Radioactive and Chemical Waste Characterization, Segregation, and Remedial Action at the Fusrap Middlesex Sampling Plant Site

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ABSTRACT

The challenge of the Formerly Utilized Sites Remedial Action Program (FUSRAP) designated Middlesex Sampling Plant (MSP) site is to economically meet the clean up criteria for both radiological and chemical hazards present. The goal is to ensure the site is remediated in accordance with the Record of Decision (ROD), while at the same time minimizing waste generation and maintaining the lowest disposal costs possible. This paper describes the results achieved to date during remediation activities. The U.S. Army Corps of Engineers (USACE) contracted ECC as the prime contractor to perform the remediation. The project is being performed under a Performance Based task order utilizing design-build processes. ECC has utilized multiple screening processes to first segregate and minimize the amount of material that needs to be handled as radioactive material, and secondly to segregate and minimize the amount of material that needs to be handled as hazardous. This process is allowing ECC to meet the cleanup criteria while minimizing cost.

INTRODUCTION

History

The Middlesex Sampling Plan (MSP) site began in 1910 as an industrial site, with the construction of a plant for the manufacture of asphalt paint. In October 1943, the Manhattan Engineer District (MED) leased the property to sample, store, test, and transfer ores containing uranium, thorium, and beryllium. Over the years that MSP was operational, the primary activities focused around the buildings on the north end of the site. The swamp-like south end of the site was filled, graded, and re-graded as necessary to bury and level the site to be more usable. During this time, buildings, grounds, and nearby land parcels became contaminated with radium, uranium, metals and semi-volatile organic compounds (SVOCs) due to air migration, limited surface water runoff, and infiltration. No other natural migration pathways were observed. In 1968 the property was returned to the General Services Administration as excess property until the United States Marine Corps (USMC) expressed interest in the property. It served as a USMC reserve training center from 1969 to 1979, before being placed back in the custody of the US Department of Energy (DOE) in 1980. Vicinity properties were remediated in the early 1980s. The plant site is no longer operational for use, and is being remediated under USACE's FUSRAP. MSP was listed on the U.S. Environmental Protection Agency's (USEPA) National Priorities List in February 1999. In 2005, the ROD for the soils operable unit was issued and approved. Off-site areas identified with contamination were remediated during previous activities. Therefore the current ROD only addresses the current site conditions.

Site Description

The MSP site is located in the Borough of Middlesex, Middlesex County, New Jersey, approximately 29 kilometers (km) (18 miles) southwest of Newark, New Jersey. The 3.9 hectare (9.6 acre) site includes foundations and associated underground structures of four former buildings which include the administration building, garage, boiler house, and process building. The majority of the site is asphalt paved, except for a small grassy area on the north side of the former administration building.

Media impacted at the MSP include on-site soils, concrete floor slabs, below-grade structures, foundations, and portions of the stormwater control system. A remedial investigation and risk assessment were completed at the MSP site in 2001. Based on the findings, certain areas of concern presented chemical and radiological risks for future users of the property. The remedial action being implemented at the site, as described in the ROD, is excavation and removal of contaminated soil and debris to an extent that will allow unrestricted use of the land. These remediation activities are being implemented by ECC under a performance based contract (PBC). A Remedial Action Work Plan (RAWP) was developed by ECC, accepted by USACE, and approved by the USEPA. Mutual goals were developed by USACE and ECC to ensure that a construction complete milestone is achieved by the end of 2007.

Both the geology (underlying soils and rocks) and hydrogeology (movement of groundwater underlying the site) is complex. Bedrock at MSP is located between 1.8 and 3.4 meters (6 feet and 11 feet) below ground surface. There are areas where the fluctuating water table contacts the contaminated soils, potentially allowing leaching of contaminants to the groundwater. In addition, the material surrounding the stormwater system may provide a preferential path for contamination to enter the groundwater. Both of these situations create the potential for off-site migration of contaminants of concern (COCs) via groundwater; however, the interim action of paving the site and installing the stormwater control system in the 1980's prevented surface infiltration, and reduced the potential for leaching of the contaminated soil.

Site Soil Contamination

The Soils Operable Unit Remedial Investigation Report for Middlesex Sampling Plant, dated May 2004, identifies several classes of contaminants detected in MSP soils, including SVOCs and radionuclides. Table I provides a summary of the site soil contamination identified in the Remedial Investigation (RI) Report.

Table I. Description of MSP Soil Contamination

	AVERAGE SITE CONCENTRATION		**BACKGROUND CONCENTRATION**	
	95% UCL	**Unit**	**95% UCL**	**Unit**
SURFACE SOILS (Surface to 2' bgs)				
Benzo(a)anthracene	7.09	mg/kg	Not Available	
Benzo(a)pyrene	8.41	mg/kg	Not Available	
Benzo(b)fluoranthene	13.5	mg/kg	Not Available	
Dibenzo(a,h)anthracene	1.38	mg/kg	Not Available	
Indeno(1,2,3-cd)pyrene	5.95	mg/kg	Not Available	
Lead (Note 1)				
Radium-226	.62 (17)	Bq/g (pCi/g)	.03 (.84)	Bq/g (pCi/g)
Thorium-230	1.3 (35.5)	Bq/g (pCi/g)	.03 (.90)	Bq/g (pCi/g)
Uranium-234	.93 (25.5)	Bq/g (pCi/g)	.03 (.86)	Bq/g (pCi/g)
Uranium-235 (Note 2)	.05 (1.38)	Bq/g (pCi/g)	ND (ND)	Bq/g (pCi/g)
Uranium-238 (Note 3)	1.03 (28.3)	Bq/g (pCi/g)	.03 (.77)	Bq/g (pCi/g)
SUBSURFACE SOILS (> 2 feet bgs)				
Benzo(a)anthracene	4.62	mg/kg	Not Available	

