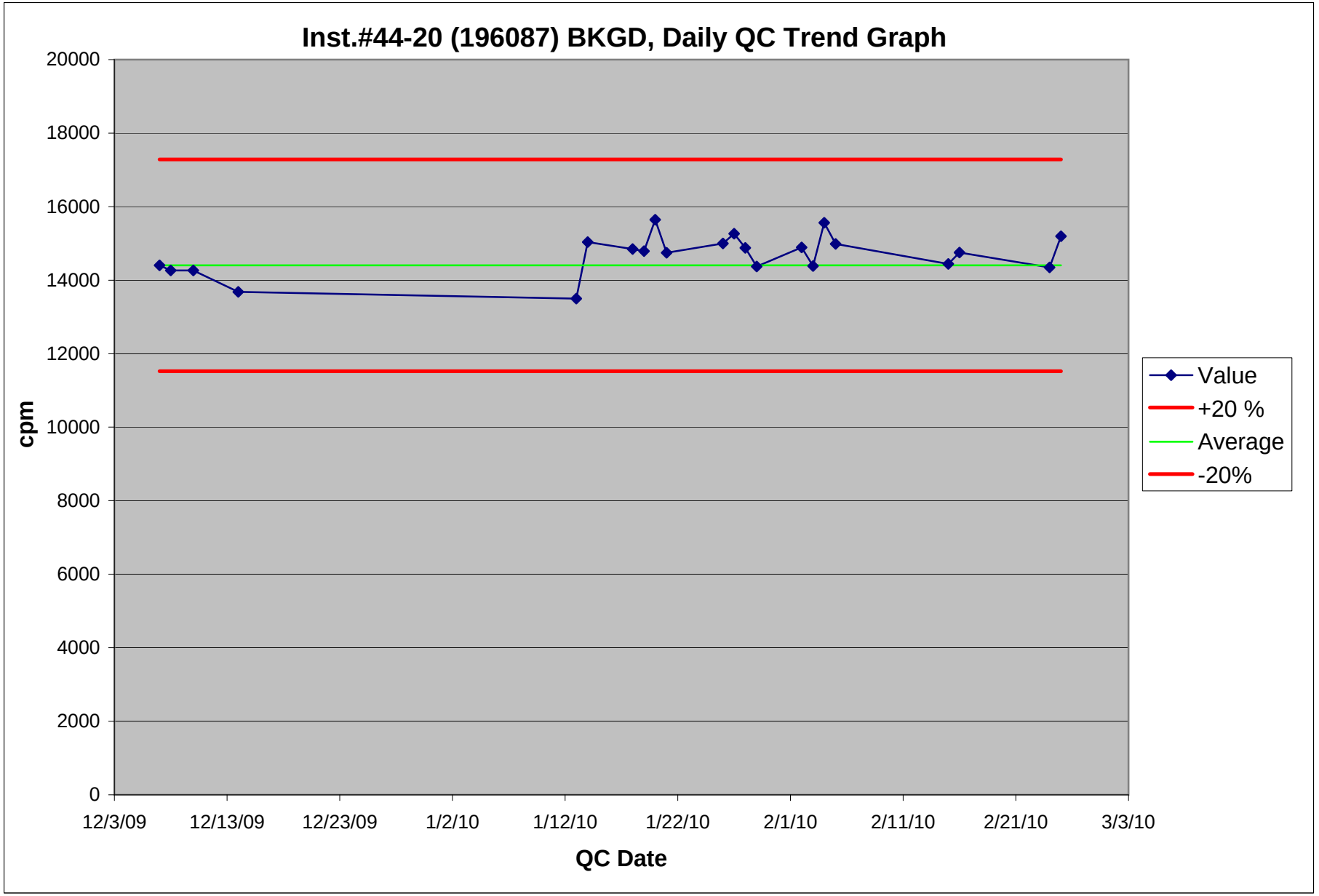
Inst.#44-20 (196087) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
12/2/2009	358712	Pass

Inst.#44-20 (196087) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
12/2/2009	361188		
12/2/2009	361243		
12/2/2009	359655		
12/2/2009	359487		
12/2/2009	360249		
12/2/2009	353732		
12/2/2009	359001		
12/2/2009	358411		
12/2/2009	360236		
12/2/2009	360252		
	Average		
	359345		


Inst.#44-20 (196087) SOURCE, Daily QC Trend Graph
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
cpm
1/0/00
9/8/13
5/18/27
1/24/41
10/3/54
6/11/68
2/18/82
10/28/95
7/6/09
3/15/23
QC Date
Value
+20 %
Average
-20%

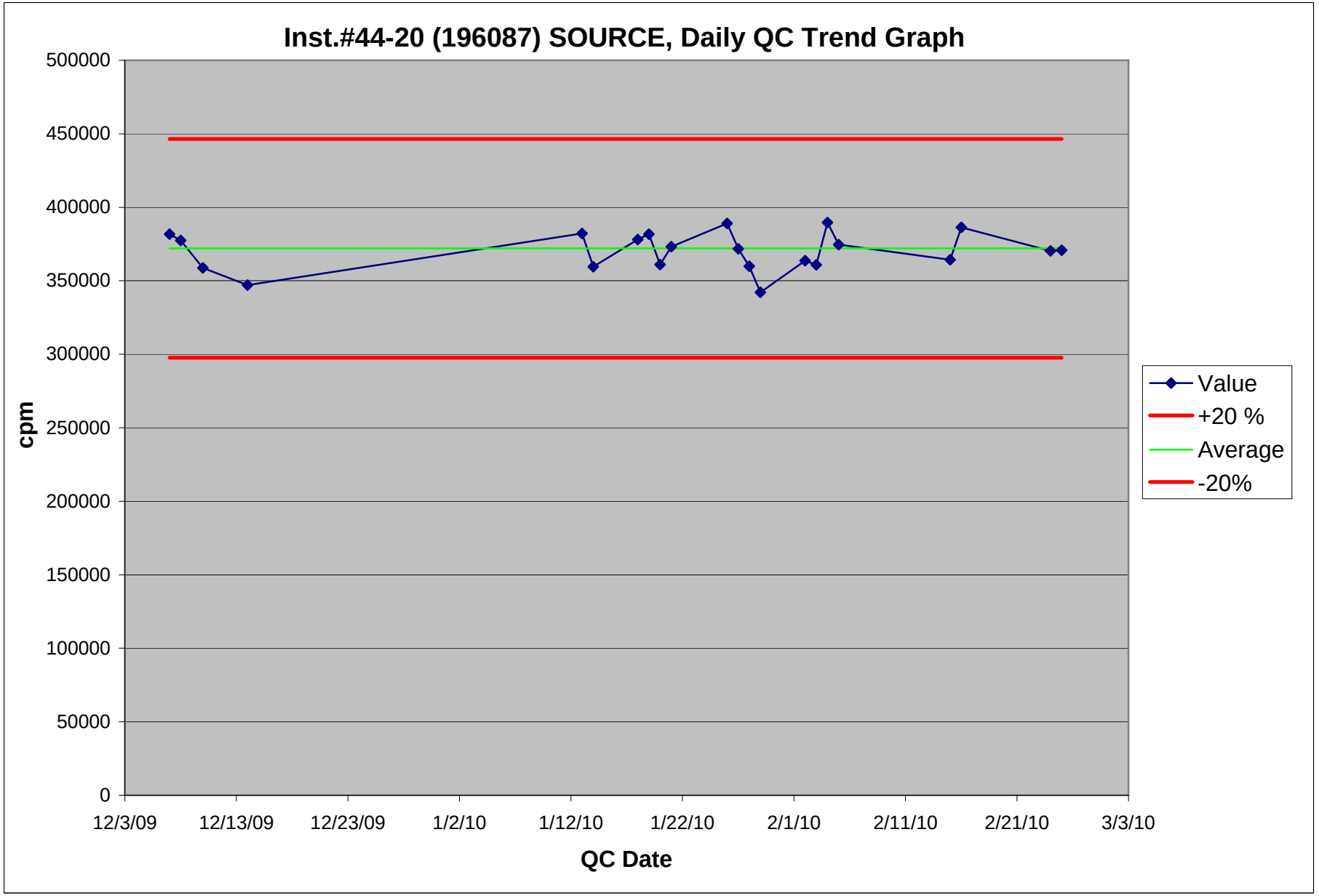
Inst.#44-20 (196087) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
12/7/2009	14401	Pass
12/8/2009	14261	Pass
12/10/2009	14262	Pass
12/14/2009	13682	Pass
1/13/2010	13495	Pass
1/14/2010	15034	Pass
1/18/2010	14844	Pass
1/19/2010	14792	Pass
1/20/2010	15646	Pass
1/21/2010	14746	Pass
1/26/2010	14999	Pass
1/27/2010	15265	Pass
1/28/2010	14875	Pass
1/29/2010	14372	Pass
2/2/2010	14888	Pass
2/3/2010	14386	Pass
2/4/2010	15560	Pass
2/5/2010	14985	Pass
2/15/2010	14444	Pass
2/16/2010	14753	Pass
2/24/2010	14348	Pass
2/25/2010	15192	Pass

Inst.#44-20 (196087) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
12/7/2009	14720		
12/7/2009	14514		
12/7/2009	14432		
12/7/2009	14267		
12/7/2009	14554		
12/7/2009	14399		
12/7/2009	14194		
12/7/2009	14493		
12/7/2009	14196		
12/7/2009	14277		
	Average		
	14405		


Inst.#44-20 (196087) BKGD, Daily QC Trend Graph
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
cpm
12/3/09
12/13/09
12/23/09
1/2/10
1/12/10
1/22/10
2/1/10
2/11/10
2/21/10
3/3/10
QC Date
Value
+20 %
Average
-20%

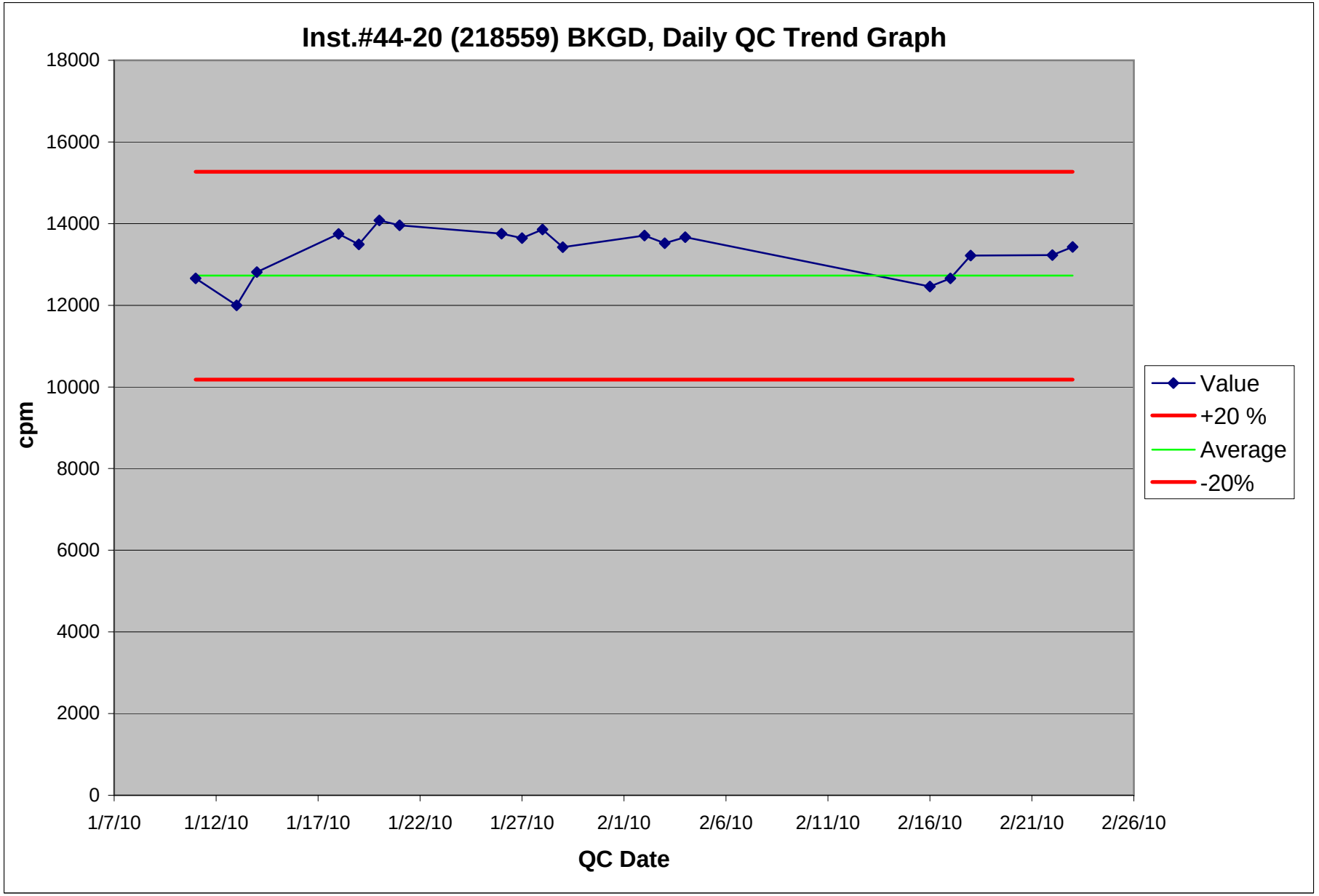
Inst.#44-20 (196087) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
12/7/2009	381714	Pass
12/8/2009	377456	Pass
12/10/2009	358751	Pass
12/14/2009	347105	Pass
1/13/2010	382250	Pass
1/14/2010	359588	Pass
1/18/2010	378010	Pass
1/19/2010	381676	Pass
1/20/2010	361023	Pass
1/21/2010	373221	Pass
1/26/2010	389060	Pass
1/27/2010	371728	Pass
1/28/2010	359877	Pass
1/29/2010	342213	Pass
2/2/2010	363688	Pass
2/3/2010	360760	Pass
2/4/2010	389708	Pass
2/5/2010	374551	Pass
2/15/2010	364287	Pass
2/16/2010	386304	Pass
2/24/2010	370398	Pass
2/25/2010	370830	Pass

Inst.#44-20 (196087) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
12/7/2009	357582		
12/7/2009	383122		
12/7/2009	353310		
12/7/2009	382812		
12/7/2009	375345		
12/7/2009	376418		
12/7/2009	366517		
12/7/2009	366727		
12/7/2009	384069		
12/7/2009	374190		
	Average		
	372009		


Inst.#44-20 (196087) SOURCE, Daily QC Trend Graph
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
cpm
12/3/09
12/13/09
12/23/09
1/2/10
1/12/10
1/22/10
2/1/10
2/11/10
2/21/10
3/3/10
QC Date
Value
+20 %
Average
-20%

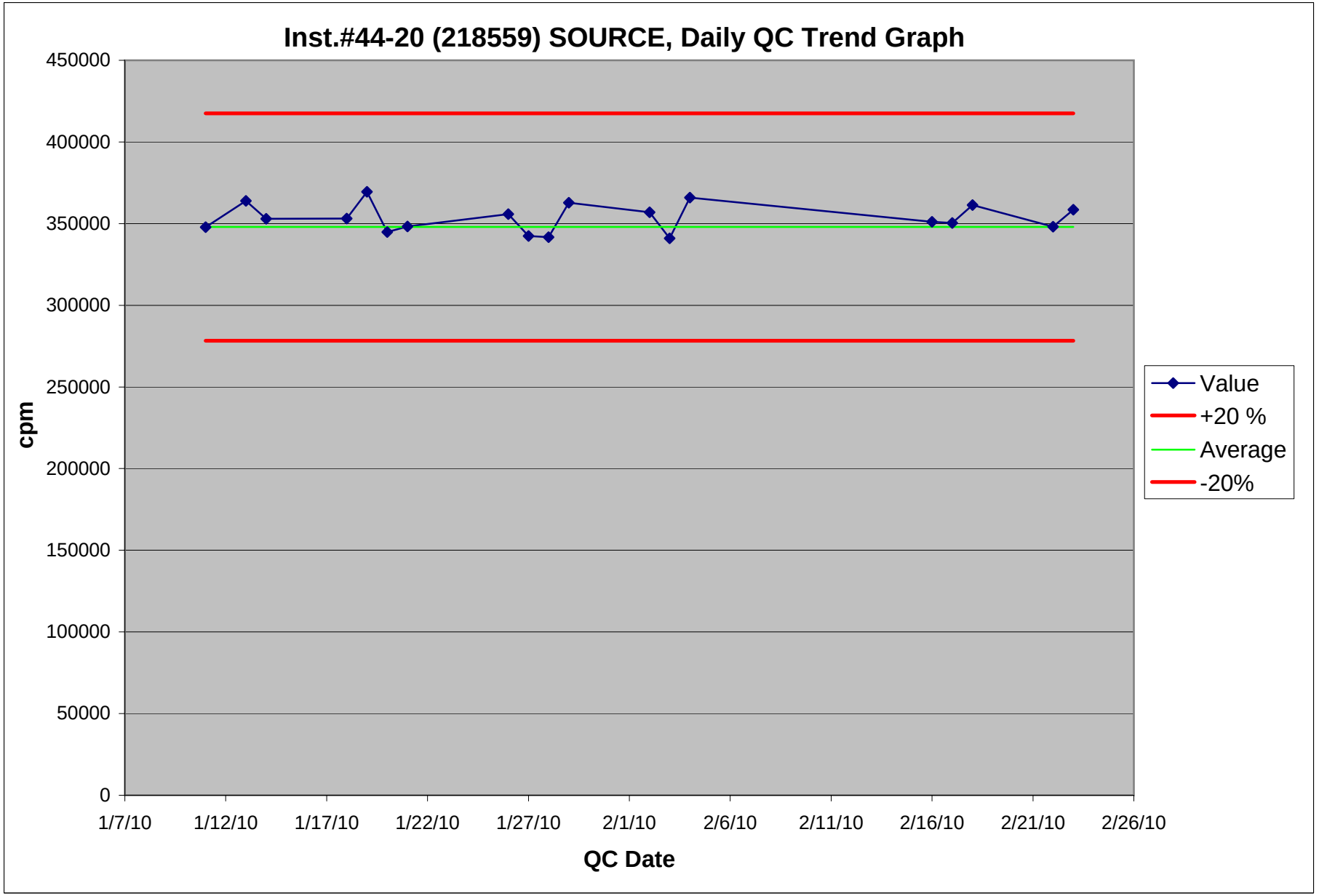
Inst.#44-20 (218559) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
1/11/2010	12661	Pass
1/13/2010	11998	Pass
1/14/2010	12816	Pass
1/18/2010	13746	Pass
1/19/2010	13491	Pass
1/20/2010	14080	Pass
1/21/2010	13959	Pass
1/26/2010	13755	Pass
1/27/2010	13645	Pass
1/28/2010	13858	Pass
1/29/2010	13422	Pass
2/2/2010	13710	Pass
2/3/2010	13521	Pass
2/4/2010	13667	Pass
2/16/2010	12459	Pass
2/17/2010	12662	Pass
2/18/2010	13219	Pass
2/22/2010	13229	Pass
2/23/2010	13430	Pass

