
*CSX/Vaughan Landfill
and
Bramlette Road MGP Sites*

*Remedial Action Plan
Final Report*

June 2003

Volume 1



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June 9, 2003

Mr. Mark C. Holder
CSXT Environmental Manager
CSX Real Property, Inc.
301 West Bay Street
Suite 800
Jacksonville, Florida 32202

Subject: Bramlette Road MGP Site Remediation Work Plan
Final Report

Dear Mr. Holder:

In accordance with the Environmental Access and Indemnification Agreement, Paragraph 4(k), between Duke Power and CSX Transportation; Duke Power is providing you with the attached Final Report documenting remedial activities conducted at the Bramlette Road MGP site.

If you have any questions, please contact me at 704-634-7098.

Sincerely,

Mark McGary, P.E.
Manager
Remediation Services Group
Energy Delivery Services, Inc.

For

Ralph C. Roberts
Duke Energy

enclosures

cc w/o attachment: Ralph Roberts L. B. Somers

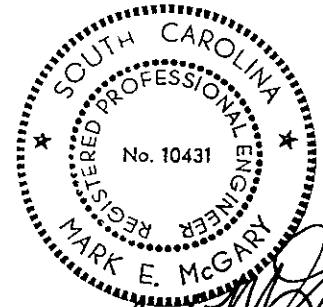
**CSX/VAUGHN LANDFILL
AND
BRAMLETTE ROAD MGP SITES**

**REMEDIAL ACTION PLAN
FINAL REPORT**

Prepared by:

SITE REMEDIATION SERVICES GROUP
DUKE ENERGY
ENERGY DELIVERY SERVICES

JUNE 2003



Mark E. McGary
JUN 9, 2003

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**CSX/VAUGHN LANDFILL
AND
BRAMLETTE ROAD MGP SITES**

**REMEDIAL ACTION PLAN
FINAL REPORT**

1.0 Introduction

This Remedial Action Plan – Final Report describes and documents activities that were performed to remediate certain impacted soils and free tars located within the site of the former Bramlette Road manufactured gas plant (MGP) and along a drainage pathway leading from the site located north of Bramlette Road. This report also describes and documents remediation activities performed on properties immediately north and adjacent to the MGP site and otherwise known as the Suburban Propane property and the Northwest Area (that area immediately west of the Suburban Propane property). All site remediation activities were performed or were directly overseen by personnel employed with Duke Energy – Energy Delivery Services, Inc.

Previous reports and correspondences associated with remediation of the Bramlette Road MGP site are listed and summarized as follows:

Stormwater Management and Erosion Control Plan - Preliminary Site Clean-up Work; submitted to and approved by Greenville County Engineering Department, January 2000.

This plan described best management practices employed for pre-remediation site preparation activities.

CSX/Vaughn Landfill and Bramlette Road MGP Sites - Phase III Investigation and Site Assessment Report; June 2000.

This report documents the results of a 1999 Phase III Site Investigation of the Bramlette Road Manufactured Gas Plant and CSX/Vaughn Landfill sites, and also summarizes the results and conclusions of previously conducted site investigations beginning in 1995.

CSX/Vaughn Landfill and Bramlette Road MGP Sites - Remedial Action Plan; September 2000.

This plan established risk-based soil cleanup criteria and outlined the activities to be performed to remediate certain impacted soils and free tars located within the MGP site proper and along a drainage pathway leading from the site.

Stormwater Management and Erosion Control Plan; submitted to and approved by Greenville County Engineering Department, January 2001.

This plan described best management practices and controls employed for the management of stormwater and the minimization of sediment transport during site remediation.

Water Management Plan; submitted for approval to Ms. Jennifer Boynton, SCDHEC, February 22, 2001.

This plan described best management practices and controls to be employed for the management of stormwater, mobilized sediments, free tars, and potential petroleum sheens during site remediation.

Well Abandonment Notification letter, dated August 9, 2001; submitted to Ms. Jennifer Boynton, SCDHEC.

This letter provided notification for site monitoring wells MW7 through MW14, and MW17 abandoned in support of remediation activities.

Remediation Action Plan Site ID #00801 letter; dated August 21, 2001; submitted by Ms. Jennifer Boynton.

This letter assigned the stated Site ID #00801 to the Bramlette Road MGP site, and clarified that disposal of contaminated soils from the site was regulated by the SCDHEC Bureau of Land and Waste Management – Waste Assessment Section.

Suburban Propane Property and Northwest Area Investigation Report; July 2002.

This report documented results from an investigation conducted within these area to determine the extent, if any, of MGP related impacts beyond the northern MGP boundary proper. The area was investigated by excavation of test trenches and collection of sidewall soil samples.

Ambient Soil Arsenic Data letter; submitted to Mr. Steve Burdick, SCDHEC, July 22, 2002.

Documented the results of laboratory analyses on ambient arsenic levels in soils within and immediately surrounding the MGP site boundary.