Table I. Description of MSP Soil Contamination				
	AVERAGE SITE CONCENTRATION		**BACKGROUND CONCENTRATION**	
	95% UCL	**Unit**	**95% UCL**	**Unit**
Benzo(a)pyrene	6.12	mg/kg	Not Available	
Benzo(b)fluoranthene	8.96	mg/kg	Not Available	
Dibenzo(a,h)anthracene	1.16	mg/kg	Not Available	
Indeno(1,2,3-cd)pyrene	3.84	mg/kg	Not Available	
Radium-226	.84 (22.9)	Bq/g (pCi/g)	.03 (.89)	Bq/g (pCi/g)
Thorium-230	1.11 (30.2)	(Bq/g (pCi/g)	.03 (.85)	Bq/g (pCi/g)
Uranium-234	.77 (21.1)	Bq/g (pCi/g))	.03 (.90)	Bq/g (pCi/g)
Uranium-235 (Note 2)	.06 (1.66)	Bq/g (pCi/g)	.003 (.09)	Bq/g (pCi/g)
Uranium-238 (Note 3)	1.28 (34.9)	Bq/g (pCi/g)	.03 (.80)	Bq/g (pCi/g)

NOTES:
(1) Lead is included as a COC due to one exceedance at 64,900 mg/kg.
(2) Pa-231 and Ac-227 are included as part of the U-235 chain (actinium chain).
(3) Pb-210 is included as part of the U-238 chain (uranium chain).
(4) UCL = Upper Confidence Limit
(5) Bq/g = Becquerel per gram
(6) pCi/g = picocurie per gram
(7) mg/kg = milligram per kilogram

ROD Cleanup Criteria

Table II summarizes the site cleanup criteria established for the radiological and chemical contamination at the MSP site. Volume estimates of soils requiring remediation were estimated in the ROD. Based on the extent of contamination as defined in the RI Report and the ROD cleanup criteria listed below, the estimated in-situ volume of chemically contaminated soils at the MSP site was estimated to be 17,600 cubic meters (23,000 cubic yards). The estimated in-situ volume of radionuclide-contaminated soils at the MSP site was estimated to be 18,400 cubic meters (24,000 cubic yards).

Table II. MSP ROD Soil Cleanup Criteria	
Contaminant of Concern	**Remediation Goal**
Radium-226[1]	.18 Bq/g(5 pCi/g)
Benzo(a)pyrene[2]	0.66 mg/kg
Benzo(a)anthracene[2]	0.90 mg/kg
Dibenzo(a,h)anthracene[2]	0.66 mg/kg

Table II. MSP ROD Soil Cleanup Criteria	
Contaminant of Concern	**Remediation Goal**
Benzo(b)fluoranthene[2]	0.90 mg/kg
Indeno(1,2,3-c,d)pyrene[2]	0.90 mg/kg
Lead	400 mg/kg

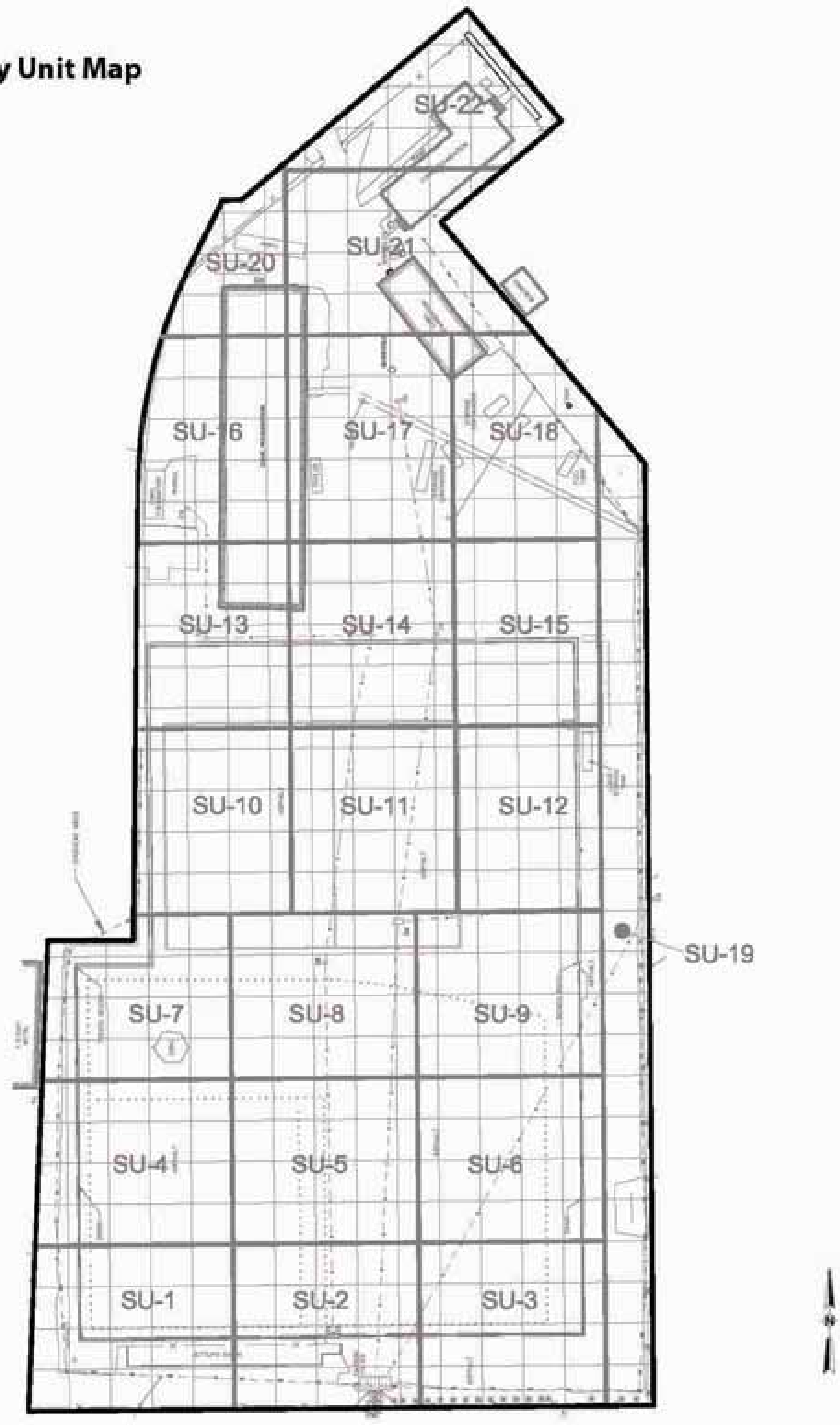
[1.] An average of .18 Bq/g (5 pCi/g) of radium-226 (Ra-226) above background for surface and subsurface soils. Although other radiological COCs were identified at the site, Ra-226 is the dominant risk source and is co-located with the other radiological COCs. The cleanup criterion for Ra-226 accounts for the dose contributions from the other nuclides. Radiological soil remediation on the MSP property will meet the 1.5E-4 Sv (15 mrem/yr) above background dose limit specified in NJAC 7:28-12.8(a) 1.