Inst.#44-20 (218559) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
1/11/2010	12773		
1/11/2010	12575		
1/11/2010	12729		
1/11/2010	12738		
1/11/2010	12768		
1/11/2010	12850		
1/11/2010	12580		
1/11/2010	12622		
1/11/2010	12825		
1/11/2010	12807		
	Average		
	12727		


Inst.#44-20 (218559) BKGD, Daily QC Trend Graph
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
cpm
1/7/10
1/12/10
1/17/10
1/22/10
1/27/10
2/1/10
2/6/10
2/11/10
2/16/10
2/21/10
2/26/10
QC Date
Value
+20 %
Average
-20%

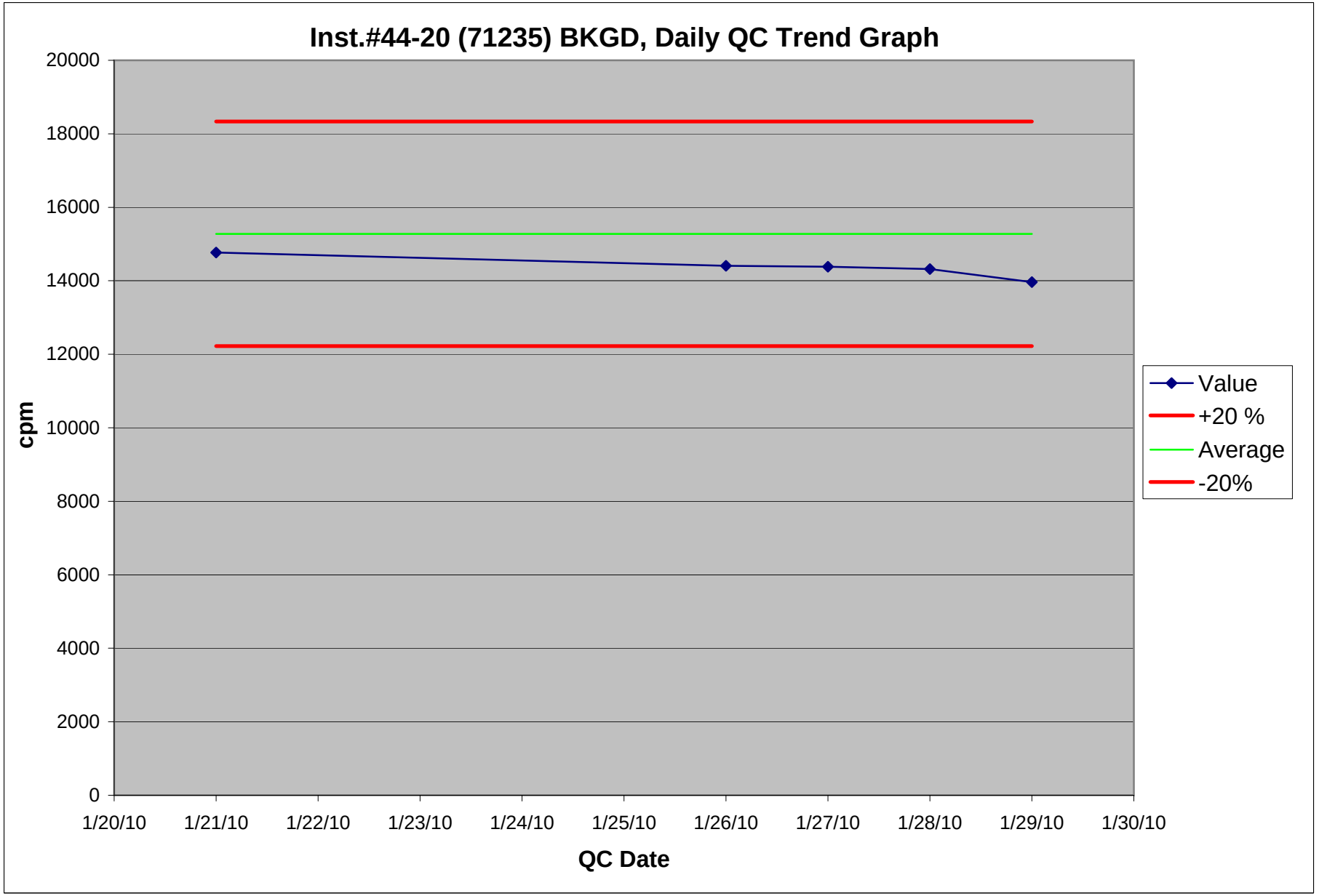
Inst.#44-20 (218559) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
1/11/2010	347774	Pass
1/13/2010	363868	Pass
1/14/2010	352981	Pass
1/18/2010	353039	Pass
1/19/2010	369466	Pass
1/20/2010	344849	Pass
1/21/2010	348286	Pass
1/26/2010	355802	Pass
1/27/2010	342403	Pass
1/28/2010	341663	Pass
1/29/2010	362840	Pass
2/2/2010	356991	Pass
2/3/2010	340921	Pass
2/4/2010	365881	Pass
2/16/2010	351053	Pass
2/17/2010	350365	Pass
2/18/2010	361420	Pass
2/22/2010	348140	Pass
2/23/2010	358571	Pass

Inst.#44-20 (218559) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
1/11/2010	347707		
1/11/2010	348080		
1/11/2010	348009		
1/11/2010	347632		
1/11/2010	346627		
1/11/2010	348218		
1/11/2010	348580		
1/11/2010	348467		
1/11/2010	348157		
1/11/2010	347931		
	Average		
	347941		


Inst.#44-20 (218559) SOURCE, Daily QC Trend Graph
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
cpm
1/7/10
1/12/10
1/17/10
1/22/10
1/27/10
2/1/10
2/6/10
2/11/10
2/16/10
2/21/10
2/26/10
QC Date
Value
+20 %
Average
-20%

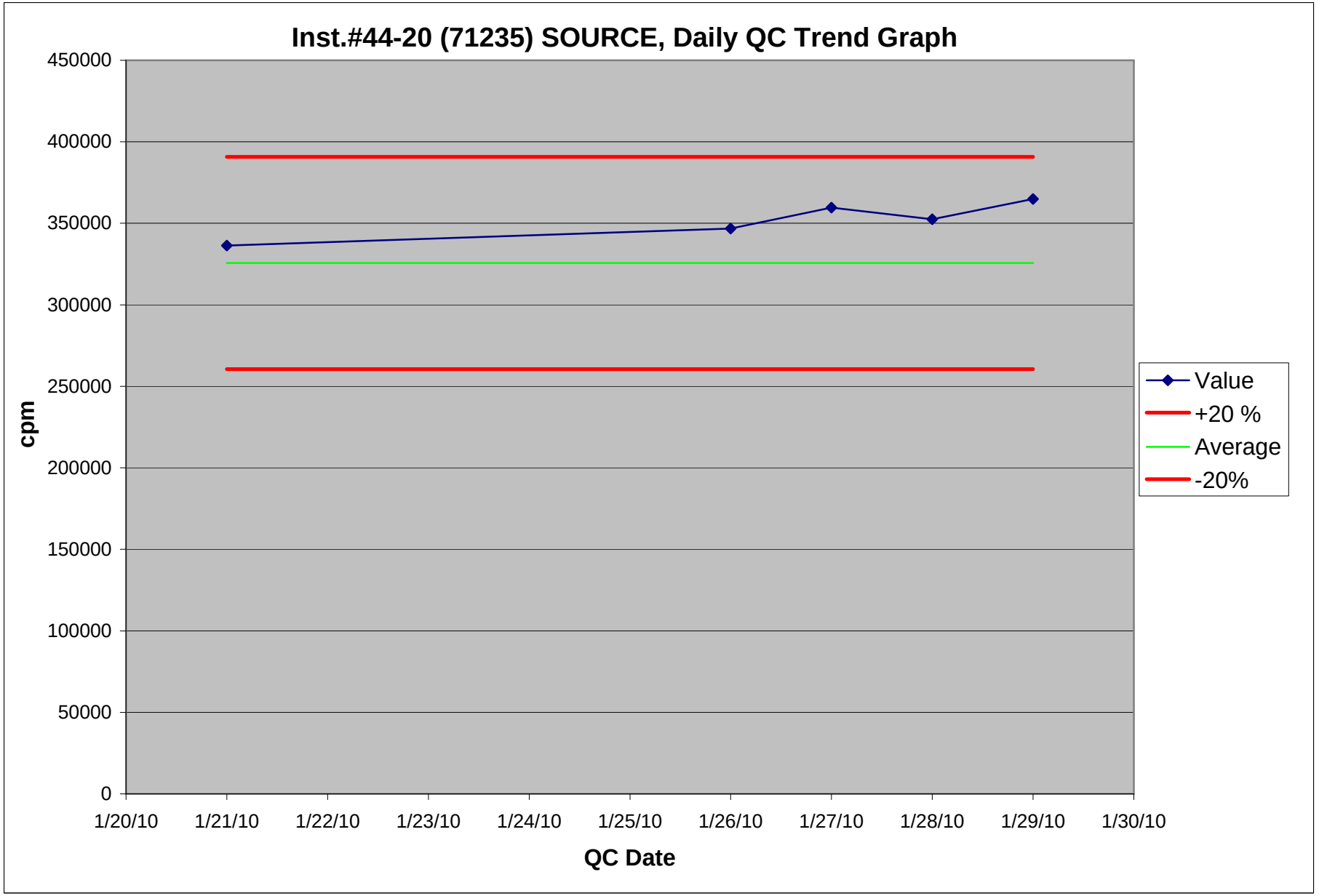
Inst.#44-20 (71235) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
1/21/2010	14768	Pass
1/26/2010	14408	Pass
1/27/2010	14384	Pass
1/28/2010	14322	Pass
1/29/2010	13964	Pass

Inst.#44-20 (71235) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
1/20/2010	15216		
1/20/2010	15396		
1/20/2010	15392		
1/20/2010	15174		
1/20/2010	15200		
1/20/2010	15315		
1/20/2010	15533		
1/20/2010	15149		
1/20/2010	15251		
1/20/2010	15135		
	Average		
	15276		


Inst.#44-20 (71235) BKGD, Daily QC Trend Graph
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
cpm
1/20/10
1/21/10
1/22/10
1/23/10
1/24/10
1/25/10
1/26/10
1/27/10
1/28/10
1/29/10
1/30/10
QC Date
Value
+20 %
Average
-20%

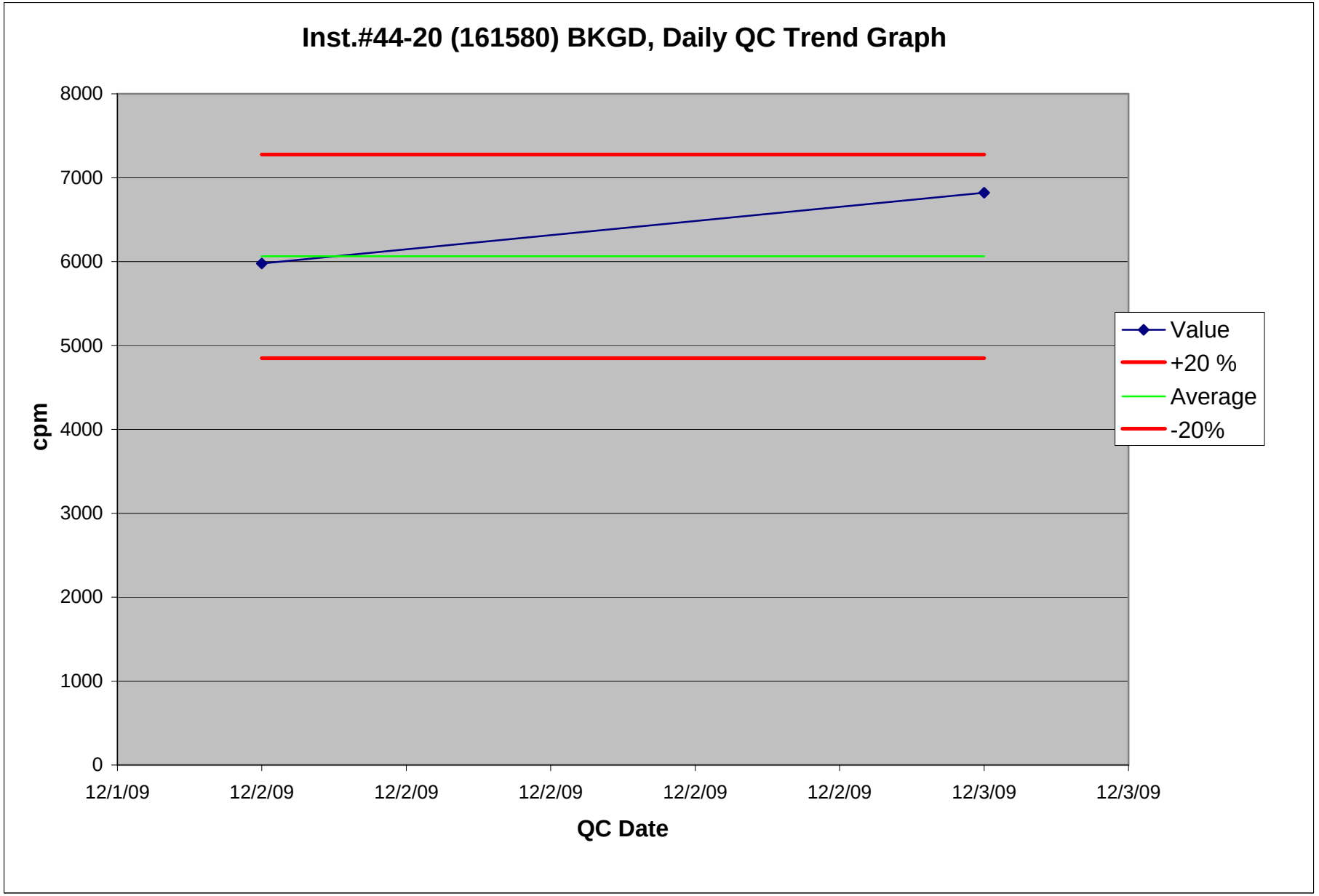
Inst.#44-20 (71235) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
1/21/2010	336352	Pass
1/26/2010	346829	Pass
1/27/2010	359576	Pass
1/28/2010	352516	Pass
1/29/2010	364964	Pass

Inst.#44-20 (71235) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
1/20/2010	335982		
1/20/2010	335500		
1/20/2010	336228		
1/20/2010	336971		
1/20/2010	336186		
1/20/2010	315797		
1/20/2010	315466		
1/20/2010	315035		
1/20/2010	314393		
1/20/2010	314500		
	Average		
	325606		


Inst.#44-20 (71235) SOURCE, Daily QC Trend Graph
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
cpm
1/20/10
1/21/10
1/22/10
1/23/10
1/24/10
1/25/10
1/26/10
1/27/10
1/28/10
1/29/10
1/30/10
QC Date
Value
+20 %
Average
-20%