2.0 Site Description

The Bramlette Road MGP site is located in the community of City View in Greenville County, South Carolina as indicated on Figures 1 and 2. The site lies just outside of the Greenville City limits. The MGP site proper covers 3.69 acres and is located at 400 South Bramlette Road in the western quadrant of the intersection of Bramlette Road and West Washington Street. The site was vacant prior to the initiation of remediation activities. Access to the site was, and currently remains, restricted by perimeter fencing. Lockable access gates are located near the southern corner of the site along Bramlette Road and along West Washington Street.

The Bramlette Road MGP site is owned by CSX Transportation and has been investigated along with the adjacent CSX/Vaughn Landfill site. The Landfill site covers approximately 7 acres and is located approximately 800 feet west of this intersection across and south of Bramlette Road. Both the Bramlette Road MGP and the CSX/Vaughn Landfill sites are owned by CSX Transportation (CSXT). The two sites are part of more extensive CSXT property holdings in the Bramlette Road area that total approximately 40 acres and contain rail lines, an office for crew transfers and scheduling activities, and an asphalt transfer station. The asphalt transfer station lies immediately west and adjacent to the MGP site. The CSXT holdings also include tracts immediately north and adjacent to the MGP site and referred to herein as the Suburban Propane property and the Northwest Area property. The majority of these properties lie within the floodplain of the Reedy River located to the west. Land use immediately east of

the MGP and Landfill sites is primarily residential with the exception of the property located in the southern quadrant of the intersection of Bramlette Road and West Washington Street. This property contains a school building and is owned by the Greenville County School District.

3.0 Site History

The Bramlette Road MGP site was originally developed as a manufactured gas plant by Southern Public Utilities in 1917. The Bramlette Road plant was constructed as a replacement for an existing gas plant located at Broad Street in Greenville; and was a larger plant that produced gas using the more economical coal gas process. The site eventually contained a retort house, three gas holders, a water gas plant, tar and ammonia washer tanks, purifiers, a tar extractor and holder, and an underground heating oil tank. Locations of historical site structures are indicated on Figure 3.

Gas plant ownership and operation transferred to Duke Power Company in 1935. Piedmont Natural Gas Company purchased the site in 1951 and subsequently demolished the gas plant sometime in the late 1950s. Site ownership transferred to Piedmont and Northern Railway in 1963. Piedmont and Northern Railway became part of Seaboard Coast Line (CSX) in 1967. The site was used as a trucking facility in the 1970s and 1980s.

The CSX/Vaughn Landfill site is located within the eastern bank floodplain of the Reedy River. The site was developed as an unpermitted landfill by Mr. Robert Vaughn of Vaughn Construction and Demolition Company in Greenville. Mr. Vaughn attempted to purchase approximately 16 acres from CSXT in 1988 for the purpose of constructing a solid waste landfill. Following payment of a deposit, Mr. Vaughn began unpermitted landfilling activities on the property. The property transfer was never finalized, however, Mr. Vaughn continued to operate the landfill. The South Carolina Department of Health and Environmental Control (SCDHEC) advised Mr. Vaughn in 1993 that his landfilling activities were improper. In February of 1994, the U.S. Army Corps of Engineers (ACE) notified CSXT that the property on which the landfill is located is considered a wetlands, and the landfilling operation was a violation of

Section 301 of the Clean Water Act. Following notification by the ACE, CSXT ordered Mr. Vaughn to cease landfilling activities and the site was closed.

4.0 Summary of Site Investigations

Three primary investigations of the CSX/Vaughn Landfill and Bramlette Road MGP sites have been performed. A Phase I investigation was conducted in early 1995 at the CSX/Vaughn Landfill site by Applied Engineering and Science (AES) of Atlanta, Georgia. This investigation included soil, sediment, surface water and groundwater sampling across and around the Landfill. The results of this investigation were documented in an AES report entitled "Site investigation; Soil, Sediment, and Groundwater Sampling; Vaughn Landfill, CSX Real Property; March 1995".

A Phase II investigation was conducted by AES in 1996. This investigation included the installation of 8 monitoring wells to assess groundwater quality at both the MGP site and the Landfill site; and soil sampling at the MGP site to assess the extent of coal tar. This investigation also included a biological survey conducted in the wetlands area surrounding the Landfill site, and included a site characterization and contaminant pathway/exposure evaluation. The results of this investigation were documented in an AES report entitled "Site Investigation Phase II, Vaughn Landfill/Duke Power Sites, CSXT Real Properties, Bramlette Road, Greenville, South Carolina, September 1996".

A Phase III investigation was conducted by Duke Power Company in 1999. The Phase III investigation included the installation of 18 additional groundwater monitoring wells within both the MGP site and the Landfill site. The Phase III report summarized the findings of the two previous AES investigations, provided additional characterization of soils and groundwater, and documented the results of additional biological assessments in the wetlands area surrounding the landfill. This report also provided a characterization of risks to human health from potential exposure to soil and groundwater contaminants associated with the MGP site.

Chemical constituents of interest typically associated with MGP residuals include polycyclic aromatic hydrocarbon (PAH) compounds, naphthalene, volatile organic compounds (VOCs), phenols, cyanides, and various other inorganics. The quantity and makeup of these constituents found at a specific MGP site is dependent on several factors including the age of the site, the geologic setting of the site, the gas manufacturing process utilized, the amount of by-product recovered during plant operation, waste disposal practices employed during operation, and the manner in which the site was demolished.