[2] Chemical soil remediation will be consistent with the remedial goals set forth in the NJAC 7:26D (It should be noted that the 0.66 mg/kg cleanup levels for benzo (a) pyrene and dibenzo (a, h) anthracene are based on the Practical Quantification Limits (PQLs) for these two chemicals, since risk-based levels were lower than the achievable PQLs. The use of these PQLs, although not at 10^{-6} risk, will result in a cleanup that removes contaminants to an acceptable risk range.)

Remedial Approach

During development of the RAWP, ECC divided the site into 22 distinct Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)-like survey units, each approximately 2000 square meters (21,528 square feet) (Figure 1).

Figure 1
MSP Survey Unit Map



Based on Remedial Investigation and site history data, ECC developed a breakdown of mass of each waste stream. **Table III** identifies this mass per survey unit as the basis for an interim payment milestone for PBC execution of waste transportation and disposal.

Table III. Radiological and Chemical Soil Mass was identified per Survey Unit

Survey Unit	Est. RAD Soil & Debris (tonnes)	Est. CHEM Soil and Debris (tonnes)
SU-1	5860 (6459 tons)	191 (210 tons)
SU-2	4232 (4665 tons)	1004 (1107 tons)
SU-3	82 (90 tons)	4259 (4695 tons)
SU-4	977 (1077 tons)	3173 (3498 tons)
SU-5	3364 (3708 tons)	191 (210 tons)
SU-6	2062 (2273 tons)	2089 (2303 tons)
SU-7	82 (90 tons)	6428 (7086 tons)
SU-8	977 (1077 tons)	3173 (3498 tons)
SU-9	977 (1077 tons)	2089 (2303 tons)
SU-10	82 (90 tons)	2089 (2303 tons)
SU-11	1736 (1914 tons)	191 (210 tons)
SU-12	82 (90 tons)	1764 (1944 tons)
SU-13	2282 (2516 tons)	620 (683 tons)
SU-14	2062 (2273 tons)	191 (210 tons)
SU-15	650 (717 tons)	191 (210 tons)
SU-16	1711 (1886 tons)	1382 (1523 tons)
SU-17	2605 (2871 tons)	191 (210 tons)
SU-18	2084 (2297 tons)	152 (168 tons)
SU-19	326 (358 tons)	1725 (1902 tons)
SU-20	201 (222 tons)	524 (578 tons)
SU-21	494 (545 tons)	331 (365 tons)
SU-22	154 (170 tons)	511 (563 tons)
Totals	**33082 (36465 tons)**	**32459 (35779 tons)**

The known surface elevation of the top of bedrock assisted USACE and ECC in limiting the risk of contaminated soil volume growth at the site. Therefore, the volume of potentially contaminated soil was limited in vertical extent, and the history of the site identified that the lateral extent of contamination was limited to only the government-owned property. Based on these conditions, the project was able to assess the upper limit of waste volume based on the bedrock constraint and property limits. Waste materials could only be above bedrock throughout the site within the property boundary, which supported moving forward with remediation versus the full design and construction project sequence.

Based on the history of the site, the shallow bedrock, and the information obtained during the remedial investigation, the extent of contamination was considered to be limited, and thus, opportunities for contaminated soil volume growth would be manageable under a fixed-price, PCB. A performance based approach was used to allow ECC the flexibility to incorporate best business practices in the efficient and cost-effective remediation of the MSP site.

In addition, the remediation schedule could be more accurately defined since the horizontal and vertical extent of contaminated soil was known to be limited. Planning for on-site remediation allowed the streamlined timeline to be part of the performance metric. The schedule driven milestone for construction complete by the end of 2007 is a shared goal between USACE and ECC.