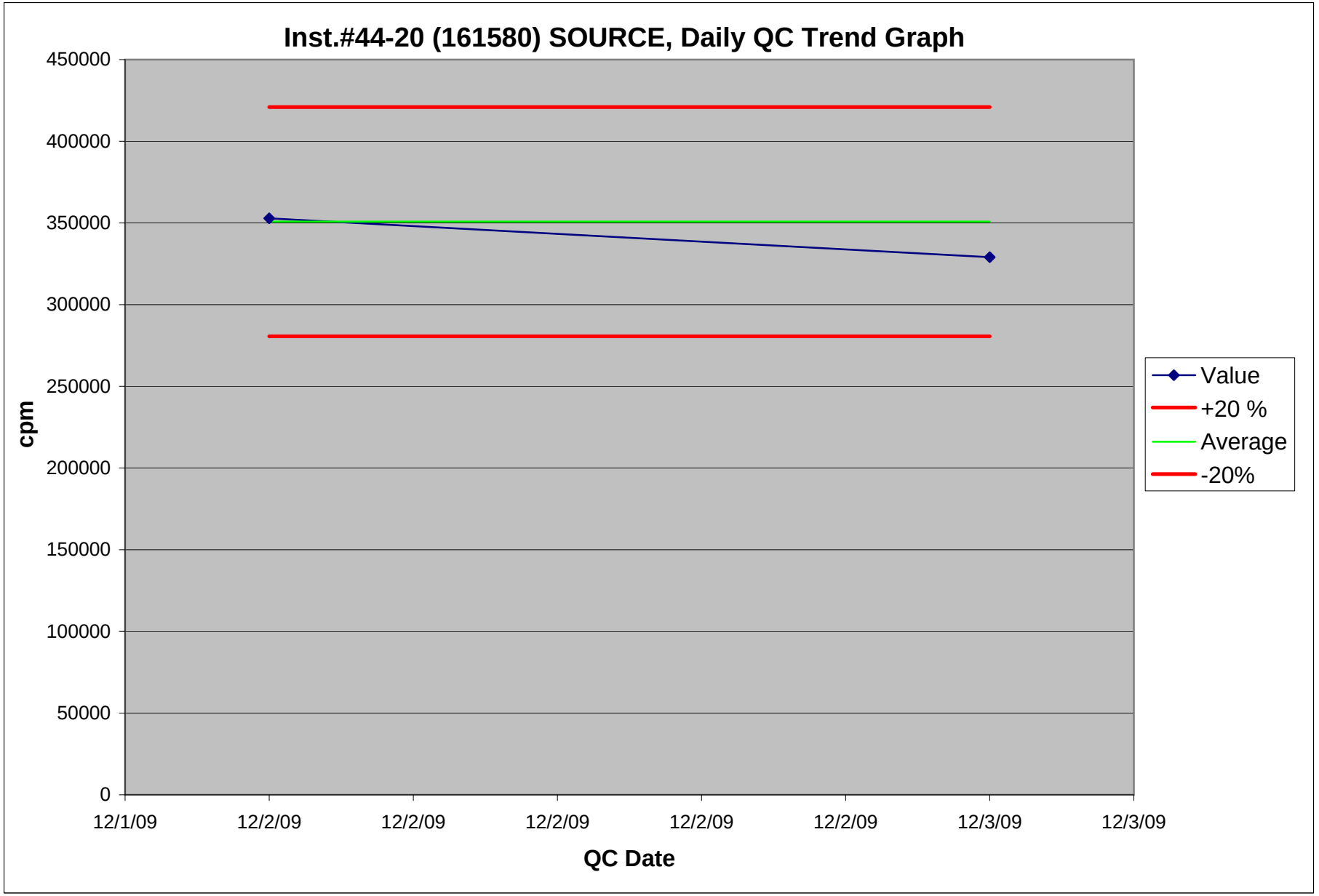
Inst.#44-20 (161580) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
12/2/2009	5979	Pass
12/3/2009	6822	Pass

Inst.#44-20 (161580) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
12/2/2009	5924		
12/2/2009	5993		
12/2/2009	6053		
12/2/2009	6100		
12/2/2009	6105		
12/2/2009	6041		
12/2/2009	6125		
12/2/2009	6033		
12/2/2009	6070		
12/2/2009	6183		
	Average		
	6063		


Inst.#44-20 (161580) BKGD, Daily QC Trend Graph
8000
7000
6000
5000
4000
3000
2000
1000
0
cpm
12/1/09
12/2/09
12/2/09
12/2/09
12/2/09
12/2/09
12/3/09
12/3/09
QC Date
Value
+20 %
Average
-20%

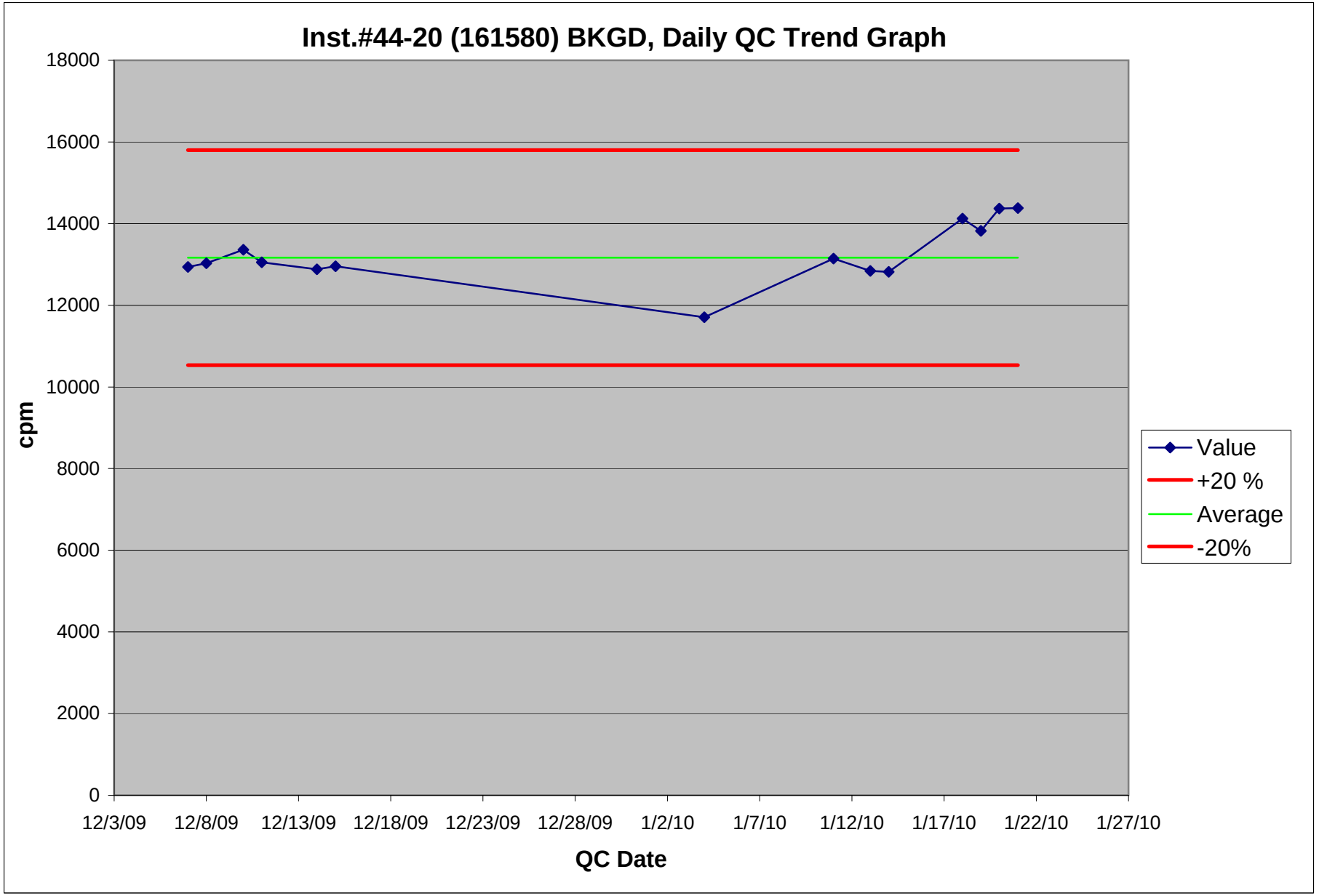
Inst.#44-20 (161580) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
12/2/2009	352817	Pass
12/3/2009	329031	Pass

Inst.#44-20 (161580) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
12/2/2009	354296		
12/2/2009	352290		
12/2/2009	353622		
12/2/2009	350728		
12/2/2009	343542		
12/2/2009	354287		
12/2/2009	353789		
12/2/2009	353282		
12/2/2009	346325		
12/2/2009	346241		
	Average		
	350840		


Inst.#44-20 (161580) SOURCE, Daily QC Trend Graph
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
cpm
12/1/09
12/2/09
12/2/09
12/2/09
12/2/09
12/2/09
12/3/09
12/3/09
QC Date
Value
+20 %
Average
-20%

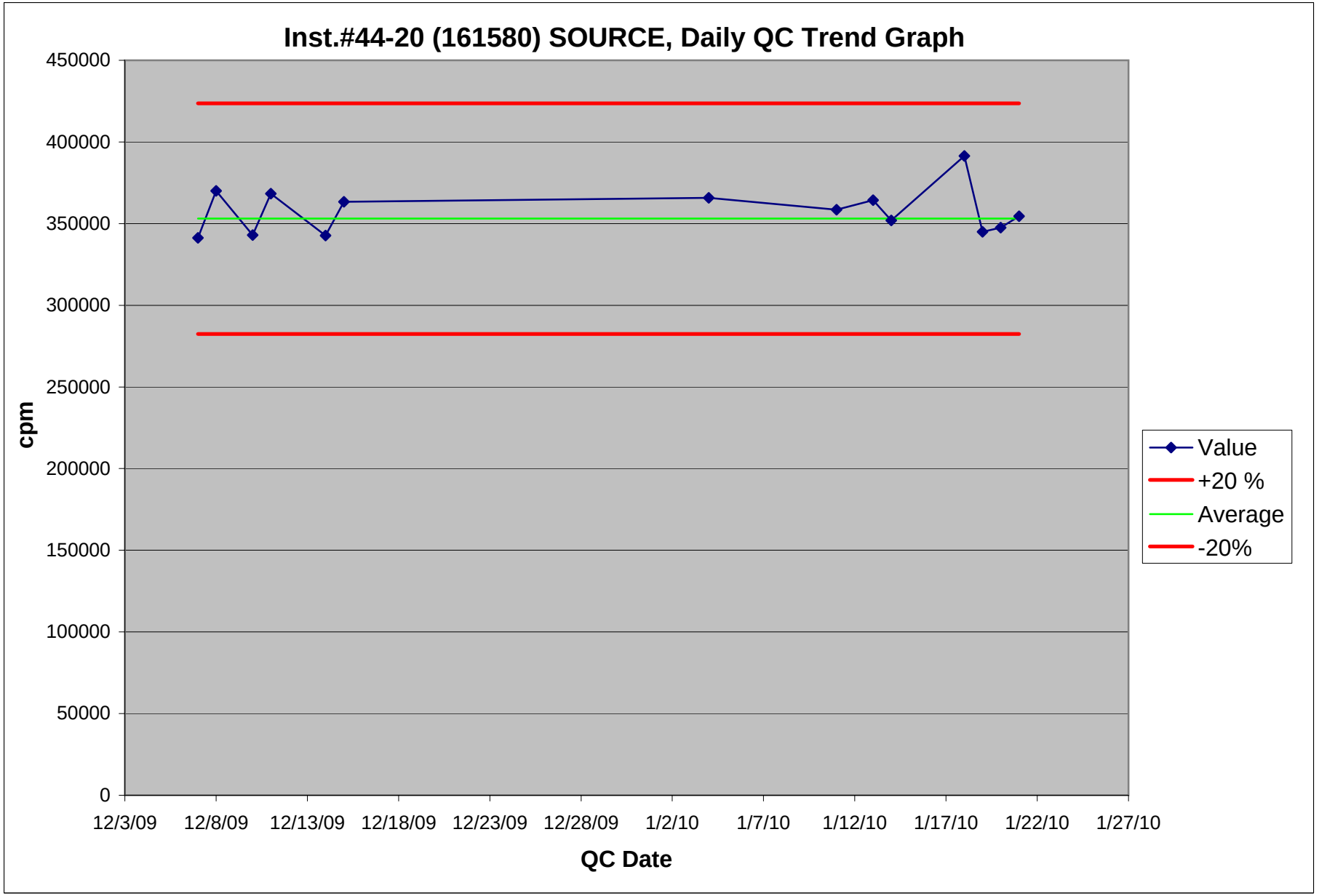
Inst.#44-20 (161580) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
12/7/2009	12940	Pass
12/8/2009	13030	Pass
12/10/2009	13360	Pass
12/11/2009	13050	Pass
12/14/2009	12879	Pass
12/15/2009	12954	Pass
1/4/2010	11709	Pass
1/11/2010	13144	Pass
1/13/2010	12840	Pass
1/14/2010	12820	Pass
1/18/2010	14123	Pass
1/19/2010	13822	Pass
1/20/2010	14368	Pass
1/21/2010	14379	Pass

Inst.#44-20 (161580) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
12/7/2009	13425		
12/7/2009	13126		
12/7/2009	12912		
12/7/2009	12936		
12/7/2009	13233		
12/7/2009	13714		
12/7/2009	13221		
12/7/2009	13073		
12/7/2009	12933		
12/7/2009	13092		
	Average		
	13167		


Inst.#44-20 (161580) BKGD, Daily QC Trend Graph
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
cpm
12/3/09
12/8/09
12/13/09
12/18/09
12/23/09
12/28/09
1/2/10
1/7/10
1/12/10
1/17/10
1/22/10
1/27/10
QC Date
Value
+20 %
Average
-20%

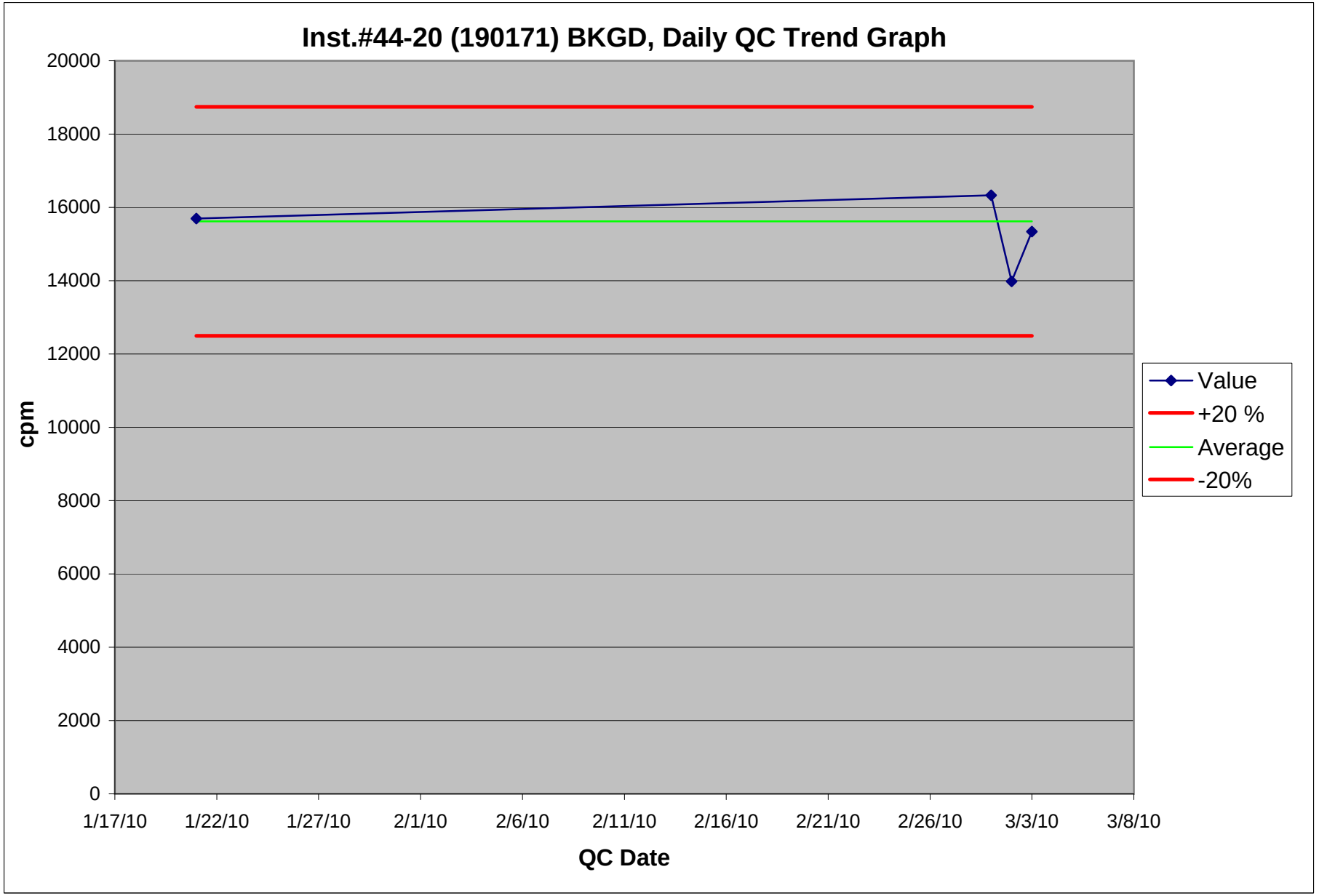
Inst.#44-20 (161580) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
12/7/2009	341276	Pass
12/8/2009	370098	Pass
12/10/2009	343057	Pass
12/11/2009	368321	Pass
12/14/2009	342764	Pass
12/15/2009	363335	Pass
1/4/2010	365835	Pass
1/11/2010	358493	Pass
1/13/2010	364322	Pass
1/14/2010	351994	Pass
1/18/2010	391428	Pass
1/19/2010	344924	Pass
1/20/2010	347492	Pass
1/21/2010	354517	Pass