Investigation efforts have verified the presence of typical MGP residuals in soils and groundwater within the MGP site, and along surface migration pathways leading from site. All aforementioned investigation results are summarized and documented in the June 2000 CSX/Vaughn Landfill and Bramlette Road MGP Sites - Phase III Investigation and Site Assessment Report. Additional investigations within the Suburban Propane Property and the Northwest Area are documented in the aforementioned Suburban Propane Property and Northwest Area Investigation Report; July 2002.

5.0 Remedial Action Plan Summary

The overall objective of remedial action proposed for the Bramlette Road MGP site was to minimize present risks to human health with regards to persons accessing the site; and to transform the property into an acceptable condition that is suitable for future commercial or industrial development. The specific objectives of remedial actions proposed were to:

- a. Cleanup near-surface soils within the MGP site proper and along the ditch leading from the site (parallel to Bramlette Road) that represent the greatest present risk to human health;
- b. Reduce the amount of source material contributing to groundwater contamination;
- c. Remove free tars contained within the masonry tar wells on-site.

As discussed in the June 2000 Phase III Investigation and Site Assessment Report, the greatest present risk associated with contaminants at the MGP site involves ingestion of carcinogenic PAH compounds adsorbed onto near-surface soils. Site trespassers, defined as individuals (particularly children) that could potentially access the site and come in direct contact with near-surface soils, were assumed to be the population most at risk. Consequently, remediation activities were focused primarily on the reduction of this present risk by the cleanup of these soils within the MGP site and along the ditch parallel to Bramlette Road as indicated on Figure 4. Near-surface soils were defined as being located within the top 3 feet of the existing ground surface. Considering the proximity of the site to nearby residential properties, cleanup concentrations were based on exposures to near-surface soils in a residential setting. EPA Region III guidelines were used to establish a risk-based cleanup criteria for near-surface soils at the MGP site as documented in the September 2000 CSX/Vaughn Landfill and Bramlette Road MGP Sites - Remedial Action Plan. Cleanup target concentrations were based on exposure to carcinogenic PAHs adsorbed onto near-surface soils, with direct ingestion of contaminated soil as the primary controlling exposure pathway. As the most potent carcinogenic PAH, benzo(a)pyrene was used as the surrogate carcinogen. The EPA Region III allowable risk-based soil concentration of benzo(a)pyrene based on ingestion of soil in a residential setting was 0.087 mg/kg. Target soil cleanup concentrations from the Remedial Action Plan are summarized in the following table:

Target Cleanup Concentrations [mg/kg]		
Total Carcinogenic PAHs as B(a)P	Total Carcinogenic PAHs	Total PAHs
0.087	0.319	0.9

To establish a non-compound specific cleanup concentration for total carcinogenic PAHs and for total PAHs, a statistical evaluation was performed on soil samples from the MGP site. The evaluation included only data from samples that indicated PAH contamination above method detection limits. Samples indicating no detectable PAHs were omitted from the evaluation. Total concentrations of PAHs, carcinogenic PAHs, and carcinogenic PAHs as benzo(a)pyrene were calculated. Non-detected compounds were included in total sums at one-half the method detection limit. A total carcinogenic PAHs as benzo(a)pyrene concentration was calculated by

factoring the concentration of each individual carcinogenic PAH compound by its associated B(a)P equivalent potency factor.

Average and upper confidence level ratios of total carcinogenic PAHs as B(a)P to total carcinogenic PAHs were determined. Average and upper confidence level ratios of total carcinogenic PAHs as B(a)P to total PAHs were also determined. Target cleanup concentrations for total carcinogenic PAHs and for total PAHs were determined by factoring the allowable concentration of benzo(a)pyrene (0.087 mg/kg) by the calculated ratios. Target cleanup concentrations for near-surface soils shown in the table above were determined using the 95% upper confidence level ratio.

Site remediation was accomplished by the excavation, screening, and off-site treatment of near-surface (upper 3 feet) soils that exceeded the specified cleanup concentration. Excavated areas were backfilled with treated soil meeting the specified cleanup criteria, and/or with virgin clean material obtained from off-site sources. No remediation was planned for soils located below 3 feet deep, although deeper excavation was actually performed in several areas of the site.

The remedial action plan did not include remediation of groundwater at the MGP site or at the CSX/Vaughn Landfill site as outlined in the Remedial Action Plan. Groundwater at the MGP site has become contaminated from the percolation of rainwater through contaminated near-surface soils, and from direct contact with deeper contaminated soils. Cleanup of near-surface soils served to reduce a source of continuing groundwater contamination. Contaminated soils, sediments and groundwater are pervasive within the CSX/Vaughn Landfill site located downgradient from the MGP site. Efforts to remediate groundwater within the MGP site would be counterproductive as this same groundwater would become recontaminated upon migration into the Landfill site. Excavation and removal of contaminated soils and sediments within the CSX/Vaughn Landfill site would likely result in severe damage, if not complete destruction, to the wetland environment. Biological assessments have indicated that the presence of MGP constituents in soils and sediments within the wetlands has no adverse impact to the flora and fauna. Sampling results have suggested that natural attenuation processes may be acting to contain groundwater contaminants within CSX property boundaries.