The design and construction process schedule is being minimized through the PBC task order. To meet the shared schedule goal, pre-construction activities were downsized and full-scale remediation efforts were prioritized. After notice to proceed (NTP), the project work plans were developed and gained USACE approval within 10 days. Immediately following work plan approval, project mobilization was initiated, including subsurface geoprobe sampling, trailer setup, site utility installation and on-site laboratory build-out. The findings of this initial pre-excavation data lead ECC to determine that the need for extensive pre-excavation sampling would not provide any more accurate volume estimates than what had already been determined, and therefore, the additional characterization and design sampling would only extend the schedule, in addition to generating additional costs. Construction and remediation activities were started 27 days after NTP, building positive schedule float.

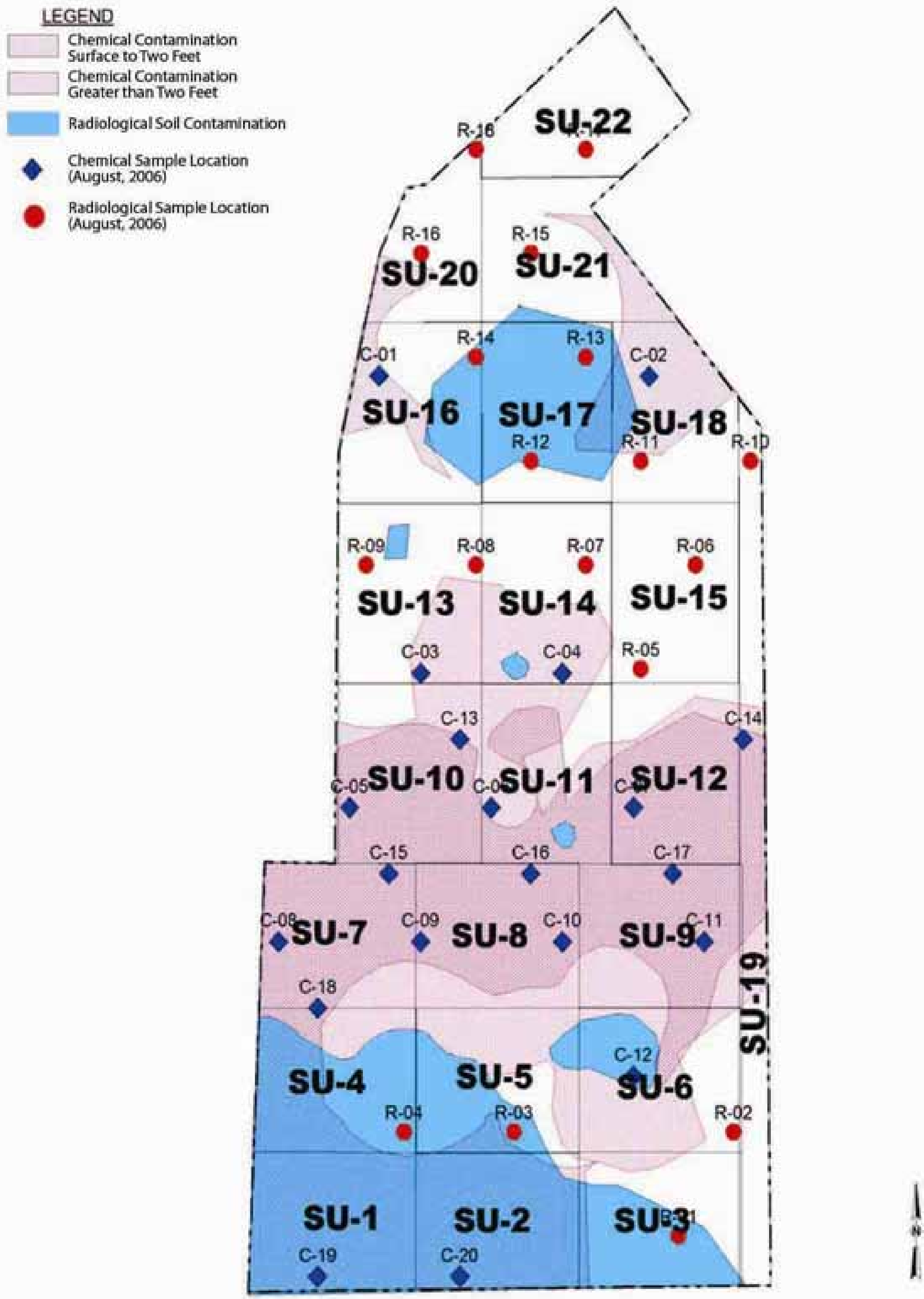
Pre-Excavation Investigations and Surveys

Prior to remedial action, ECC performed subsurface sampling, analytical and site-wide radiological surveys to support remedial efforts. ECC collected media samples sufficient to provide accurate indicators that material shipped to and received by the disposal facilities was compliant to the requisite waste acceptance criteria (WAC). Selected sampling frequency, locations and intervals were established in order to demonstrate compliance to the WAC. **Figure 2** illustrates the location of the sub-surface sampling locations along with the anticipated lateral extent of adiological and chemical contamination.