Inst.#44-20 (161580) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
12/7/2009	366952		
12/7/2009	329474		
12/7/2009	332600		
12/7/2009	346294		
12/7/2009	329855		
12/7/2009	346005		
12/7/2009	370375		
12/7/2009	369236		
12/7/2009	370567		
12/7/2009	369154		
	Average		
	353051		


Inst.#44-20 (161580) SOURCE, Daily QC Trend Graph
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
cpm
12/3/09
12/8/09
12/13/09
12/18/09
12/23/09
12/28/09
1/2/10
1/7/10
1/12/10
1/17/10
1/22/10
1/27/10
QC Date
Value
+20 %
Average
-20%

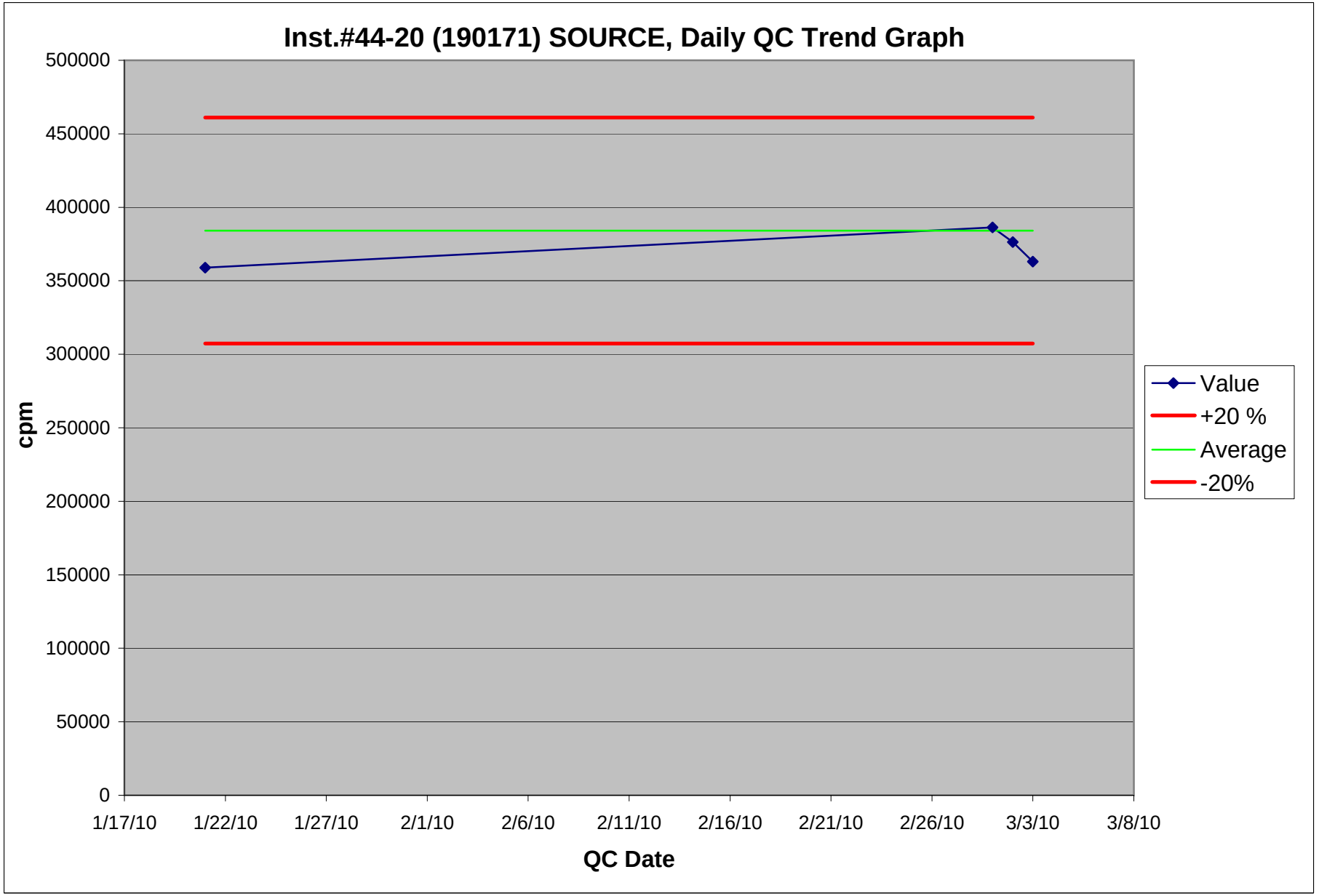
Inst.#44-20 (190171) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
1/21/2010	15694	Pass
3/1/2010	16328	Pass
3/2/2010	13980	Pass
3/3/2010	15339	Pass

Inst.#44-20 (190171) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
1/20/2010	15390		
1/20/2010	15503		
1/20/2010	15610		
1/20/2010	15744		
1/20/2010	15467		
1/20/2010	15563		
1/20/2010	15757		
1/20/2010	15635		
1/20/2010	15590		
1/20/2010	15924		
	Average		
	15618		


Inst.#44-20 (190171) BKGD, Daily QC Trend Graph
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
cpm
1/17/10
1/22/10
1/27/10
2/1/10
2/6/10
2/11/10
2/16/10
2/21/10
2/26/10
3/3/10
3/8/10
QC Date
Value
+20 %
Average
-20%

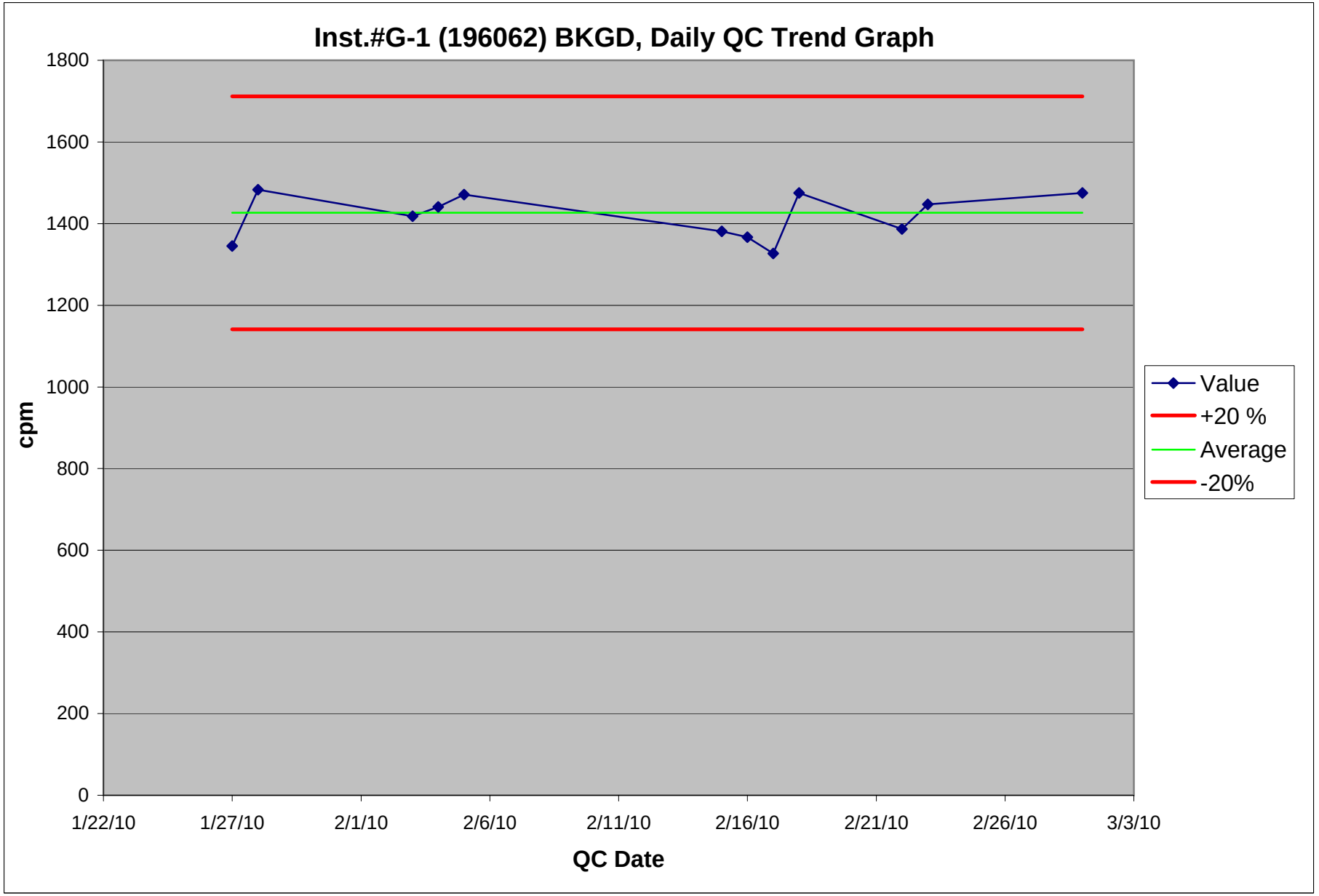
Inst.#44-20 (190171) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
1/21/2010	358904	Pass
3/1/2010	386322	Pass
3/2/2010	376303	Pass
3/3/2010	363089	Pass

Inst.#44-20 (190171) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
1/20/2010	386656		
1/20/2010	386882		
1/20/2010	387677		
1/20/2010	387259		
1/20/2010	387289		
1/20/2010	386811		
1/20/2010	386466		
1/20/2010	387731		
1/20/2010	386714		
1/20/2010	358206		
	Average		
	384169		


Inst.#44-20 (190171) SOURCE, Daily QC Trend Graph
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
cpm
1/17/10
1/22/10
1/27/10
2/1/10
2/6/10
2/11/10
2/16/10
2/21/10
2/26/10
3/3/10
3/8/10
QC Date
Value
+20 %
Average
-20%

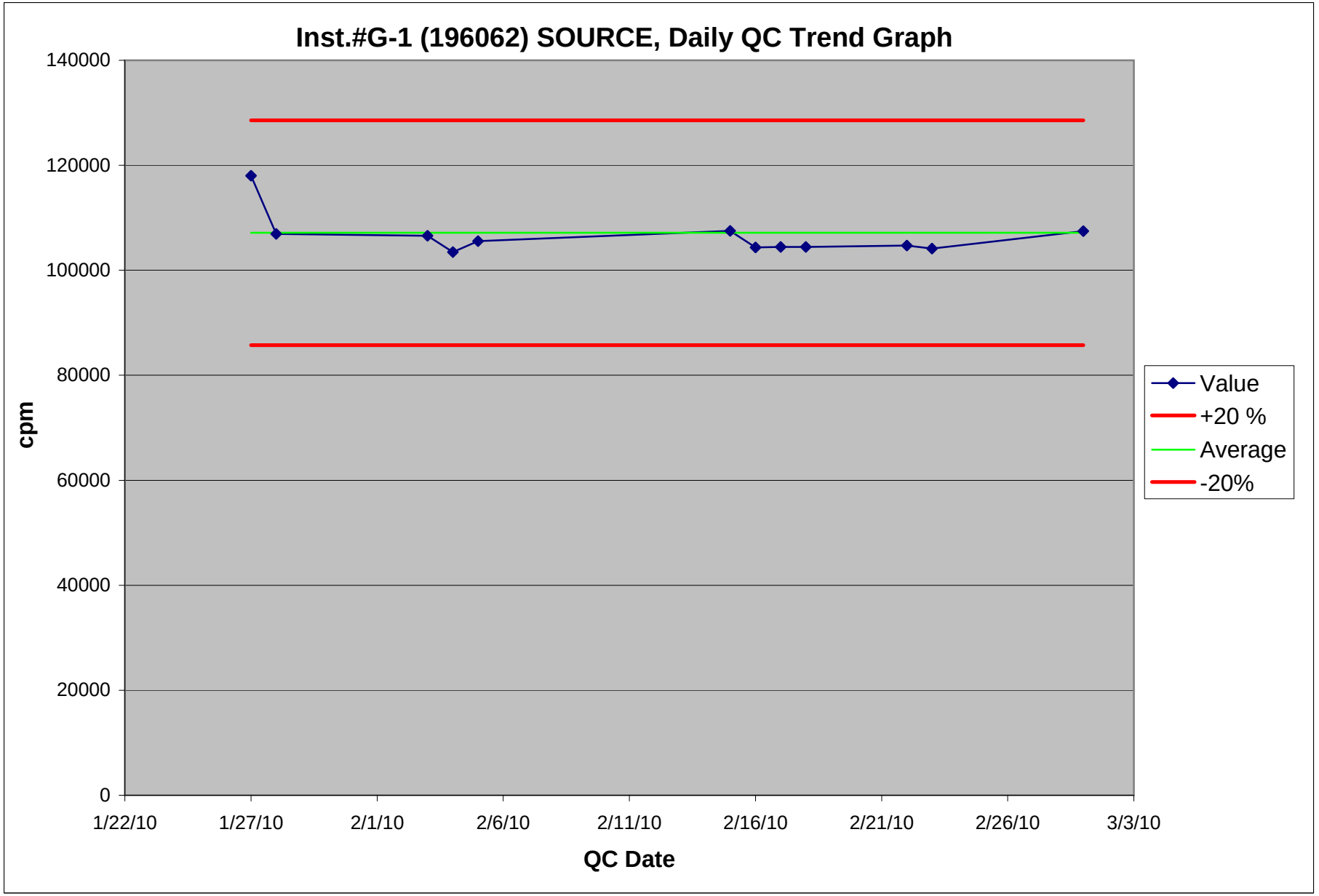
Inst.#G-1 (196062) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
1/27/2010	1345	Pass
1/28/2010	1483	Pass
2/3/2010	1418	Pass
2/4/2010	1441	Pass
2/5/2010	1471	Pass
2/15/2010	1381	Pass
2/16/2010	1367	Pass
2/17/2010	1327	Pass
2/18/2010	1475	Pass
2/22/2010	1387	Pass
2/23/2010	1447	Pass
3/1/2010	1475	Pass

Inst.#G-1 (196062) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
1/20/2010	1400		
1/20/2010	1399		
1/20/2010	1445		
1/20/2010	1406		
1/20/2010	1454		
1/20/2010	1465		
1/20/2010	1369		
1/20/2010	1509		
1/20/2010	1405		
1/20/2010	1414		
	Average		
	1427		


Inst.#G-1 (196062) BKGD, Daily QC Trend Graph
1800
1600
1400
1200
1000
800
600
400
200
0
cpm
1/22/10
1/27/10
2/1/10
2/6/10
2/11/10
2/16/10
2/21/10
2/26/10
3/3/10
QC Date
Value
+20 %
Average
-20%

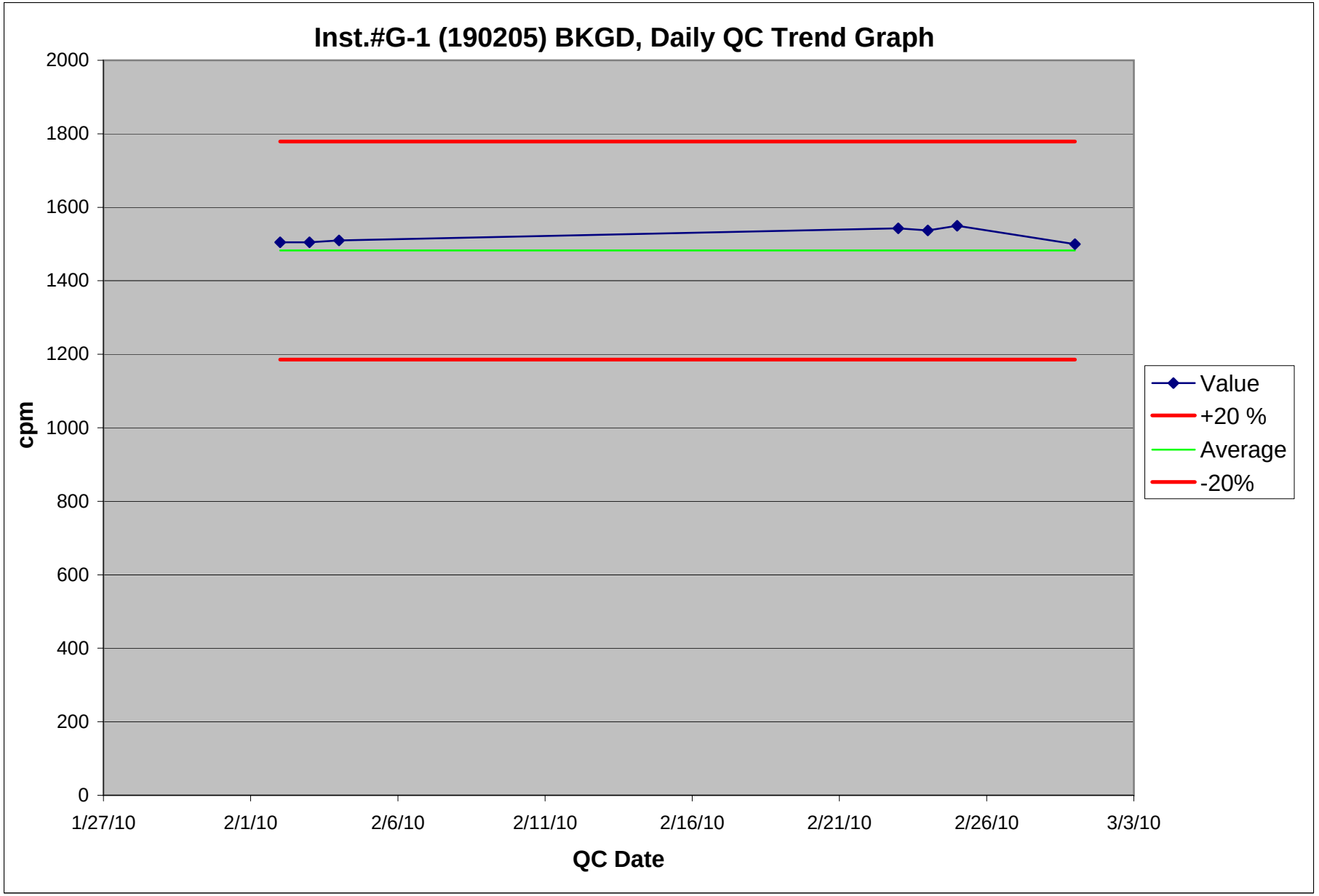
Inst.#G-1 (196062) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
1/27/2010	118001	Pass
1/28/2010	106925	Pass
2/3/2010	106552	Pass
2/4/2010	103451	Pass
2/5/2010	105551	Pass
2/15/2010	107505	Pass
2/16/2010	104355	Pass
2/17/2010	104459	Pass
2/18/2010	104465	Pass
2/22/2010	104705	Pass
2/23/2010	104125	Pass
3/1/2010	107458	Pass