6.0 Stormwater Management and Erosion Control

Installation of Greenville County and SCDHEC approved stormwater management and erosion control features and practices (Figure 5) was performed prior to the initiation of land disturbing activities. The primary focus at the Bramlette Road MGP site was the protection of wetland areas immediately south and downgradient of the remediation work area. The issues of concern relating to water management were:

- a. Preventing off-site stormwater runoff from entering the remediation work area.
- b. Controlling off-site deposition of potentially contaminated sediments generated from within the site during remediation activities. The primary constituents of concern were carcinogenic PAH compounds (typically those PAH compounds having molecular weights above 228 g/mole, solubilities less than .014 mg/l, and octanol-water partition coefficients, K_{ow} , greater than $4E+05$) that readily adsorb and are bound within a soil matrix. Sediments generated by stormwater runoff across a disturbed area of contaminated soil would be expected to contain various concentrations of these carcinogenic PAH compounds.
- c. Preventing off-site migration of surface waters containing a "sheen" caused by the contact of water with soils containing lighter-weight volatile and semi-volatile organic compounds.

Stormwater management and erosion control practices and methods employed at the site to accomplish these objectives included the following:

1. Upland stormwater runoff entering the site from West Washington Street was intercepted by a polyethylene pipe and routed through and around the remediation work area and. The pipe routed runoff into a water collection pit located near the entrance to the 24 inch diameter culvert beneath Bramlette Road. This pipe was left in place at the site.

2. A temporary sediment trap was installed on the western side of the site to collect stormwater runoff from disturbed areas within the MGP site boundary proper. This trap was designed in accordance with SCDHEC Bureau of Water guidelines to retain sediment laden runoff and provide for the settling out of suspended sediments at an 80% minimum trapping efficiency. For sheen control, an oil-absorbent mini-boom was maintained across the face of the discharge weir. All stormwater runoff and standing water from within the site was directed into this trap. Stormwater discharging from the basin was directed down the natural ditch line along Bramlette Road.
3. A water collection pit was constructed within the existing ditch and near the 24 inch culvert inlet beneath Bramlette Road. This pit served as a designated collection point for water discharging from the sediment basin, water discharging from the diversion pipe, and to facilitate drainage of existing standing water along the ditch. A gravel horseshoe was installed around the inlet of the 24 inch diameter culvert to minimize sediment transport into the wetlands area south of Bramlette Road. For sheen control, an absorbent mini-boom was placed around the culvert inlet. Collected water was pumped from the water collection pit through the culvert and into sediment collection bags placed on the south side of Bramlette Road. Absorbent mini-booms were maintained around the sediment bags. The pump inlet hose was maintained at least 6 inches below the water surface to minimize the transfer of any sheen, and was maintained well above the bottom of the pit to minimize the intake of sediments collecting in the pit bottom.
4. Truck traffic through the site was restricted to clean areas maintained with washed surge stone.
5. Permanent vegetation was established across all disturbed areas of the site following site remediation and backfill operations.

7.0 Remedial Excavation and Verification Sampling

Site remediation activities began in April 2000 with preliminary site cleanup and preparation work. This initial phase of preparation work extended through June 2000 and involved the

removal of surface and backfilled trash and debris consisting of broken concrete, metal, bricks, block, ceiling tiles, old tanks, reinforcing rods, etc. This initial work also included cutting and removing trees, brush, shrubs, and other vegetation. During this initial work, 227 truck loads of debris totaling 5073.48 tons was removed from the site and disposed of at the Waste Management - Palmetto Landfill Facility in Wellford, South Carolina. A debris shipment summary is provided in Table 1.

Remedial excavation and backfilling activities began in earnest in July 2001 and extended through December 2002. Due to their locations within or near to designated excavation areas, groundwater monitoring wells MW7 through MW14, and MW17, were abandoned prior to initiation of excavation activities. Wells were abandoned in accordance with applicable SCDHEC requirements as documented in Appendix F. Monitoring wells MW15 and MW16, located in the extreme western corner of the site, were left in place. Other activities completed prior to excavation activities included, a) installation of stormwater management and erosion control practices and measures described in Section 6.0, b) installation of visual denial fencing on existing perimeter fencing, c) improvement to the 2 existing access gates on Bramlette Road and West Washington Street, d) construction of a washed surge stone access road through the site connecting the 2 access gates, e) mobilization of temporary office trailers and equipment trailers into the southern corner of the site, f) temporary removal of perimeter fencing along the site western boundary, and g) establishment of exclusion zones for contaminated work area isolation and access control.

Following investigation activities conducted within the Suburban Propane property and the northwest area in July 2002 (Appendix G), the Suburban Propane property was included within the overall scope of remedial excavation activities under the auspices of the previously approved work plan. Analytical results obtained during this investigation are summarized in Tables 7 and 8 and in Appendix G (samples 57SW, 58B, 59SW, 60B, 61SW, 62B, 63SW and 64B). Additional shallow trench samples 90SW through 94SW were also collected within the Suburban Propane property during remedial excavation activities. Analytical results from these samples are also summarized in Tables 7 and 8.