Investigation components:

1. Site gamma walkover – performed a 100 percent gamma walkover utilizing 10m x10m (33 feet by 33 feet) grids noting 2 times background locations on survey maps
2. Geoprobe sampling –
   - The sampling frequency for the disposal facility WAC was one composite sample per 765cubic meters (1,000 cubic yards) of candidate waste material. The volume of naturally occurring radioactive material (NORM) waste for disposal was estimated at 18,400 cubic meters (24,000 cubic yards), thus requiring at least 24 samples to characterize the candidate waste material.
   - Sampling for chemical constituents was also predicated on 1 sample per 765 cubic meters (1000 cubic yards) of candidate waste material. The analysis was specific to SVOCs and Metals of concern. In addition, 20 samples were obtained as part of the discretionary sampling activities. The analyte list for these samples is as follows:
   - Ignitability; Oil & Grease; Paint Filter; pH; Reactive Cyanide; Reactive Sulfides; TCLP/Pesticides; TCLP/Herbicides; TCLP Metals (8); TCLP/VOCs; TCLP/SVOCs; and PCBs.

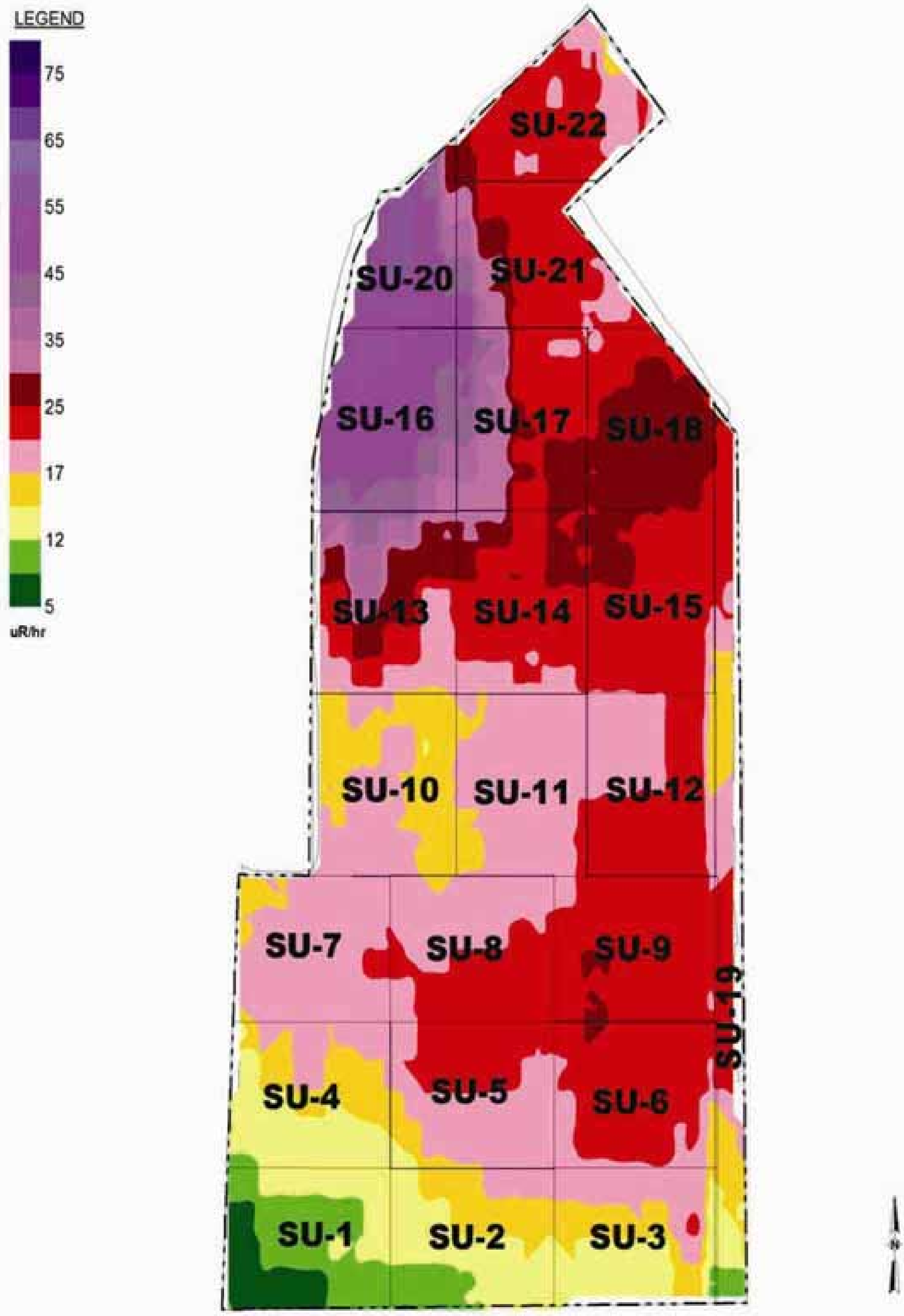
Figure 2
Pre-Excavation Soil Sampling Locations



3. Downhole gamma logging - Each geoprobe borehole was surveyed with a downhole gamma probe to measure radiological activity. The borehole data provided guidance during sampling activities and a better understanding of the extent of subsurface waste disposition. The results of the downhole gamma logging are depicted by color shaded areas shown on **Figure 3**. The distribution of dose rate, as defined by color shading, provides an indication of likely subsurface waste distribution. This data was used to pre-plan the survey unit excavations.

The purpose of the pre-excavation survey (PES) was to delineate and characterize residual radiological and chemical concentrations present in soil and debris that was to be excavated. The PES was a reasonable way to determine if a volume of soil met or exceeded the remediation goals presented previously in Table II as Derived Concentration Guideline Limits (DCGLs) for radiological constituents and NJAC soil remedial goals for the PAH and lead. In addition, the PES was used to determine waste packaging and transportation requirements, and ensure that the candidate material met the designated off-site disposal facility WAC.