Inst.#G-1 (196062) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
1/20/2010	109207		
1/20/2010	105650		
1/20/2010	103888		
1/20/2010	103881		
1/20/2010	103377		
1/20/2010	101845		
1/20/2010	100682		
1/20/2010	114888		
1/20/2010	113951		
1/20/2010	114129		
	Average		
	107150		


Inst.#G-1 (196062) SOURCE, Daily QC Trend Graph
140000
120000
100000
80000
60000
40000
20000
0
cpm
1/22/10
1/27/10
2/1/10
2/6/10
2/11/10
2/16/10
2/21/10
2/26/10
3/3/10
QC Date
Value
+20 %
Average
-20%

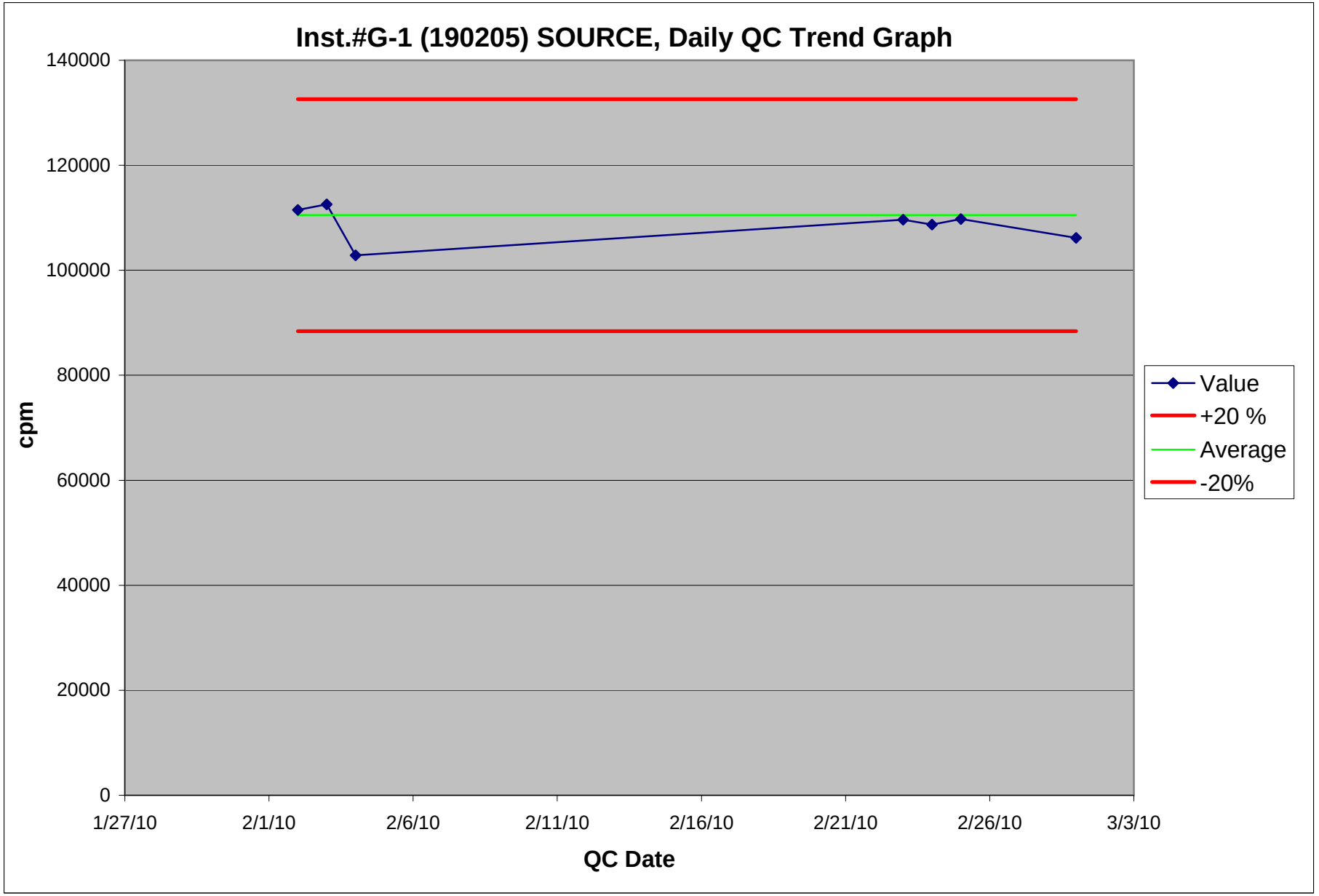
Inst.#G-1 (190205) BKGD		
QC Daily Source		
Date	Result (cpm)	P/F
2/2/2010	1505	Pass
2/3/2010	1505	Pass
2/4/2010	1510	Pass
2/23/2010	1543	Pass
2/24/2010	1537	Pass
2/25/2010	1550	Pass
3/1/2010	1500	Pass

Inst.#G-1 (190205) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (cpm)		
2/2/2010	1558		
2/2/2010	1520		
2/2/2010	1452		
2/2/2010	1478		
2/2/2010	1533		
2/2/2010	1420		
2/2/2010	1493		
2/2/2010	1462		
2/2/2010	1439		
2/2/2010	1468		
	Average		
	1482		


Inst.#G-1 (190205) BKGD, Daily QC Trend Graph
2000
1800
1600
1400
1200
1000
800
600
400
200
0
cpm
1/27/10
2/1/10
2/6/10
2/11/10
2/16/10
2/21/10
2/26/10
3/3/10
QC Date
Value
+20 %
Average
-20%

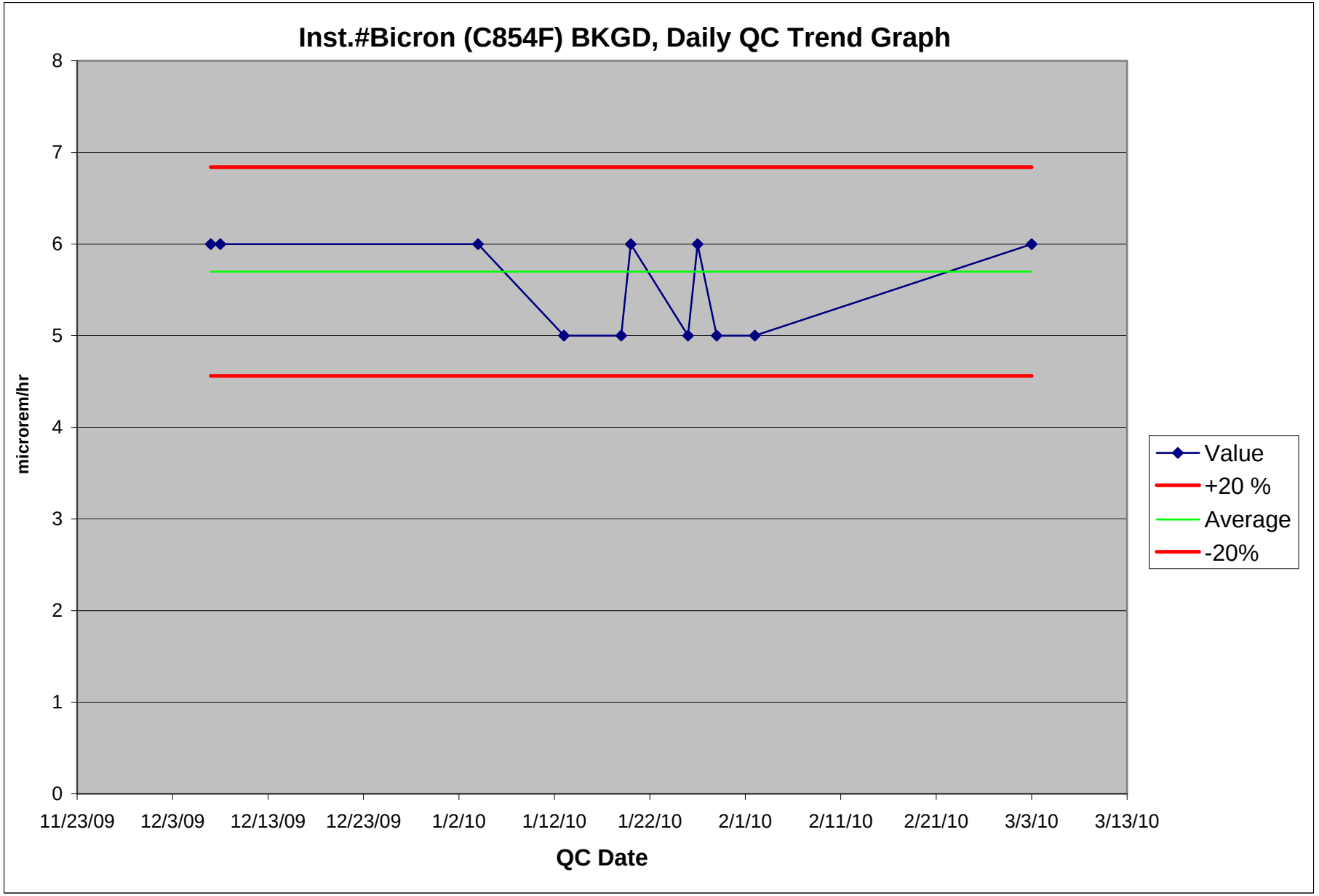
Inst.#G-1 (190205) SOURCE		
QC Daily Source		
Date	Result (cpm)	P/F
2/2/2010	111515	Pass
2/3/2010	112559	Pass
2/4/2010	102841	Pass
2/23/2010	109623	Pass
2/24/2010	108695	Pass
2/25/2010	109766	Pass
3/1/2010	106196	Pass

Inst.#G-1 (190205) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (cpm)		
2/2/2010	111258		
2/2/2010	111141		
2/2/2010	112436		
2/2/2010	111860		
2/2/2010	109136		
2/2/2010	111725		
2/2/2010	109870		
2/2/2010	108491		
2/2/2010	108039		
2/2/2010	111131		
	Average		
	110509		


Inst.#G-1 (190205) SOURCE, Daily QC Trend Graph
140000
120000
100000
80000
60000
40000
20000
0
cpm
1/27/10
2/1/10
2/6/10
2/11/10
2/16/10
2/21/10
2/26/10
3/3/10
QC Date
Value
+20 %
Average
-20%

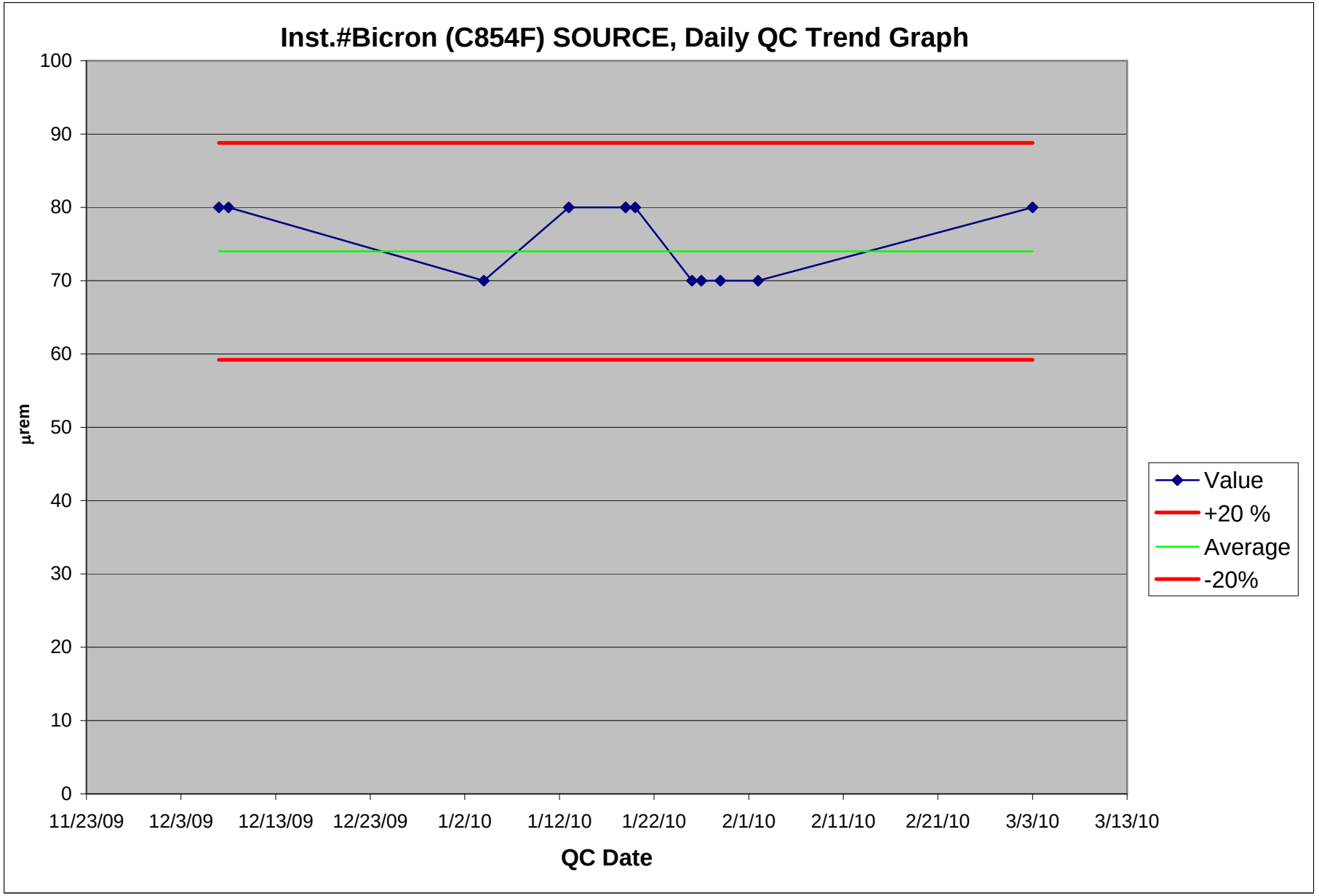
Inst.#Bicron (C854F) BKGD		
QC Daily Source		
Date	Result (µrem/hr)	P/F
12/7/2009	6	Pass
12/8/2009	6	Pass
1/4/2010	6	Pass
1/13/2010	5	Pass
1/19/2010	5	Pass
1/20/2010	6	Pass
1/26/2010	5	Pass
1/27/2010	6	Pass
1/29/2010	5	Pass
2/2/2010	5	Pass
3/3/2010	6	Pass

Inst.#Bicron (C854F) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (µrem/hr)		
12/7/2009	6		
12/7/2009	5		
12/7/2009	7		
12/7/2009	5		
12/7/2009	5		
12/7/2009	6		
12/7/2009	6		
12/7/2009	6		
12/7/2009	5		
12/7/2009	6		
	Average		
	6		


Inst.#Bicron (C854F) BKGD, Daily QC Trend Graph
8
7
6
5
4
3
2
1
0
microrem/hr
11/23/09
12/3/09
12/13/09
12/23/09
1/2/10
1/12/10
1/22/10
2/1/10
2/11/10
2/21/10
3/3/10
3/13/10
QC Date
Value
+20 %
Average
-20%