Remedial excavation was performed across approximately 3.8 total acres. As indicated on Figure 7, approximately 1.4 acres of the site were excavated to depths ranging from 3 to less than 6 feet, while the remaining 2.4 acres of the site were excavated to depths ranging from 6 to 12 feet. Excavation depths were typically extended beyond the 3 feet target depth to remove additional and obvious source material that would serve to facilitate the future natural attenuation of groundwater contaminants. In many areas of the site, contaminated soil was not encountered until at least 3 feet of landfilled overburden material had been removed. In areas of deeper excavations, material removal was typically terminated after encounter with an underlying grayish cohesive clay material.

Excavations were extended laterally across the site until analytical results indicated that cleanup target concentration levels had been reached, or until physical boundaries prevented further excavation. Excavation was constrained by the property boundary along Bramlette Road and West Washington Street to the south and east, respectively. Massive quantities of previously landfilled debris constrained further excavations in the western corner of the site and north of the ditch along Bramlette Road. Excavation extended northerly past the MGP site boundary proper approximately 50 feet into the Suburban Propane property. Further excavation into this area was not warranted as indicated by field verification sampling results, investigation results, and additional shallow trench samples collected and discussed herein.

Field verification samples were collected in excavation side walls (SW designation) and from the bottom of excavations (B designation) at various locations around the site as indicated on Figure 7. Samples were collected at least every 200 feet of sidewall length at a depth of 1 to 2 feet below the ground surface. Laboratory samples were submitted for analyses of volatile organics and semi-volatile organics by EPA Methods 8260 and 8270, respectively. Laboratory samples were analyzed by Duke Energy Laboratory Services (SC Certification 99005) or by Pace Analytical Services, Inc (SC Certification 99006). Analytical results from all soil samples collected during remedial excavation activities are summarized in Tables 7 and 8 and provided in Appendix A. Considering that the vertical extent of remedial excavation had been predetermined (surface to 3 feet minimum), bottom samples were collected for information purposes only to document contaminant levels remaining at the site. Sidewall samples were collected to verify that the lateral extent of remedial excavations was adequate in removing all

near-surface MGP material exhibiting contaminant concentrations above target levels. In total, 61 side wall samples and 28 bottom samples were collected.

As indicated in Table 8, 21 out of a total 61 side wall samples (34%) reflected Carcinogenic PAH concentrations above site cleanup target levels. All of these samples were collected from sidewalls where physical boundaries (streets or landfilled debris) prevented further excavation. Analytical results from samples 25SW, 26SW, 32SW in the eastern corner of the site indicated that the lateral extent of remedial excavations was adequate in this area. Petroleum contaminated soils uncharacteristic of typical MGP related contamination were encountered in the Suburban Propane property as indicated by the shaded area on Figure 7. Site verification sidewall samples 95SW through 97SW, 99SW and 100SW (Table 8) confirmed that MGP related target contaminant levels were not exceeded in soils beyond this area. Additional shallow exploratory trench samples 90SW through 94SW were collected further within the Suburban Propane property as indicated on Figure 7. Analytical results from these samples (Table 8) confirmed that MGP related contaminants were not present.

In general, contaminated soils and debris were excavated and briefly stockpiled immediately adjacent to the excavation. Stockpiled soils were then transported to a Read Screen-All RD150B fitted with 3 inch mesh for screening. Soil material passing the screen was stockpiled for subsequent transport to the thermal treatment facility. Screen rejects were stockpiled separately for subsequent transport to the landfill disposal facility. Stockpiles were covered by 10 mil HDPE poly when not being worked. Most excavation work at the site was performed using a Link-Belt 3400 trackhoe. All material transfer and handling was performed using a Cat 970 rubber-tire loader, a Cat 950 rubber-tire loader, and a Cat 953 track-loader. Equipment used for excavation and handling of contaminated materials was maintained within the designated contaminated exclusion zone at all times. Clean equipment such as bulldozers used for the placement of clean backfill, personnel vehicles, and trucks were restricted to designated "clean" areas. Trucks being loaded with contaminated materials were routed into a controlled clean loading zone lined with 10 mil HDPE poly adjacent to the exclusion zone. Material was loaded using a Cat 970 rubber-tire loader operating just inside the exclusion zone boundary. Any spilled material was collected on the 10 mil HDPE poly and returned to the exclusion zone by hand shoveling. All trucks used for hauling were in good working condition

with no holes or perforations in the beds. All loaded trucks were securely covered to prevent spillage and dust en route.

Some material removed from some lower elevation areas of the site was of an extremely wet consistency. This material was typically encountered near the center of the site and along the ditch parallel to Bramlette Road. Some of these materials were blended with post-treatment soils that had been returned to the site to render them easier to handle for normal screening and stockpiling. Wet materials containing large quantities of debris were often transported directly to the landfill disposal facility without screening. Certain large pieces of excavated debris as well as debris resulting from the demolishing of masonry structures on-site were stockpiled without screening. This type of debris typically consisted of large concrete fragments from holder slabs, railroad trestle supports, and other structures.