Figure 3
Down-Hole Gamma Logging Results



REMEDIAL ACTION

Excavation

Prior to remediation activities, the project site was 85 percent covered with an asphalt cap and included over 3,000 square meters of concrete foundations and building slabs. The initial remedial efforts included scabbling contaminated concrete, asphalt and foundation removal. These debris streams were decontaminated, surveyed, and segregated into contaminated and clean staging areas. Uncontaminated debris was loaded into roll-offs for local landfill disposal. Contaminated asphalt and concrete is stockpiled for combining with soil waste disposal at US Ecology. Soil excavation proceeds within each SU based on data from the PES tasks, and is guided by real-time gamma walk-over surveying. Excavation lifts vary in depth from 8 cm (3 inches) to .61 meters (2 feet) based on sample data and real-time in-situ measurements. Remediation progresses with continuous feedback from the Health Physicist technician to the excavator operator. These communications allow for either continued excavation on where and how much to dig, or to cease remediation. Excavation proceeds in lifts of varied depth until the contamination is below the cleanup standards. If chemical screening indicates residual contamination is present within .61 meters (2 feet) of bedrock, excavation may proceed to bedrock. If radiological screening indicates residual contamination within .61 meters (2 feet) of bedrock, excavation will proceed in 8 cm (3-inch) to 15 cm (6-inch) lifts.

Field Screening and Sampling

Field screening is utilized to provide a real-time or near real-time decision making process to the excavation effort. Direct reading radiation detection instrumentation is utilized to scan the newly uncovered soil after each lift of soil is removed. This iterative process allows for reduced soil volumes for removal. If excess activity is detected above cleanup criteria levels, additional soils are removed in 8 cm (3-inch) to .61 m (2-foot) lifts.

Following radiological remediation, the presence of chemically contaminated soils is evaluated using PAH field screening kits. Sample collection is based on survey unit pre-remedial characteristics and statistical basis. Sample analysis turnaround is approximately 3 hours to accurately detect PAHs of concern above the cleanup levels. Once the data is available, if chemical contaminants are present then additional soils are removed in 5 cm (2-inch) lifts, and the soil is screened again. This was repeated until the soils are deemed below the cleanup criteria. The field screening kits have yielded accurate results to date, correlating well with off-site laboratory results.

ECC supplied all labor, materials, and equipment necessary to provide screening level data in a timely fashion to make project decisions regarding the remediation of chemical and radiological contaminated soils. Correlation criteria of field screening data versus laboratory data were identified in the approved RAWP for the site. ECC's field laboratory provided gamma spectroscopy analyses of soil samples for radiological parameters, while on-site test kit analyses were used for the polyaromatic compounds being tested at the site.

Soil was removed from areas identified in the ROD and verified from the Soils OU 1 RI and the pre-excavation tasks that indicated the radioactive activity was above the radiological DCGLs. The soil was removed from the established survey units to the predetermined depth, and stockpiled for shipment. If the data acquired during the PES indicated that the residual radioactive contamination present within a survey unit(s) was at or below the radiological DCGLs, the survey units were eligible for a Remedial Action Support Survey (RASS). Grids were grouped and managed according to Survey Units.

In conjunction with RASS activities, and for purposes of waste characterization and transportation, radiological activity levels for stockpiled soil were reported at the 95 percent confidence level of the average of the samples from the grids.

Laboratories

The on-site screening laboratory, using gamma spectroscopy, analyzed all radiological samples collected during the pre-excavation tasks. Radiological parameters analyzed by the on-site laboratory are measured in Bq/g (pCi/g) on a dry weight basis. On-site radiological screening assumes the radionuclides listed are in secular equilibrium. The on-site screening laboratory must achieve minimum detection concentrations that are less than the remediation goals.

Screening for PAHs was conducted using USEPA Method 4030 by immunoassay. Results of chemical screening were reported as either "positive" or "negative" for the PAHs. Soil screening was preferred to provide a gross indicator of compliance to the cleanup criteria. Screening samples were collected when the RASS indicated residual radioactive contamination did not exceed the cleanup criteria. Confirmatory PAH samples were collected if screening indicated a "negative" presence of PAH contaminants. The on-site analysis turnaround time is approximately 3 hours, allowing for near real-time decision making.