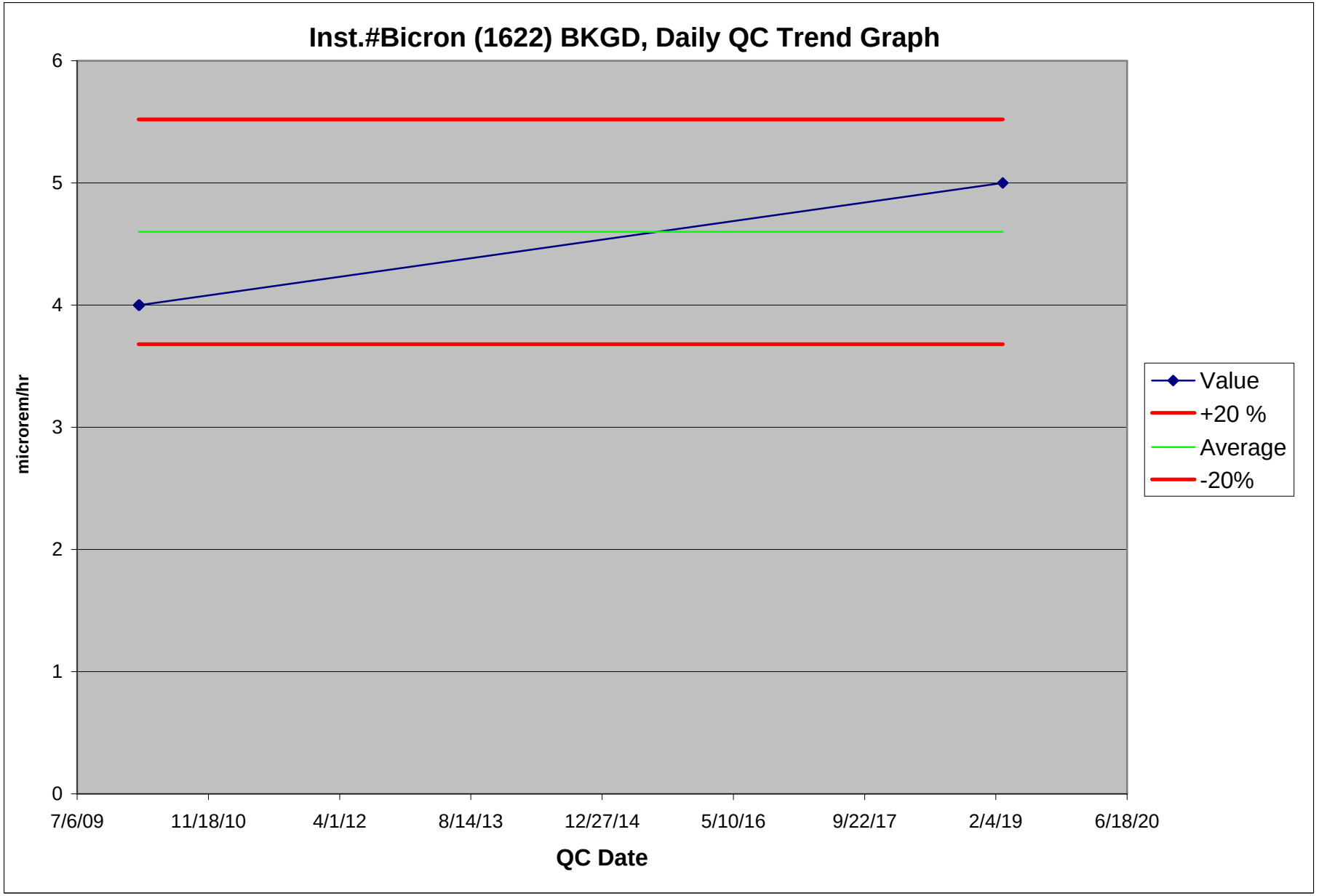
Inst.#Bicron (C854F) SOURCE		
QC Daily Source		
Date	Result (µrem/hr)	P/F
12/7/2009	80	Pass
12/8/2009	80	Pass
1/4/2010	70	Pass
1/13/2010	80	Pass
1/19/2010	80	Pass
1/20/2010	80	Pass
1/26/2010	70	Pass
1/27/2010	70	Pass
1/29/2010	70	Pass
2/2/2010	70	Pass
3/3/2010	80	Pass

Inst.#Bicron (C854F) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (µrem/hr)		
12/7/2009	70		
12/7/2009	80		
12/7/2009	80		
12/7/2009	60		
12/7/2009	60		
12/7/2009	70		
12/7/2009	80		
12/7/2009	70		
12/7/2009	90		
12/7/2009	80		
	Average		
	74		


Inst.#Bicron (C854F) SOURCE, Daily QC Trend Graph
100
90
80
70
60
50
40
30
20
10
0
µrem
11/23/09
12/3/09
12/13/09
12/23/09
1/2/10
1/12/10
1/22/10
2/1/10
2/11/10
2/21/10
3/3/10
3/13/10
QC Date
Value
+20 %
Average
-20%

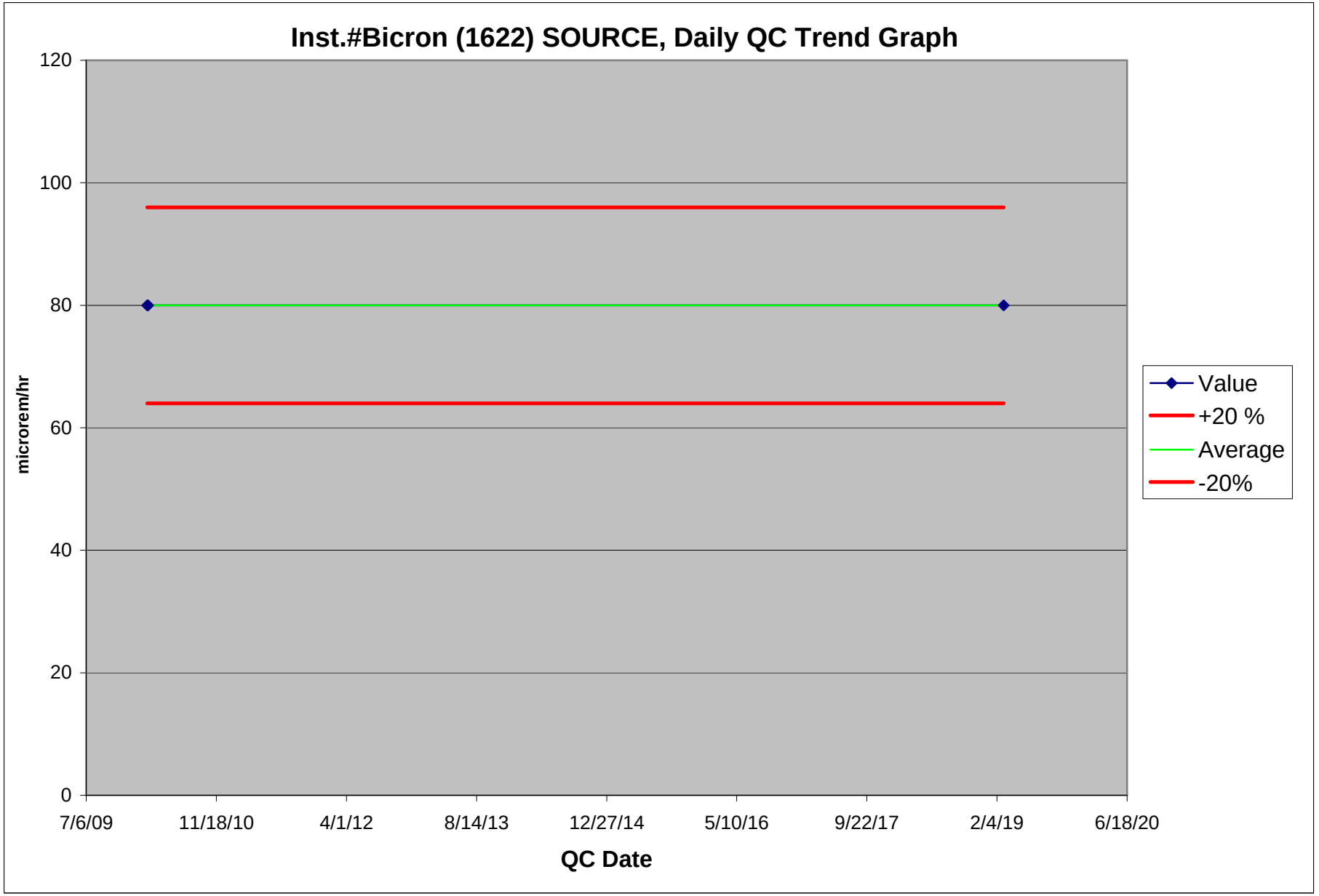
Inst.#Bicron (1622) BKGD		
QC Daily Source		
Date	Result (µrem/hr)	P/F
2/25/2010	4	Pass
3/1/2010	4	Pass
3/2/2019	5	Pass

Inst.#Bicron (1622) BKGD		Source Ser. #	
Initial Source Readings		Nuclide	BKGD
Date	Result (µrem/hr)		
2/25/2010	4		
2/25/2010	5		
2/25/2010	4		
2/25/2010	4		
2/25/2010	5		
2/25/2010	4		
2/25/2010	6		
2/25/2010	5		
2/25/2010	5		
2/25/2010	4		
	Average		
	5		


Inst.#Bicron (1622) BKGD, Daily QC Trend Graph
6
5
4
3
2
1
0
microrem/hr
7/6/09
11/18/10
4/1/12
8/14/13
12/27/14
5/10/16
9/22/17
2/4/19
6/18/20
QC Date
Value
+20 %
Average
-20%

Inst.#Bicron (1622) SOURCE		
QC Daily Source		
Date	Result (µrem/hr)	P/F
2/25/2010	80	Pass
3/1/2010	80	Pass
3/2/2019	80	Pass

Inst.#Bicron (1622) SOURCE		Source Ser. #	1162
Initial Source Readings		Nuclide	Cs-137
Date	Result (µrem/hr)		
2/25/2010	80		
2/25/2010	80		
2/25/2010	70		
2/25/2010	70		
2/25/2010	80		
2/25/2010	80		
2/25/2010	90		
2/25/2010	90		
2/25/2010	80		
2/25/2010	80		
	Average		
	80		


Inst.#Bicron (1622) SOURCE, Daily QC Trend Graph
120
100
80
60
40
20
0
microrem/hr
7/6/09
11/18/10
4/1/12
8/14/13
12/27/14
5/10/16
9/22/17
2/4/19
6/18/20
QC Date
Value
+20 %
Average
-20%

APPENDIX F-3
DATA QUALITY ASSESSMENT FOR MIDDLESEX MUNICIPAL LANDFILL

1.0 INTRODUCTION

Medium-specific environmental sampling events were conducted for Middlesex Municipal Landfill (MML) located within the Borough of Middlesex, New Jersey (NJ) in accordance with Field Sampling Plan (FSP) (USACE, 2010a). These activities were conducted during the Site Investigation (SI) to provide sufficient information to determine the need for a full remedial investigation (RI) or other actions in accordance with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), based on preliminary site data and field sampling for contamination. As a part of the FSP, Quality Assurance/Quality Control (QA/QC) activities were performed under this project in accordance with applicable technical standards, U.S. Environmental Protection Agency (EPA) regulations, government regulations and guidelines, and specific project goals and requirements. The objectives for these QA/QC activities are to demonstrate that environmental data generated during this investigation can withstand scientific scrutiny, are appropriate for their intended purpose, are technically defensible, and are of known and acceptable precision, and accuracy. This assessment presents the results of QA/QC evaluation performed for MML by utilizing the sampling results of radiological isotopes as they may be potential radiological contaminants of concerns for the site.

2.0 CONTRACTED LABORATORY PROGRAMS

Analytical Laboratory Services (ALS) of Fort Collins, Colorado was selected as a laboratory to perform sampling analyses for primary and QC samples collected from different environmental media as a part of SI for MML.

3.0 QUALITY-INDICATOR SAMPLES

The Quality-Indicator Samples (QIS) were collected for soil, as part of field and laboratory QC measures and were submitted for analysis to ALS. The QIS are used to evaluate the usability of data. The identity of duplicate QC samples is held blind to the analysts and the purpose of these samples is to provide activity-specific, field-originated information regarding the homogeneity of the sampled matrix and the consistency of the sampling effort. These samples were collected concurrently with the primary environmental samples and equally represent the medium at a given time and location. QIS samples consisted of the following types – laboratory duplicate (DUP), laboratory control sample (LCS), matrix spikes (MS), matrix spikes duplicates (MSD) and method blank (MB). They were analyzed at a rate of one per ten for duplicate samples and one per 20 samples for MS/MSD for each analysis performed on each matrix.

4.0 DATA EVALUATION

The evaluation/assessment of measurement data is required to ensure that the QA objectives for the program are met and that quantitative measures of data quality are provided. The data

evaluation procedures, calculations and applications used for the project are based on the criteria presented in *USACE Kansas City and St. Louis District Radionuclide Data Quality Evaluation Guidance for Alpha and Gamma Spectroscopy* (USACE, 2002).

All samples have been reviewed with respect to condition of sample receipt from the laboratory. All sample containers were received by ALS in good condition and under proper chain of custody (COC). All samples were extracted and analyzed within 180 days from time of sample collection. The routine quality control procedures conducted in the laboratory include proper instrument maintenance, calibration and continuing calibration checks, and internal quality control analyses at the required frequencies. One of the additional ongoing data assessment processes is maintaining control charts for representative QC sample analyses to monitor system performance. This provides verification that the system is in statistical control, and indicated when performance problems occur, so that the problems can be corrected as soon as possible. When reporting the sample data, the laboratory also provides the results of associated QC sample analyses. The following sections summarize the data evaluation process conducted for the MML

4.1 Data Assessment Procedures

The primary objective of the data assessment phase was to assess and summarize the quality and reliability of the data for the intended use and to document factors that may affect the usability of the data. Qualifiers were applied to each field and analytical result to indicate the usability of the data for its intended purpose. Data assessment procedures performed for this project includes:

- Initial review of analytical and field data for complete and accurate documentation, holding time compliance, and required frequency of QC samples
- Evaluation of blank results to identify systematic contamination
- Statistical calculations for accuracy and precision using the appropriate quality control sample results
- Estimates of completeness, in terms of the percent of valid unqualified data
- Assigning data qualifier flags to the data as necessary to reflect limitations identified by the process

4.2 Data Quality Indicators

The data quality indicators that were used during the data assessment process are summarized in the following sections.

4.2.1 Precision

The degree of agreement between the numerical values of a set of duplicate samples performed in an identical fashion constitutes the precision of the measurement. During the collection of data using field methods and/or instruments, precision is checked by reporting measurements at one location and comparing results. Control limits for control sample analyses, acceptability limits for replicate analyses, and response factor agreement criteria specified for calibration and internal QC checks are based upon precision, in terms of the relative percent difference, RPD.

The RPD calculation allows for the comparison of two analysis values in terms of precision with no estimate of accuracy. Relative percent difference is calculated as:

$$RPD = \frac{|M - m|}{\left(\frac{M + m}{2}\right)} \times 100$$

where:

M = First measurement value; and
m = Second measurement value.

RPD evaluations are not typically performed on radiological samples because of the possibility of the results being net negative, e.g. sample concentration being lower than representative background sample. Therefore, a normalized absolute difference (NAD) was also calculated between the values by using the following equation:

$$\text{Normalized Absolute Difference}_{\text{Duplicate}} = \frac{|\text{Sample} - \text{Duplicate}|}{\sqrt{\sigma^2_{\text{Sample}} + \sigma^2_{\text{Duplicate}}}}$$

Where: Sample = first sample value (original) σ_{Sample} = 2 counting uncertainty of the sample

Duplicate = second sample value (duplicate) $\sigma_{Duplicate}$ =2 counting uncertainty of the duplicate

The calculated NAD results will be compared to a performance criteria of less than or equal to 1.96. Calculated NAD values less than 1.96 will be considered acceptable and values greater than 1.96 will be investigated for possible discrepancies in analytical precision.

4.2.2 Accuracy

Accuracy is the degree of agreement of a measurement, X, with an accepted reference or true value, T. Accuracy is usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100(X-T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measure of the bias in a system and is assessed by means of reference samples and percent recoveries. Error may arise from personnel, instrument, or method factors.

Analytical accuracy is expressed as the percent recovery of an analyte that has been added to the control samples or a standard matrix (e.g., blank soil, analyte-free water, etc.) at a known concentration prior to analysis. Two types of analytical check samples can be used: laboratory control samples (blank spike) and the matrix spike. For this project, percent spike recovery calculation was used to determine the performance of a method for recovery of a spike concentration added to a sample is the percent spike recovery calculation. The percent spike recovery was determined as:

$$\%\,\text{Spike Recovery} = \frac{[(\textit{Measured Sample Value Plus Spike}) - (\textit{Measured Sample Value})]}{(\textit{Value of Spike Added})} x\,100$$

4.2.3 Completeness

Completeness is a measure of the degree to which the amount of sample data collected meets the scope and a measure of the relative number of analytical data points that meet the acceptance criteria, including accuracy, precision, and any other criteria required by the specific analytical method used. Completeness is defined as a comparison of the actual numbers of valid data points and expected numbers of points expressed as a percentage.

The QA objectives for completeness will be based upon a project goal of 90%. If data cannot be reported without qualifications, project completion goals may still be met if the qualified data, i.e., data of known quality even if not perfect, are suitable for the specified project goals.

4.2.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. The representativeness criteria are best satisfied by making certain that sampling locations are properly selected and a sufficient number of samples are collected. Representativeness is addressed by describing sampling techniques and rationale used to select sampling locations. The SI performed at the MML was designed using guidance in Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (NRC, 2000). Additionally, EPA-approved and American Society for Testing and Materials (ASTM)-approved and standardized sampling procedures were used where practical, and considered as guidance in other cases, to ensure the representativeness of sample data.