Free tars were encountered and removed from both known surface tar well, and a previously unknown subsurface tar tank, as indicated on Figure 7. The tar well, identified during previously site assessments, measured approximately 17 feet wide, 40 feet long, and 14 feet deep, and was constructed with several separate chambers. Approximately 350 cubic yards of tar mixed with bricks and other debris was removed from this structure. An additional approximately 2500 gallons of free liquid tar was encountered and removed from a previously unknown 4.5 feet diameter by 24.5 feet long underground steel tar tank located in the southern area of the site. In both cases, removed tars were blended with less contaminated soil to render a consistency more suitable for handling, screening, transport, and thermal treatment.

In total, 61,088 tons of contaminated soil and debris was excavated, screened and shipped from the Bramlette Road MGP Site. Of this material, 1,300 truck loads consisting of approximately 27,144 tons of screen rejects and other debris was shipped to the Waste Management - Palmetto Landfill Facility in Wellford, South Carolina for disposal as summarized in Table 2. This reject material typically consisted of soil mixed with brick, block, broken concrete, broken pipe, steel track, and timbers. As summarized in Table 3, the remaining approximately 33,944 tons of screened contaminated soil material was transported in 1,655 truck loads to the Southeastern Soil Recovery (SSR) Facility in Laurens County, South Carolina for thermal treatment. All material was transported in accordance with DOT regulations. Weigh

scales at the SSR facility and at the Palmetto Landfill Facility were used to document shipping tonnages. Manifests were completed for each load shipped, and copies of typical transportation manifests are included in Appendix D. Due to their voluminous nature, copies of all manifests are not included as part of this report but are available upon request.

Odors were continuously monitored by on-site remediation personnel. Odors were controlled by the application of an odor suppression foam applied to stockpiles and open excavations as needed. The odor suppression foam used is a biodegradable, non-toxic, non-hazardous, non-flammable mixture that forms a flexible membrane over the soil surface resulting in a seal that minimizes volatile emissions. The foam does not inhibit subsequent thermal treatment of the soil, and has been used successfully at several other MGP site cleanups.

Water sprays were used to suppress dust emanating from heavy equipment and truck traffic across backfilled areas and access roads. Due to their tarry nature and usually high moisture content, coal tar contaminated soils were not a significant source of dust emissions from the site.

8.0 Soil Treatment and Verification Sampling

As previously discussed in Section 7.0 and summarized in Table 3, approximately 33,944 tons of screened contaminated soil material was transported in 1,655 truck loads to the Southeastern Soil Recovery (SSR) Facility in Laurens County, South Carolina for thermal treatment. Upon arrival at the facility, the material was weighed, screened and stockpiled for subsequent treatment. Treated material was stockpiled and sampled for verification of successful treatment to SCDHEC acceptable standards. For soils being treated and returned to the Bramlette Road MGP site, those standards were established to meet EPA Region 9 PRG limits based on exposure to soils in a residential setting. Verification samples for volatile and semi-volatile organics were collected for every 500 tons of material processed. Sampling and analytical results are summarized in Table 9 and provided in Appendix B. Initially, samples were analyzed in accordance with standard EPA Methods 8260 and 8270. Beginning with sample C15, the analytical method for semi-volatiles was changed to Method 8270C to attain

detection limits at or below the treatment target concentration for benzo(a)pyrene and dibenz(a,h)anthracene.

As indicated in Table 9, thermal treatment was successful in meeting the specified target concentrations for all volatile and semi-volatile organics with the exception of a single minor exceedance for Sample C18. Sample C18 analytical results indicated a benzo(a)pyrene concentration of 64 ppb, or 2 ppb above the target concentration. In this case, SSR was granted a one-time exemption by SCDHEC, and the return to Bramlette Road MGP site of material represented by C18 was allowed to proceed.

In total, approximately 33,926 tons of treated material from the SSR facility was returned to the Bramlette Road MGP site for use as backfill as summarized in Table 5. Approximately 607 tons of rejects from the SSR facility screening operation were transported to the Palmetto landfill facility for disposal as summarized in Table 6.

9.0 Remaining Contaminant Levels

Some degree of MGP related BTEX and PAH soil contamination remains at the Bramlette Road MGP Site as indicated in Tables 11 and 12, and as shown on Figures 8, 9 and 10.

BTEX contaminated material remaining at the site is summarized in Table 11 and is indicated on Figure 8. Sixteen sidewall samples and 7 bottom samples indicated various combinations of detectable BTEX compounds. Benzene was detected at 9 sampling locations, and at a maximum concentration of 27 ppm. Ethylbenzene was detected at 14 sampling locations, and at a maximum concentration of 2.7 ppm. Xylenes were detected at 18 and 16 locations for m-p-xylene and o-xylene, respectively. The maximum concentration detected was 43 ppm for m-p-xylene. Toluene was detected at 12 locations, at a maximum concentration of 42 ppm. All maximum BTEX concentrations were indicated in bottom sample 23B located between the tar well area and the location of a subsurface tar tank discovered during site excavation. BTEX compounds detected in Suburban Propane property samples 94SW, 95SW, 96SW, 99SW and 100SW are likely indicative of petroleum related contamination encountered in soils within this

area. High BTEX concentrations (above 1 ppm) were indicated at locations 6SWD, 49SW, 63SW, 100SW, 102SW, and 23B.