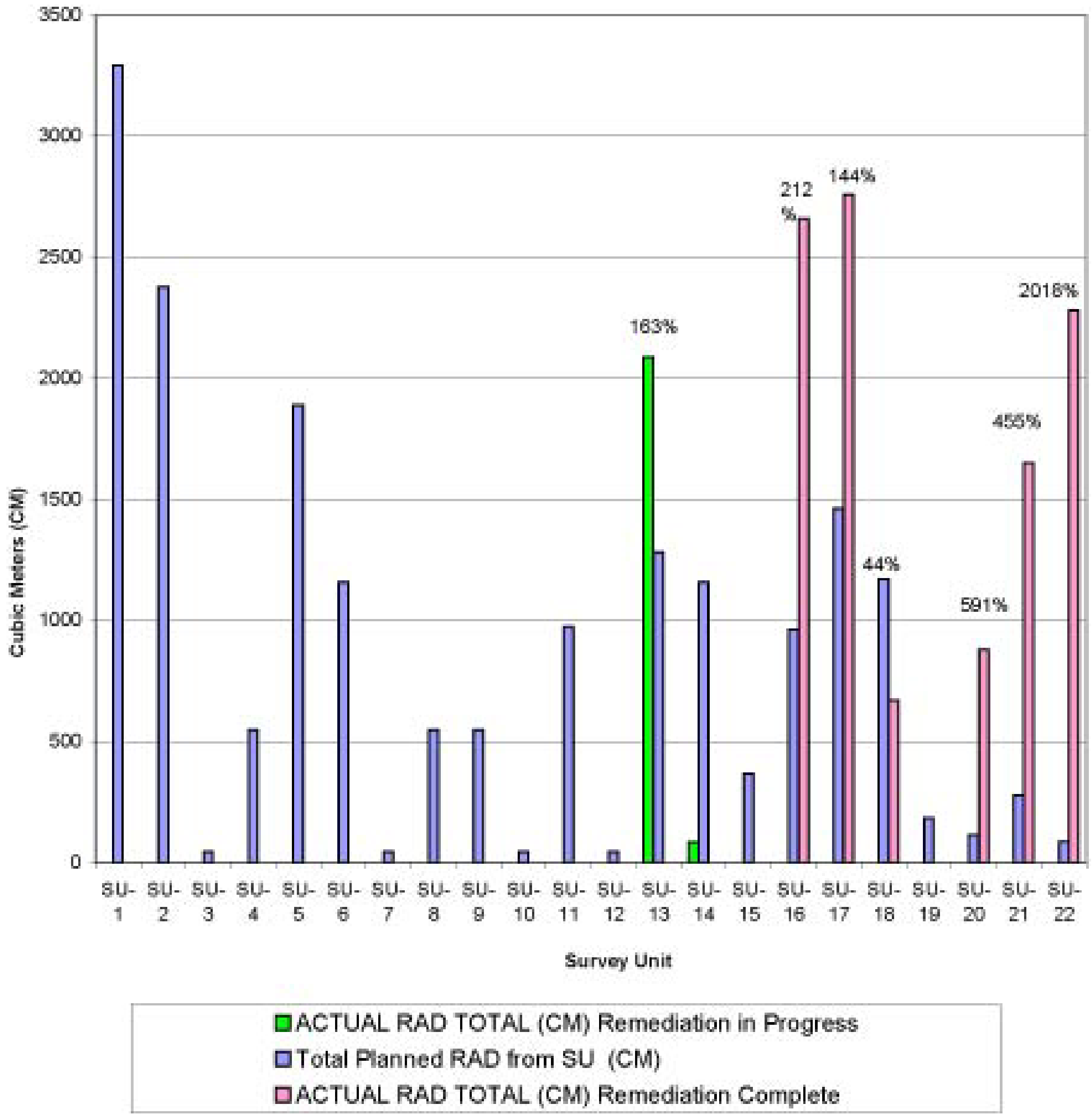
A minimum of one sample was collected from each stockpile and analyzed by the on-site screening laboratory. This was completed to verify that the reported concentration level for that stockpile is within a 95 percent confidence level of the average of the samples used for radiological characterization of the material. Screening for PAHs provided qualitative indicators not subject to statistical analysis. Confirmatory samples were collected for off-site analysis if screening revealed high concentrations of PAHs.

Transportation and Disposal

Due to the unanticipated presence of discrete "hot" radiological particles consisting of ores, piping, and soil, new protocols have been executed to ensure compliant transportation and disposal. Waste material staged for transportation is scanned to detect "hot" particles and segregated into piles to confirm specific activity. Shipping containers are loaded from designated tested staged piles which have associated radiological sample analysis confirming activity. During final packaging operations, ECC performs an exposure rate survey over all surfaces of the conveyance container searching for the presence of excessive waste acceptance criteria and transportation exposure rates. The transportation and disposal activities have been closely monitored to ensure that the material is within the capabilities of the WAC for each facility. **Figure 4** shows a comparison of anticipated volumes of excavated material versus the actual volumes encountered and remediated. As of January, 2007, field screening surveys for radiologically impacted soils have generated an increase of actual waste excavated than anticipated. Much of the unexpected volume has been attributed to previously unidentified subsurface structures such as piping, underground storage tanks, and extensive remains of concrete footings in the survey units completed to date. Only one survey unit (SU-18) has generated less than anticipated waste volumes.

Based on field screening capabilities for the site contaminants of concern, ECC has been able to make real-time decisions regarding remediation progress, enabling continued excavation, segregation, staging and transportation efforts. Based on daily ECC and USACE coordination, our project delivery team ensures waste remediation efforts are forecasted and documented to program resources and waste disposal needs based on actual site conditions.

Figure 4
Waste Tracking Chart; Planned vs Actual with Posted Variance (%)
Middlesex Sampling Plant FUSRAP
January, 2007



WASTE

Soils and debris at the MSP were evaluated to determine levels of radiation and hazardous chemical contamination. Four classes of waste were determined to be present at this site:

1. Radiologically Impacted Waste
2. Chemically Impacted Waste
3. Mixed Radiological and Chemical Waste
4. Non-Hazardous Waste and Solid Waste.

These waste streams were defined more accurately during the pre-excavation efforts to allow for accurate characterization and waste profile determination prior to beginning remediation. Based on RI/Feasibility Study (FS) data, geo-profiles, and pre-excavation tasks ECC was able to quantify waste types and anticipate quantities. The basis of waste volume was a guide to determine the protocols, type of work, and estimated cost allowing for expedited field remediation efforts.

Radiologically Impacted Waste

All radioactive soils and debris with activity present above release limits is designated for remediation. Radioactive classifications were made as specified under requirements of the Code of Federal Regulations (49 CFR) and were assigned based upon data collected during the pre-excavation efforts. Classification for transportation is based on radiological activity data from material staged for loading, weight of the loaded conveyance and exposure rates. Shipments can be classified as Class 9 or non-regulated waste.