4.2.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The comparability of the data, a relative measure, is influenced by sampling and analytical procedures. By providing specific protocols to be used for obtaining and analyzing samples, data sets should be comparable regardless of who obtains the sample or performs the analysis.

The analytical laboratory was responsible for enhancing comparability using the following controls:

- Use of current, standard EPA-approved methodology for sample preservation, holding, and analysis
- Consistent reporting units for each parameter in similar matrices
- EPA- or NIST-traceable standards, when available
- Analysis of EPA QC samples, when available
- Participation in inter-laboratory performance evaluation studies

4.3 Results of Data Assessment

The following sections summarized the data evaluation procedures to be used for each QIS.

4.3.1 Standard Traceability

All standards used in the preparation of QC sampling including LCS, MS or sample-specific tracers are traceable to a reliable source (e.g. NIST, IAEA).

4.3.2 Laboratory Control Sample (LCS)

The purpose of the LCS is to monitor the accuracy of sample preparation and analysis. The LCS must be the same matrix type as the analytical samples. It is prepared and analyzed using the same methods as the project samples. An LCS spike recovery QC criterion for LCS is 75-125%. The percentage spike recovery rate for Ra-226 and Uranium isotopes falls within the QC criteria.

4.3.3 Laboratory Duplicate (LD)

The purpose of the LD is to monitor the precision of the analytical method, provided the sample is fully homogenized prior to preparation and analysis. For sample and LD result pairs, a normalized absolute difference (NAD) was calculated between the values. The calculated NAD results were compared to a performance criteria of less than or equal to 1.96. Calculated NAD values less than 1.96 were considered acceptable and values greater than 1.96 will be investigated for possible discrepancies in analytical precision.

Additionally, relative percent difference (RPD) values were calculated for each analyte based on sample and LD sampling results. All calculated RPD between the sample and the corresponding LD were compared to the QC criteria (RPD <50).

Table 1 presents the results of NAD and RPD for sample and laboratory duplicate samples. The results showed that NAD values are less than 1.96 for the all duplicate samples. All calculated RPD between the sample and the corresponding LD met the QC criteria (RPD <50)

Table 1: Determination of NAD and RPD for Soil Sampling Results

Sample ID	Ac-228						Ra-226						U-238					
	SMP		DUP		NAD	RPD	SMP		DUP		NAD	RPD	SMP		DUP		NAD	RPD
	Result	TPU	Result	TPU			Result	TPU	Result	TPU			Result	TPU	Result	TPU		
MML-SBG01-P-10.0-12.0	0.72	0.34	0.53	0.19	0.5	30%	1	1.2	0.5	1.1	0.3	**67%**	0.67	0.16	0.47	0.13	1.0	35%
MML-SBG05-P-2.0-3.5	0.76	0.17			NC	NC	1.72	0.94			NC	NC	0.69	0.17	0.66	0.16	0.1	4%
MML-SBG13-P-4.0-5.0	1.77	0.24	1.58	0.24	0.6	11%	2.08	0.77	1.69	0.79	0.4	21%	1.01	0.22			NC	NC
MML-SBG14-P-0.5-4.0	1.15	0.23	0.95	0.22	0.6	19%	3.2	1.3	5.1	1.2	1.1	46%	1.24	0.27	1.48	0.3	0.6	18%
MML-SBG17-P-2.0-5.0	0.79	0.2	0.72	0.13	0.3	9%	1.14	0.73	1.53	0.64	0.4	29%	0.55	0.15	0.65	0.16	0.5	17%
MML-SBG18-P-1.5-3.0	0.64	0.26	0.8	0.28	0.4	22%	1	1.1	1.1	1.3	0.1	10%	0.62	0.17			NC	NC
MML-SBG21-P-1.0-3.0	0.76	0.27	0.71	0.25	0.1	7%	1.7	1.1	0.7	1.4	0.6	**83%**	0.87	0.2	1.05	0.23	0.6	19%
MML-SBG28-P-0.5-2.0	0.95	0.2	0.72	0.15	0.9	28%	2.41	0.72	1.93	0.81	0.4	22%	0.59	0.15			NC	NC
MML-SBG35-P-0.0-3.0	1.09	0.2	1.2	0.17	0.4	10%	1.77	0.76	2.1	0.79	0.3	17%	0.95	0.22	0.95	0.22	0.0	0%
MML-SBG37-P-9.0-11.0	0.71	0.17	0.8	0.18	0.4	12%	0.81	0.76	1.42	0.77	0.6	**55%**	0.59	0.15			NC	NC
MML-SBG38-D-10.0-12.0	1.23	0.22			NC	NC	1.06	0.8			NC	NC	0.84	0.19	0.77	0.18	0.3	9%
MML-SBG40-D-6.0-8.0	0.65	0.17			NC	NC	1.17	0.77			NC	NC	0.51	0.13	0.67	0.16	0.8	27%
MML-SBG43-P-6.0-9.0	1.08	0.29	0.85	0.29	0.6	24%	1.2	1.4	2	1.3	0.4	50%	0.83	0.19	0.71	0.17	0.5	16%
MML-SBG45-P-3.5-4.5	0.83	0.23	1.13	0.37	0.7	31%	2.8	1.2	1.1	1.7	0.8	**87%**	1.92	0.36	1.92	0.36	0.0	0%
MML-SBG46-B-0.0-1.0	188	39	111	32	1.5	52%					NC	NC					NC	NC
MML-SBG48-P-1.0-3.0	1.39	0.23	1.52	0.25	0.4	9%	1.58	0.94	1.6	1	0.0	1%	1.05	0.23	0.96	0.21	0.3	9%
MML-SBT11-B-0.0-0.5(3)	0.63	0.23			NC	NC	2.8	1.2			NC	NC	1.19	0.26	1.06	0.23	0.4	12%
MML-SBT13-B-0.0-1.5	0.92	0.2	0.83	0.18	0.3	10%	1.04	0.74	1.38	0.85	0.3	28%	0.68	0.16			NC	NC
MML-SBT14-B-4.5-5.5	32	14	40.8	8.8	0.5	24%	114	14			NC	NC	114	19			NC	NC
MML-SSC01-P-0.0-0.5	0.73	0.15	0.75	0.16	0.1	3%	4.4	1	4.38	0.95	0.0	0%	2.93	0.63			NC	NC
MML-SSC10-P-0.0-0.5	0.85	0.26			NC	NC	10	2.2			NC	NC	2.71	0.57	2.48	0.55	0.3	9%
MML-SSC11-P-0.0-0.5	1.04	0.2	1.01	0.16	0.1	3%	2.74	0.92	2.61	0.79	0.1	5%	1.02	0.28			NC	NC
MML-SSC14-P-0.0-0.5	1.31	0.21	1.1	0.22	0.7	17%	1.55	0.79	2.51	0.92	0.8	47%	0.76	0.23			NC	NC
MML-SSC15-P-0.0-0.5	1.2	0.23	1.02	0.21	0.6	16%	1.7	1.1	1.92	0.87	0.2	12%	0.96	0.27			NC	NC
MML-SSC18-P-0.0-0.5	1.1	0.21			NC	NC	0.9	1			NC	NC	0.77	0.19	1.03	0.28	0.8	29%
MML-SSC23-P-0.0-0.5	1.14	0.17			NC	NC	1.54	0.64			NC	NC	0.54	0.19	0.82	0.2	1.0	41%
MML-SSC26-P-0.0-0.5	0.82	0.28			NC	NC	15.1	2.6			NC	NC	4.07	0.72	4.16	0.72	0.1	2%
MML-SSC27-D-0.0-1.0	8.8	1.2	9.8	1.3	0.6	11%	23	4	14.3	3.5	1.6	47%	5.8	1			NC	NC
MML-SSC29-D-0.0-0.5	0.94	0.2			NC	NC	66.5	8			NC	NC	11.3	2.4	10.5	2	0.3	7%

Table 1: Determination of NAD and RPD for Soil Sampling Results (Cont'd)

Sample ID	Ac-228						Ra-226						U-238					
	SMP		DUP		NAD	RPD	SMP		DUP		NAD	RPD	SMP		DUP		NAD	RPD
	Result	TPU	Result	TPU			Result	TPU	Result	TPU			Result	TPU	Result	TPU		
MML-SSC34-P-0.0-0.5	1.58	0.24	1.46	0.37	0.3	8%	2.34	0.8	2.2	1.7	0.1	6%	1.16	0.25	1.24	0.26	0.2	7%
MML-SSC38-P-0.0-0.5	0.91	0.15	0.76	0.2	0.6	18%	10.9	1.5	9.3	1.6	0.7	16%	4.75	0.81			NC	NC
MML-SSC39-P-0.0-0.5	0.87	0.25			NC	NC	2.1	1.1			NC	NC	1.19	0.26	1.17	0.25	0.1	2%
MML-SSW01-P-0.0-0.5	0.91	0.27	0.79	0.24	0.3	14%	2.2	1.3	1.3	1.1	0.5	**51%**	1.03	0.23	0.7	0.18	1.1	38%
MML-SSW08-P-0.0-0.5	1.91	0.26	1.62	0.25	0.8	16%	2.08	0.85	1.72	0.84	0.3	19%	0.95	0.21	0.87	0.2	0.3	9%

Footnote
NC Not calculated
Unit in pCi/g.

4.3.4 Matrix Spike (MS)/ Matrix Spike Duplicates (MSD)

The purpose of the MS/MSD is to measure the effect of interferences from the sample matrix that will hinder accurate quantitation by the instrument. The MS assumes that the sample matrix has been fully homogenized prior to preparation and analysis. The MS spike recovery QC criteria is 75-125%. The percentage spike recovery rate for Uranium isotopes falls within the QC acceptable criteria.

4.3.5 Method Blank (MB)

The purpose of the MB is to monitor the presence of external sources of contamination for analytes of interest in the sample preparation and analysis process. The MB is a laboratory-generated sample of the same matrix as the analytical samples but in absence of the analytes of interest. During this project, the results of all radionuclides of interest in the MB were compared to their corresponding MDCs. The measured activities for few radionuclides of interest are higher than the calculated MDCs. However, they are below the requested MDCs.

4.3.6 Tracer Yield

A tracer is defined as a radioactive isotope, introduced into the sample preparation/analysis process that will behave chemically similar to the analyte isotopes of interest. Tracers provide a means of evaluating chemical separation. The activity of the tracer detected at the end of analysis compared to that of the spiked amount is used to calculate the percent recovery. The QC limits for tracer recovery are 20-110%. Generally, a low tracer yield is indicative of losses of the spiked tracer through sample separation. Recoveries greater than expected are indicative of instrumental problems or contamination. The percent recovery results of U-232 for all samples are within the acceptable QC limits.

4.3.7 Required Detection Limits (RDLs)

The MDCs for all radionuclides of interest must be less than the RDLs. The MDC for each radionuclide of interest was compared to its corresponding RDL. The reported MDCs for a large number of the sample results for Ac-228 are greater than the project's MDL. The reported MDCs for 15 sample results for U-238 are greater than the project's MDL.

4.4 Data Usability

The overall quality of the sampling information meets or exceeds the established project objectives. Data, as presented, has been qualified as usable, but estimated when necessary. Data that have been estimated have concentrations/activities that are below the quantitation limit or are indicative of accuracy and precision being less than desired but adequate for interpretation.

Data produced for this project demonstrates that it can withstand scientific scrutiny, is appropriate for its intended purpose, is technically defensible, and is of known and acceptable precision, and accuracy. Data integrity has been documented through proper implementation of Quality Assurance and Quality Control measures.

APPENDIX G
EFFLUENT AIR MONITORING DATA

PERSONNEL AIR MONITORING DATA CALCULATION LOG (Rev 3)

Counting Instrument:	2929	Detector:	43-10-1	Cal. Date:	1/5/2010
Serial #:	129566	Serial #:	PR132720	Cal. Due Date OK?	WARNING

Radiation Type	Counting Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Sample Count time (min)	Background Count time (min)
Alpha	0.3130	Th-230	1160	17,500	4/29/2002	7.54E+04	17499	10	10
Beta	0.2360	Tc-99	1161	17,700	4/29/2002	2.11E+05	17700	10	10

Isotope of Concern	
Isotope	10CFR20 Occup. DAC
Th-232	5.00E-13

Person Monitored	Air Sample Start Time Period Date/Time	Air Sample End Time Period Date/Time	Count Date	Total BZ Run Time (min)	Flow rate (lpm)	Sample Gross Alpha (Counts)	Sample Gross Beta (Counts)	Alpha Bkg (cpm)	Beta Bkg (cpm)	Filter Efficiency (fraction)	Sample Alpha Activity (dpm)	Sample Beta Activity (dpm)	Alpha Count Concen. (uCi/cc)	Beta Count Concen. (uCi/cc)	Alpha DAC-hours	Beta DAC-hours	Alpha MDA (uCi/cc)	Beta MDA (uCi/cc)
Scott (1294)	1/27/10 9:20	1/27/10 16:17	01/28/10	340	2.5	1	370	0.00	365.00	1.00	0	-1390	1.69E-13	-7.37E-10	1.9	-8347.3	4.59E-13	6.37E-11
Stephan (1205)	1/27/10 9:36	1/27/10 16:48	01/28/10	356	2.5	0	365	0.00	365.00	1.00	0	-1392	0.00E+00	-7.04E-10	0.0	-8360.1	4.38E-13	6.09E-11
Warren (1076)	1/27/10 14:53	1/27/10 16:29	02/03/10	96	2.5	0	412	2.00	391.00	1.00	-6	-1482	-1.20E-11	-2.78E-09	-38.4	-8902.1	1.41E-11	2.34E-10
John (1204)	1/27/10 14:45	1/27/10 16:46	02/03/10	113	2.5	2	401	2.00	391.00	1.00	-6	-1487	-9.17E-12	-2.37E-09	-34.5	-8930.1	1.20E-11	1.98E-10
Scott (1076)	1/28/10 8:06	1/28/10 16:15	02/03/10	550	2.5	2	402	2.00	391.00	1.00	-6	-1486	-1.88E-12	-4.87E-10	-34.5	-8927.6	2.46E-12	4.08E-11
Stephan (1204)	1/28/10 8:09	1/28/10 16:16	02/03/10	547	2.5	1	412	2.00	391.00	1.00	-6	-1482	-2.00E-12	-4.88E-10	-36.5	-8902.1	2.47E-12	4.10E-11
Warren (1294)	1/28/10 8:35	`1/28/10 01:14	02/03/10	276	2.5	2	376	2.00	391.00	1.00	-6	-1497	-3.75E-12	-9.78E-10	-34.5	-8993.7	4.91E-12	8.12E-11
Dennis (1205)	1/28/10 8:35	`1/28/10 01:14	02/03/10	279	2.5	0	408	2.00	391.00	1.00	-6	-1484	-4.13E-12	-9.58E-10	-38.4	-8912.3	4.85E-12	8.04E-11
Scott (1076) same filter	1/28/10 8:06	1/29/10 14:30	02/03/10	1063	2.5	3	405	2.00	391.00	1.00	-5	-1485	-9.21E-13	-2.52E-10	-32.6	-8919.9	1.27E-12	2.11E-11
Stephan (1204) same filter	1/28/10 8:09	1/29/10 14:30	02/03/10	1060	2.5	1	401	2.00	391.00	1.00	-6	-1487	-1.03E-12	-2.53E-10	-36.5	-8930.1	1.28E-12	2.12E-11
Scott (1076)	2/3/10 10:00	2/4/10 16:50	02/16/10	869	2.5	2	407	0.00	396.00	1.00	1	-1506	1.32E-13	-3.12E-10	3.8	-9042.1	1.80E-13	2.60E-11
John (1294)	2/3/10 10:00	2/4/10 16:50	02/16/10	863	2.5	0	395	0.00	396.00	1.00	0	-1511	0.00E+00	-3.15E-10	0.0	-9072.6	1.81E-13	2.61E-11
Dennis (1204)	2/3/10 9:15	2/3/10 16:50	02/16/10	902	2.5	1	370	0.00	396.00	1.00	0	-1521	2.32E-13	-1.11E-09	1.9	-9136.3	6.29E-13	9.10E-11
Dennis (1204)	2/5/10 7:37	2/4/10 11:45	02/16/10	248	2.5	0	375	0.00	396.00	1.00	0	-1519	0.00E+00	-1.16E-09	0.0	-9123.5	6.64E-13	9.60E-11
John (1076)	2/5/10 7:49	2/5/10 11:44	02/16/10	235	2.5	0	358	0.00	396.00	1.00	0	-1526	0.00E+00	-1.18E-09	0.0	-9166.8	6.67E-13	9.64E-11
Scott (1205)	2/5/10 7:37	2/5/10 11:45	02/16/10	234	2.5	1	360	0.00	396.00	1.00	0	-1525	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
John (1204)	2/15/10 8:10	2/15/10 16:40	02/16/10	510	2.5	0	370	0.00	396.00	1.00	0	-1521	0.00E+00	-5.37E-10	0.0	-9136.3	3.06E-13	4.42E-11
Scott (1076)	2/15/10 8:10	2/15/10 16:40	02/16/10	510	2.5	0	378	0.00	396.00	1.00	0	-1518	0.00E+00	-5.36E-10	0.0	-9115.9	3.06E-13	4.42E-11
Scott (1076)	2/16/10 8:02	2/17/10 16:42	02/23/10	597	2.5	2	414	0.00	405.00	1.00	1	-1541	1.93E-13	-4.65E-10	3.8	-9253.3	2.61E-13	3.82E-11
John (1204)	2/16/10 8:02	2/17/10 16:42	02/23/10	596	2.5	1	373	0.00	405.00	1.00	0	-1558	9.66E-14	-4.71E-10	1.9	-9357.7	2.62E-13	3.83E-11
Scott (1205)	2/17/10 8:10	2/17/10 16:40	02/23/10	520	2.5	1	388	0.00	405.00	1.00	0	-1552	1.11E-13	-5.38E-10	1.9	-9319.5	3.00E-13	4.39E-11
John (1294)	2/17/10 8:05	2/17/10 16:40	02/23/10	525	2.5	1	374	0.00	405.00	1.00	0	-1558	1.10E-13	-5.35E-10	1.9	-9355.1	2.97E-13	4.35E-11
Scott (1205)	2/18/10 8:00	2/18/10 15:20	02/23/10	440	2.5	0	401	0.00	405.00	1.00	0	-1546	0.00E+00	-6.33E-10	0.0	-9286.4	3.55E-13	5.18E-11
John (1294)	2/18/10 7:51	2/18/10 15:20	02/23/10	449	2.5	0	414	0.00	405.00	1.00	0	-1541	0.00E+00	-6.18E-10	0.0	-9253.3	3.47E-13	5.08E-11
Scott (1076)	2/22/10 6:45	2/22/10 17:07	02/23/10	622	2.5	2	433	0.00	405.00	1.00	1	-1533	1.85E-13	-4.44E-10	3.8	-9205.0	2.51E-13	3.67E-11
Mike (1294)	2/22/10 9:00	2/22/10 17:07	02/23/10	486	2.5	0	366	0.00	405.00	1.00	0	-1561	0.00E+00	-5.79E-10	0.0	-9375.5	3.21E-13	4.69E-11
John (1205)	2/22/10 6:45	2/22/10 17:07	02/23/10	623	2.5	1	417	0.00	405.00	1.00	0	-1539	9.24E-14	-4.45E-10	1.9	-9245.7	2.50E-13	3.66E-11
Scott (1205)	2/23/10 7:38	2/23/10 16:53	03/02/10	554	2.5	1	356	0.00	402.00	1.00	0	-1553	1.04E-13	-5.05E-10	1.9	-9324.6	2.82E-13	4.10E-11
Dennis (1204)	2/23/10 7:38	2/23/10 16:53	03/02/10	554	2.5	1	375	0.00	402.00	1.00	0	-1544	1.04E-13	-5.02E-10	1.9	-9276.2	2.82E-13	4.10E-11
John (1076)	2/23/10 7:42	2/23/10 16:53	03/02/10	551	2.5	4	373	0.00	402.00	1.00	1	-1545	4.18E-13	-5.05E-10	7.7	-9281.3	2.83E-13	4.13E-11
Scott (1294)	2/24/10 7:55	2/24/10 17:09	03/02/10	551	2.5	1	368	0.00	402.00	1.00	0	-1547	1.04E-13	-5.06E-10	1.9	-9294.0	2.83E-13	4.13E-11
Dennis (1205)	2/24/10 7:55	2/24/10 17:09	03/02/10	550	2.5	0	348	0.00	402.00	1.00	0	-1556	0.00E+00	-5.10E-10	0.0	-9344.9	2.84E-13	4.13E-11
Scott (1294)	2/25/10 6:50	2/25/10 10:41	03/02/10	231	2.5	0	391	0.00	402.00	1.00	0	-1538	0.00E+00	-1.20E-09	0.0	-9235.5	6.75E-13	9.84E-11
Dennis (1205)	2/25/10 6:50	2/25/10 10:41	03/02/10	231	2.5	2	354	0.00	402.00	1.00	1	-1553	4.98E-13	-1.21E-09	3.8	-9329.7	6.75E-13	9.84E-11
John (1204)	3/1/10 6:50	3/1/10 12:48	03/02/10	352	2.5	0	356	0.00	402.00	1.00	0	-1553	0.00E+00	-7.95E-10	0.0	-9324.6	4.43E-13	6.46E-11
Dennis (1205)	3/1/10 7:02	3/1/10 12:48	03/02/10	343	2.5	1	397	0.00	402.00	1.00	0	-1535	1.68E-13	-8.06E-10	1.9	-9220.2	4.55E-13	6.63E-11