PAH contamination remaining at the site is summarized in Table 12 and is indicated on Figures 9 and 10. Twenty-one side wall samples and 6 bottom samples indicated detectable concentrations of PAH compounds. Benzo(a)pyrene was detected at a maximum concentration of 180 ppm in sidewall sample 46SW located at the site boundary along Bramlétte Road. The maximum total carcinogenic PAHs as benzo(a)pyrene concentration (234.4 ppm), the maximum total carcinogenic PAH concentration (827 ppm), and the maximum total PAH concentration (1,440.4 ppm) were also indicated at this location. Higher benzo(a)pyrene concentrations may be present in sidewall sample 102SW suggested by the high laboratory detection limits indicated in Table 8. Further lateral excavation was constrained by significant quantities of landfill material in this area of the site. Several other PAH compounds were indicated at relatively high concentrations in sample 102SW, including naphthalene at 1400 ppm. Maximum bottom sample PAH concentrations were indicated in sample 23B as indicated in Table 12.

10.0 Site Restoration

Following remedial excavation, the Bramlette Road MGP site was backfilled with a combination of treated material from the SSR facility and from virgin backfill obtained from local sources. As previously stated, approximately 33,926 tons of treated material from the SSR facility was returned to the Bramlette Road MGP site for use as backfill. An additional 38,112 tons of virgin soil was delivered to the site from 4 separate local borrow pits as summarized in Table 4. These materials were placed and compacted using decontaminated equipment available on-site. Verification samples were collected from 3 of the local source borrow pits designated as the "hospital" site, the "Pelham Road" site, and the "Mauldin Road" site. These samples were submitted for volatile and semi-volatile organic analyses by EPA Methods 8260 and 8270, respectively; and for TCLP RCRA metals analyses. Analytical results are summarized in Table 10 and provided in Appendix C. The results indicated no detectable concentrations of organic compounds, and no TCLP metal concentrations in exceedance of regulatory limits.

The site was returned to a final grade approximately equivalent to the pre-remediation grade as is indicated on Figure 9. The stormwater diversion pipe shown on Figure 5 was left in place as a permanent improvement to intercept off-site runoff, and minor changes to the pre-remediation grade were made to improve overall site drainage and to provide adequate cover to the diversion pipe. All disturbed areas were stabilized with permanent vegetation as stipulated in the Erosion Control Plan. Fencing was replaced and security gates were left in place as shown on Figure 9. In addition, the primary access road constructed between the 2 access gates and consisting of clean surge stone was left in place as a means of stable travel and access into the site.

11.0 Health & Safety

A site-specific Health & Safety Plan (HASP) was prepared for remediation activities at the Bramlette Road MGP site as documented and provided in Appendix B of the CSX/Vaughn Landfill and Bramlette Road MGP Sites - Remedial Action Plan; September 2000. Duke Energy – Energy Delivery Services, Inc. maintained a designated Health & Safety Officer full-time at the site during all phases of the work, and all on-site personnel were HAZWOPER 40-hour certified. The HASP Officer was responsible for site personnel adherence to the HASP, collection, monitoring and documentation of airborne contaminants, excavation and heavy equipment safety, site security and access control, dust and odor monitoring, and exclusion zone monitoring.

As part of the HASP, an air monitoring program was conducted at the site to measure concentrations of airborne constituents of interest associated with remediation activities (excavation, screening, truck loading, etc.). The program consisted of both real-time screening and constituent-specific sampling. The program also included the installation of a weather data collection system at the site. This system provided continuous recording of wind direction, speed, rainfall, and air temperatures. Specifics of the air monitoring were provided in Appendix C of the CSX/Vaughn Landfill and Bramlette Road MGP Sites - Remedial Action Plan; September 2000. Air sampling was conducted beginning July 24, 2001 and extending through October 23, 2002. Constituent-specific samples were analyzed for volatile organics (BTEX)

and semi-volatile organics (PAHs) in accordance with OSHA Methods 7 and 58, respectively. A limited number of samples were analyzed for dust concentrations in accordance with NIOSH method 500. Prior to the initiation of remedial excavation work, ambient air samples were obtained from 4 locations around the perimeter of the site as indicated on Figure 7. These samples were collected to document baseline air concentrations of the constituents of interest. Analytical results from this ambient sampling indicated no organic compounds above method detection limits.

During site remediation activities, air samples were collected from 2 perimeter locations along Bramlette Road and West Washington Street as indicated on Figure 7. These locations were chosen based on predominant wind directions and the proximity of potentially affected public facilities and residential properties. Air samples were collected each day that contaminated materials were being excavated, screened, handled or loaded into trucks.