In addition, ECC has detected underground anomalies including two underground storage tanks (UST), 4 subsurface concrete cisterns, and miscellaneous debris. The volume of Class 9 and chemically impacted waste soils excavated to date has been significantly larger than anticipated in the northern portion of the site. These conditions have been reported to the USACE and work has continued without interruption based on the PBC task order parameters.

Chemically Impacted Waste

Any soils or debris with lead, benzo(a) pyrene, benzo(a)anthracene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, or indeno(1,2,3-c,d)pyrene above the established ROD limits were remediated as non-hazardous material. Chemical concentrations were compared to regulatory levels to determine if any waste codes were applicable. Excavated materials which exceeded the chemical soils cleanup criteria are being disposed of off-site at an appropriately permitted disposal facility. To date, the chemically impacted waste soils have been lower than that previously identified previously in Table III.

Mixed Radiological- and Chemical-Impacted Waste

If both radiological activity and chemical contaminant levels were present above the cleanup criteria, the soil or debris was potentially a mixed waste, although both radiological and chemical constituents needed to be above regulatory levels to be an actual mixed waste. Any soil or debris that had both a radiological component and a hazardous chemical component is being disposed of off-site at an appropriately permitted disposal facility.

To date, the radiological and chemical constituent levels have not been above regulatory levels to meet the classification of a mixed waste.

Non-Hazardous Solid Waste

General waste that was neither radioactive nor chemically contaminated is being disposed of as non-hazardous waste. The waste stream is composed of "clean" concrete, asphalt, uncontaminated personal protective equipment, and miscellaneous debris. Measures are taken to control proper segregation and the generation of excess waste. Concrete, asphalt and debris are being loaded into roll-off containers for local landfill disposal following free release surveys.

Segregation Activities

Prior to excavation, debris is surveyed for radiological contaminants and screened for chemical constituents to determine the appropriate waste disposition as follows:

- Concrete, Asphalt and Debris;
  - Remove,
  - Conduct radiation surveys,
  - Decontaminate,
  - Segregate in stockpiles for re-survey
- Soil Radiological Waste
  - Remove in coordination with field technician,
  - Place into stockpile,
  - sample and survey for hot spots, and
  - Continue to segregate, if needed
- Soil Chemical Waste
  - Remove based on PAH onsite laboratory sample data, existing RI/FS data and pre-excavation investigation analyses

DEMONSTRATIING CLEANUP IS COMPLETE

Remedial Action Support Surveys

The RASS is performed to investigate whether the Derived Concentration Guideline Limits for a Wide Area (DCGLW) was exceeded, and if so, the surface area and concentration of the contamination. Results of these surveys are used to determine if we can proceed with the Final Status Survey (FSS), or if additional hot spot excavation is required. Once the RASS is completed for radiological parameters, ECC collects samples for onsite analysis to determine PAH concentrations. This screening determines the SU area of concern for PAH contaminants, if present.

Final Status Survey

FSS efforts included 100 percent gamma walkover combined with sample collection based on randomly generated locations based MARSSIM. All samples are analyzed onsite via gamma spectroscopy and sent for full offsite analysis. The FSS report for each survey unit are prepared to present the confirmatory data identifying that the survey units meet the cleanup criteria. All FSS final lab data is being obtained from National Environmental Laboratory Accreditation Program (NELAP) and New Jersey-certified laboratories. Upon completing the FSS for radiological parameters, ECC implements a final sampling approach to confirm the SU meets chemical constituents of concern. The primary COCs are the five PAHs listed in ROD, which the on-site lab can process and analyze within 3 hours. Sample locations are determined based on USEPA SW-846 protocols and the composite samples are analyzed on-site to ensure ECC has met the cleanup standard. These samples are then packaged and sent for off-site full laboratory analysis.

The results of the FSS are deemed acceptable if residual radiological and chemical concentrations present in soil at levels that are at or below the soil cleanup goals presented above.

SUMMARY

The milestone driven project utilizes all ROD supporting technical documents, geologic profiles, and use of the PBC contract-type to focus on construction operations, while eliminating remedial design timeline and cost. Implementation of remedial action under this PBC task order has proved useful in allowing for continuation of work when unanticipated conditions are encountered. The construction complete milestone by the end of Fiscal Year 2007 is a shared goal between USACE and ECC. This mutual focus and the flexibility under the PBC task order has mitigated schedule growth and maximized opportunity to remedy site conditions as remedial action progresses. Based on RI/FS data, geo-profiles, and pre-excavation investigations and surveys, ECC was able to identify waste types and anticipate quantities. The basis of waste volume was a guide to determine the protocols, type of work, and estimated cost, allowing for expedited field remediation efforts.

Cost Reduction

Cost minimization has been effective under the PBC task order based on program schedule level of effort being reduced. By eliminating full scale remedial design and approval processes, USACE gained approximately 16 months to 24 months of schedule and associated design costs. The nature of the PBC task order has allowed for expedited mobilization and flexibility to address differing site conditions. ECC has continued remediation activities without interruption even though subsurface anomalies have been identified and higher activity radiological waste has been detected. Daily planning and resolution of change field conditions occurs with USACE and ECC onsite without significant involvement from outside stakeholders. The project remains ahead of schedule although initial waste volumes have increased.

REFERENCES

1. USACE, "Soils Operable Unit Remedial Investigation Report for Middlesex Sampling Plant" (2004).
2. USACE, "Soils Operable Unit, Record of Decision for Middlesex Sampling Plant" (2005).