IU CONVERSION SYSTEMS
HORSHAM, PENNSYLVANIA

APPROVED

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DATE

SOLID WASTE MANAGEMENT PLAN
LOUISVILLE GAS AND ELECTRIC COMPANY
MILL CREEK STATION
LOUISVILLE, KENTUCKY

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1.0 INTRODUCTION

1.1 Scope

Louisville Gas & Electric Company (LG&E) operates Mill Creek Station, a coal-fired electric generating station, located along the Ohio River due southwest of Louisville in Jefferson County, Kentucky.

This plan addresses the disposal of wastes generated by the four units (1, 2, 3, and 4) to be operating at the Mill Creek Station. The bottom ash from Units 1, 2, 3, and 4 is presently sluiced to an on-site pond adjacent to the station. This method of disposal will continue until the units are retired from service.

Units 1, 2, and 3 are currently operative. Unit 4 is still under construction. Units 1, 2, 3, and 4 are 330 mw, 330 mw, 450 mw, and 495 mw units, respectively. The four units burn high sulfur coal and are in various stages of being fitted with flue gas desulfurization (FGD) systems. Units 1 and 2 are being fitted with carbide lime/limestone type flue gas desulfurization systems. Units 3 and 4 are being fitted with carbide lime type flue gas desulfurization systems. The wastes from these units consist of bottom ash, fly ash, and FGD scrubber sludge. The scrubber on Unit 3 is the only one currently in operation, and the scrubber sludge produced is presently sluiced to the on-site pond. Fly ash and bottom ash from Units 1, 2, and 3 are presently being sluiced to the adjacent pond. LG&E has included in its power plant subsystems solid waste treatment systems capable of processing all FGD sludge and fly ash to be produced by Units 1, 2, 3, and 4.

A waste stabilization system has been selected for the solid waste treatment. This one system, for Units 1, 2, 3, and 4, will utilize accepted pozzolanic technology to chemically stabilize the fly ash and scrubber sludge generated. FGD sludge and fly ash will be processed under the IU Conversion Systems' proprietary process. This stabilized FGD sludge is to be disposed of in the proposed landfill sites. The landfill-cured stabilized waste is known under the trade name of "Poz-O-Tec"®.

1.2 Purpose

The purpose of this Solid Waste Management Manual is to present background data on the site and outline the procedures to be followed in the development and continued operation of the stabilized landfill areas at the Mill Creek Generating Station of LG&E in Jefferson County, Kentucky.

The plan presents a description of the topography, geology and soils of the sites. The plan also outlines procedures to be followed from initial start-up, through the staged fill development over the 12-year life of the landfill areas. The plan addresses management, physical and chemical characteristics of stabilized wastes; site development; hauling, placing, and compacting the processed materials; final cover and seeding; quality control; and groundwater monitoring.