Samples were collected using low-flow sampling pumps. Pumps were pre-calibrated each morning and post-calibrated at the end of each day. BTEX sampling pumps were calibrated using a .05 liter/minute flow rate, and PAH pumps were calibrated using a 2 liter/minute flow rate. Air volumes were calculated at the end of each day.

Throughout the life of the Bramlette Road MGP project, no BTEX or PAH compounds were detected in any perimeter air samples with the exception of a single event on October 2, 2001. On this day, tar well materials were being excavated and blended, and strong odors were present. Air sampling results from this day indicated a benzene concentration of 4 ppm. In this one instance, work was halted at mid-day and odor suppression foam was used.

Real-time monitoring was performed at both perimeter sampling locations and in various areas of the site as determined by particular remedial activities, odors, wind direction, or other concerns. Toxi Rae PID monitors with 10.2 eV bulbs were used to monitor concentrations of volatile organics. The PIDs were calibrated daily using a 100 ppm isobutylene standard. An MIE Mini-Ram Aerosol Meter Model PDM-3 was used to monitor dust concentrations. Real-time monitoring performed at the site indicated no exceedences of HASP specified TLV and STEL limits.

All real-time readings were documented on standard industrial hygiene records. All air sampling results were entered into the Duke Energy Medgate IH database. Overall, 334 air samples were collected and submitted for both OSHA 7 and OSHA 59 analyses, and an additional 24 samples were submitted for analysis of dust concentrations using NIOSH 500. Due to the voluminous nature of this data, actual laboratory results are not provided but are available upon request.

12.0 Ambient Soil Metals Investigation

During the treatment by SSR of contaminated soils from the Bramlette MGP Site and the subsequent return of these soils to the site, concerns were raised by SCDHEC regarding metal concentrations in the treated soil. Metals data collected from post-treatment soils at the SSR facility indicated all metal concentrations below EPA Region 9 Residential Soil PRG concentrations with the exception of the carcinogenic endpoint target concentration for arsenic (0.39 ppm). Consequently, Duke Energy obtained soil samples from both within and outside of the Bramlette Road MGP Site to assess background concentrations of this naturally occurring element. Samples were obtained at depths of 1' from 2 locations as indicated on Figure 7. Samples were collected within the MGP site boundary in an area not targeted for remedial excavation, and were also collected from outside of the site in a grassed area across West Washington Street. Analytical results for both background locations (1.18 ppm and 1.46 ppm, respectively) exceeded the carcinogenic endpoint target concentration of 0.39 ppm. Documentation and analytical data is provided in Appendix E.

13.0 Groundwater

Groundwater remediation was not included within the scope of remediation activities undertaken at the CSX Vaughn Landfill - Bramlette Road MGP Site. However, considering the extent and magnitude of the remedial excavations performed within the MGP site, some enhancement of groundwater conditions through source removal should be expected.

Groundwater contaminant levels are currently being monitored and reported to SCDHEC - Groundwater Quality Section on a semi-annual basis.

14.0 Conclusions

Remedial excavations performed at the Bramlette Road MGP site resulted in the removal of 61,088 tons of contaminated soil and debris. These remedial measures were successful in the removal of those near-surface contaminated materials that represented the most significant contamination at the site with regards to present risks to human health. In addition, a significant quantity of additional contaminated material was removed from depths below the surface to 3 feet target depth range. The removal of these deeper materials, in addition to the near-surface removal action, should be considered as a source removal action to enhance the natural attenuation of groundwater contaminants.

Some degree of contamination remains at the Bramlette MGP site. Contaminated materials remain at depths greater than 3 feet within the site. Contaminated materials also remain at depths below landfilled debris around the perimeter of the site, and at near-surface (surface to 3 feet) depths beneath Bramlette Road and West Washington Street. The lateral extent of this remaining contamination is not known, but is not considered to represent risks to human health in the current setting.



Tables

**Bramlette Road MGP Site
Remedial Action Plan - Final Report**

**Preliminary Site Cleanup
April - June 2000
Debris Shipments to Palmetto Landfill**

Shipment Date	Truck Loads	Total Tons
4/18/2000	1	21.49
4/19/2000	2	47.72
4/20/2000	5	118.81
4/24/2000	6	142.15
4/25/2000	9	214.26
4/26/2000	10	227.07
4/27/2000	8	174.55
5/2/2000	2	43.3
5/3/2000	10	234.69
5/4/2000	6	135.79
5/8/2000	3	68.47
5/9/2000	5	101.93
5/10/2000	5	104.49
5/11/2000	6	133.6
5/15/2000	10	230.19
5/16/2000	9	198.05
5/17/2000	9	192.26
5/18/2000	10	221.18
5/18/2000	1	20.75
5/22/2000	10	214.34
5/23/2000	11	235.64
5/24/2000	10	223.52
5/25/2000	10	217.39
5/30/2000	7	161.13
5/31/2000	9	196.13
6/1/2000	7	163.63
6/5/2000	9	198.73
6/6/2000	9	207.54
6/7/2000	8	188.56
6/8/2000	10	225.94
6/12/2000	8	172.75
6/13/2000	2	37.43

Total Truck Loads:	227
Total Tonnage Shipped:	5,073.48

Table 1