GENERAL/EFFLUENT AIRBORNE CONCENTRATION LOG (Rev 3)

Counting Instrument:		**Detector:**		**Cal. Date:**	
Serial #:		**Serial #:**		**Cal. Due Date OK?**	

Radiation Type	Counting Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Sample Count time (min)	Background Count time (min)
Alpha							#DIV/0!		
Beta							#DIV/0!		

Isotope of Concern

Isotope	10CFR20 Occupational /Effluent DAC

Type	**Air Sample Start Date/Time**	**Air Sample End Date/Time**	**Count Date**	**Run Time (min)**	**Flow Rate (lpm)**	**Sample Gross Alpha (Counts)**	**Sample Gross Beta (Counts)**	**Alpha Bkg (cpm)**	**Beta Bkg (cpm)**	**Filter Efficiency (fraction)**	**Sample Alpha Activity (dpm)**	**Sample Beta Activity (dpm)**	**Alpha Count Concen. (uCi/cc)**	**Beta Count Concen. (uCi/cc)**	**Fraction Environ. Effluent Limit Alpha**	**Fraction Environ. Effluent Limit Beta**	**Alpha MDA (uCi/cc)**	**Beta MDA (uCi/cc)**

Hi-Q HIGH VOLUME GENERAL/EFFLUENT AIRBORNE CONCENTRATION LOG (Rev 9)

Counting Instrument:	2929	**Detector:**	43-10-1	**Cal. Date:**	1/5/2010
Serial #:	129566	**Serial #:**	PR132720	**Cal. Due Date OK?**	WARNING

Radiation Type	Counting Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Sample Count time (min)	Background Count time (min)
Alpha	0.3130	Th-230	1160	17,500	4/29/2002	7.54E+04	17499	10	10
Beta	0.2360	Tc-99	1161	17,700	4/29/2002	2.11E+05	17700	10	10

Limiting Alpha Isotope of Concern		**Limiting Beta Isotope of Concern**		**Filter Area Factor (Adjusts for Portion of Filter that is Counted Only)**
Isotope	10CFR20 Occupational DAC /Effluent	Isotope	10CFR20 Occupational DAC /Effluent	4.67
Th-232	4.00E-15			Caution ! Review notes associated with Filter Area Factor

Type	**Air Sample Start Date/Time**	**Air Sample End Date/Time**	**Count Date**	**Run Time (min)**	**Flow Rate (CFM)**	**Sample Gross Alpha (Counts)**	**Sample Gross Beta (Counts)**	**Alpha Bkg (cpm)**	**Beta Bkg (cpm)**	**Filter Efficiency (fraction)**	**Sample Alpha Activity (dpm)**	**Sample Beta Activity (dpm)**	**Alpha Count Concen. (uCi/cc)**	**Beta Count Concen. (uCi/cc)**	**Fraction of DAC or Environ. Effluent Limit Alpha**	**Fraction of DAC or Environ. Effluent Limit Beta**	**Alpha MDA (uCi/cc)**	**Beta MDA (uCi/cc)**
Hi-Q 16830 - DW @ GP-15	1/27/10 14:45	1/27/10 16:17	02/03/10	92	20.0	0	398	2.00	391.00	1.00	-6	-1488	-2.58E-13	-6.01E-11	-64.49	#DIV/0!	3.03E-13	5.02E-12
Hi-Q 16829 - UW @ GP-15	1/27/10 14:45	1/27/10 16:17	02/03/10	92	20.0	1	382	2.00	391.00	1.00	-6	-1495	-2.41E-13	-6.03E-11	-60.30	#DIV/0!	3.03E-13	5.02E-12
Hi-Q 16832 - UW @ TP 1,5,6	1/27/10 9:30	1/27/10 16:47	02/03/10	437	10.0	3	367	2.00	391.00	1.00	-5	-1501	-8.74E-14	-2.55E-11	-21.86	#DIV/0!	1.28E-13	2.11E-12
Hi-Q 16826 - DW @ TP 1,5,6	1/27/10 9:30	1/27/10 16:47	02/03/10	437	10.0	1	367	2.00	391.00	1.00	-6	-1501	-1.02E-13	-2.55E-11	-25.39	#DIV/0!	1.28E-13	2.11E-12
Hi-Q 16830 - DW @ GP	1/28/10 8:35	1/28/10 13:14	02/03/10	279	15.0	3	366	2.00	391.00	1.00	-5	-1502	-9.13E-14	-2.67E-11	-22.82	#DIV/0!	1.33E-13	2.21E-12
Hi-Q 16831 - UW @ GP 15,17	1/28/10 8:35	1/28/10 10:35	02/03/10	120	15.0	1	376	2.00	391.00	1.00	-6	-1497	-2.47E-13	-6.18E-11	-61.64	#DIV/0!	3.10E-13	5.13E-12
Hi-Q 16837 - UW @ GP 15,17	1/28/10 8:35	1/28/10 10:35	02/03/10	120	15.0	0	389	2.00	391.00	1.00	-6	-1492	-2.64E-13	-6.16E-11	-65.92	#DIV/0!	3.10E-13	5.13E-12
Hi-Q 16826 - DW @ TP 9,3,8	1/28/10 8:17	1/28/10 16:45	02/03/10	508	10.0	2	368	2.00	391.00	1.00	-6	-1501	-8.13E-14	-2.19E-11	-20.32	#DIV/0!	1.10E-13	1.82E-12
Hi-Q 16829 - UW @ TP 9,3,8	1/28/10 8:17	1/28/10 16:45	02/03/10	508	15.0	0	359	2.00	391.00	1.00	-6	-1505	-6.23E-14	-1.47E-11	-15.57	#DIV/0!	7.32E-14	1.21E-12
Hi-Q 16826 - DW @ TP	1/29/10 8:05	1/29/10 16:20	02/03/10	495	15.0	0	368	2.00	391.00	1.00	-6	-1501	-6.39E-14	-1.50E-11	-15.98	#DIV/0!	7.52E-14	1.24E-12
Hi-Q 16829 - UW @ TP	1/29/10 8:05	1/29/10 16:20	02/03/10	495	15.0	0	363	2.00	391.00	1.00	-6	-1503	-6.39E-14	-1.50E-11	-15.98	#DIV/0!	7.52E-14	1.24E-12
Hi-Q 16826 - UW @ GP	2/3/10 9:15	2/3/10 16:59	02/16/10	464	20.0	1	388	0.00	396.00	1.00	0	-1514	3.32E-15	-1.21E-11	0.83	#DIV/0!	6.93E-15	1.00E-12
Hi-Q 16830 - DW @ GP	2/3/10 9:15	2/3/10 16:59	02/16/10	464	20.0	0	388	0.00	396.00	1.00	0	-1514	0.00E+00	-1.21E-11	0.00	#DIV/0!	6.93E-15	1.00E-12
Hi-Q 16829 - DW @ GP-	2/4/10 7:49	2/4/10 16:50	02/16/10	541	20.0	0	340	0.00	396.00	1.00	0	-1534	0.00E+00	-1.05E-11	0.00	#DIV/0!	5.94E-15	8.60E-13
Hi-Q 16826 - UW @ GP-	2/4/10 7:49	2/4/10 16:50	02/16/10	541	20.0	0	377	0.00	396.00	1.00	0	-1518	0.00E+00	-1.04E-11	0.00	#DIV/0!	5.94E-15	8.60E-13
Hi-Q 16826 - UW @ GP-	2/5/10 7:47	2/5/10 11:44	02/16/10	237	20.0	0	401	0.00	396.00	1.00	0	-1508	0.00E+00	-2.36E-11	0.00	#DIV/0!	1.36E-14	1.96E-12
Hi-Q 16829 - DW @ GP-	2/5/10 7:48	2/5/10 11:44	02/16/10	236	20.0	0	346	0.00	396.00	1.00	0	-1531	0.00E+00	-2.41E-11	0.00	#DIV/0!	1.36E-14	1.97E-12
Hi-Q 16826 - DW @ GP-	2/15/10 8:10	2/15/10 16:40	02/16/10	510	20.0	1	384	0.00	396.00	1.00	0	-1515	3.02E-15	-1.10E-11	0.76	#DIV/0!	6.31E-15	9.12E-13
Hi-Q 16829 - UW @ GP-	2/15/10 8:10	2/15/10 16:40	02/16/10	510	20.0	1	374	0.00	396.00	1.00	0	-1519	3.02E-15	-1.11E-11	0.76	#DIV/0!	6.31E-15	9.12E-13
Hi-Q 16826 - DW	2/17/10 8:05	2/17/10 16:40	03/02/10	525	20.0	1	394	0.00	402.00	1.00	0	-1536	2.94E-15	-1.09E-11	0.73	#DIV/0!	6.13E-15	8.92E-13
Hi-Q 16829 - UW	2/17/10 8:05	2/17/10 16:40	03/02/10	525	20.0	1	395	0.00	402.00	1.00	0	-1536	2.94E-15	-1.09E-11	0.73	#DIV/0!	6.13E-15	8.92E-13
Hi-Q 16826 - DW	2/18/10 8:00	2/18/10 15:20	03/02/10	440	20.0	1	380	0.00	402.00	1.00	0	-1542	3.51E-15	-1.30E-11	0.88	#DIV/0!	7.31E-15	1.06E-12
Hi-Q 16829 - UW	2/18/10 8:00	2/18/10 15:20	03/02/10	440	20.0	0	340	0.00	402.00	1.00	0	-1559	0.00E+00	-1.32E-11	0.00	#DIV/0!	7.31E-15	1.06E-12
Hi-Q 16826 - DW	2/22/10 6:45	2/22/10 17:07	03/02/10	622	20.0	1	345	0.00	402.00	1.00	0	-1557	2.48E-15	-9.30E-12	0.62	#DIV/0!	5.17E-15	7.53E-13
Hi-Q 16829 - UW	2/22/10 6:45	2/22/10 17:07	03/02/10	622	20.0	1	361	0.00	402.00	1.00	0	-1550	2.48E-15	-9.26E-12	0.62	#DIV/0!	5.17E-15	7.53E-13
Hi-Q 16826 - DW	2/23/10 7:38	2/23/10 16:53	03/02/10	554	20.0	0	399	0.00	402.00	1.00	0	-1534	0.00E+00	-1.03E-11	0.00	#DIV/0!	5.80E-15	8.46E-13
Hi-Q 16829 - UW	2/23/10 7:38	2/23/10 16:53	03/02/10	554	20.0	0	372	0.00	402.00	1.00	0	-1546	0.00E+00	-1.04E-11	0.00	#DIV/0!	5.80E-15	8.46E-13
Hi-Q 16826 - DW	2/24/10 7:55	2/24/10 17:09	03/02/10	551	20.0	1	376	0.00	402.00	1.00	0	-1544	2.80E-15	-1.04E-11	0.70	#DIV/0!	5.84E-15	8.50E-13
Hi-Q 16829 - UW	2/24/10 7:55	2/24/10 17:09	03/02/10	551	20.0	1	383	0.00	402.00	1.00	0	-1541	2.80E-15	-1.04E-11	0.70	#DIV/0!	5.84E-15	8.50E-13
Hi-Q 16826 - DW	2/25/10 6:50	2/25/10 10:41	03/02/10	231	20.0	0	417	0.00	402.00	1.00	0	-1527	0.00E+00	-2.45E-11	0.00	#DIV/0!	1.39E-14	2.03E-12
Hi-Q 16829 - UW	2/25/10 6:50	2/25/10 10:41	03/02/10	231	20.0	2	385	0.00	402.00	1.00	1	-1540	1.34E-14	-2.48E-11	3.34	#DIV/0!	1.39E-14	2.03E-12
Hi-Q 16826 - DW	3/1/10 6:50	3/1/10 12:48	03/02/10	352	20.0	0	383	0.00	402.00	1.00	0	-1541	0.00E+00	-1.63E-11	0.00	#DIV/0!	9.14E-15	1.33E-12
Hi-Q 16829 - UW	3/1/10 6:50	3/1/10 12:48	03/02/10	352	20.0	0	393	0.00	402.00	1.00	0	-1537	0.00E+00	-1.62E-11	0.00	#DIV/0!	9.14E-15	1.33E-12

This sheet provides for any net count rate greater than the decision level to represent the presence of activity in the sample.
The decision level for the net count rate is from Strom & Stansbury 1992 as shown in NUREG 1400 eqn 6.11:

$$DL(R_n) = 1.645\ (R_b(1/T_b + 1/T_g)^{1/2}$$

where 1.645 corresponds to a 5% false alarm rate (i.e., 1 sample in 20 that has no activity present will exceed this count rate simply due to random statistical fluctuations). Exceeding this net count rate would be judged to be significant with a 5% chance of being a false alarm

R_n = net count rate, counts/min
R_b = background count rate, counts/min
T_b = background counting time, min
T_g = gross counting time, min

R_b = background count rate, counts/min
T_b = background counting time, min
T_g = gross counting time, min

	80	
	10	
	1	
$DL(R_n)$ =	15.43	cpm