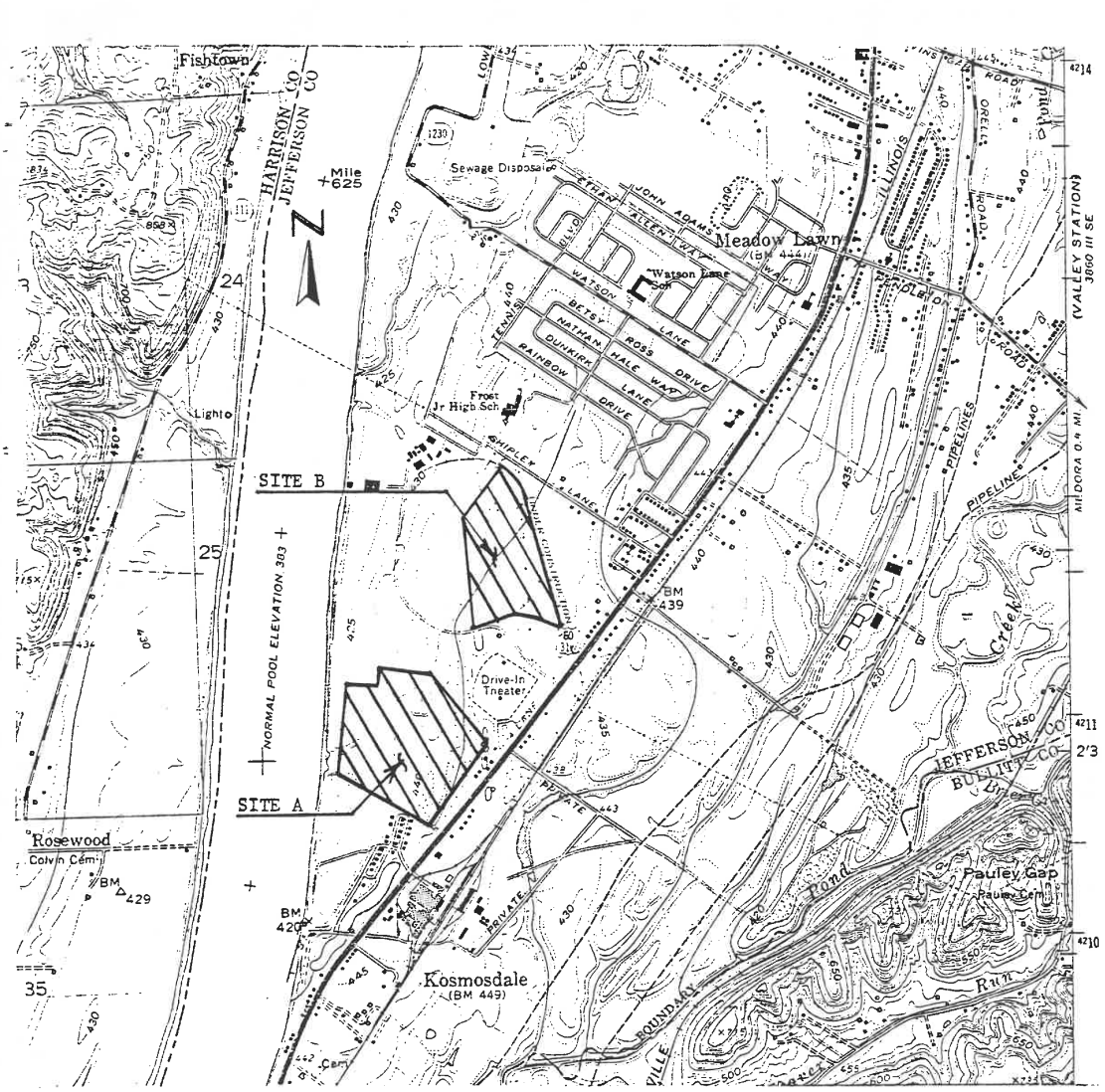
This manual presents the narrative of the final design plans for solid waste disposal of processed material at the landfill sites. The plans and details for the landfill should be carefully followed from start-up of the landfill through completion. This manual is meant to be an information source for the operator of the landfill.

2.0 EXISTING SITE DESCRIPTION

2.1 General Site Location

The Mill Creek Generating Station is located in Jefferson County, Kentucky, adjacent to the Ohio River at approximately mile 626. The site is a terrace and floodplain area and is bounded by the Ohio River on the west and Dixie Highway (Route 31) on the east.

The waste stabilization facility for Mill Creek Units 1, 2, 3, and 4 is just south of the generating station. The landfill areas for the stabilization facility consist of 2 sites within the property boundaries of the generating station. See Figure 1 for Site Location Map and Drawing CA-10606 for processing facilities and landfill orientation. Landfill Site "A" is south of the generating station with a bowl-shape configuration adjacent to the Ohio River, with a plan area of about 70 acres. Site "B" is east of the Mill Creek station, bounded on all sides by either the railroad access loop or the access road. The site consists of two depressions created from using the area for borrow materials to construct the embankment for the railroad access loop track. A water course currently drains through the larger depression. Site "B" has a plan area of approximately 50 acres.



SITE LOCATION MAP

MILL CREEK PLANT SITE PLAN
PROPOSED LANDFILL SITES

SCALE: 1"=2000'

PROPOSED LANDFILL SITE (APPROX.)

REFERENCE: REPRODUCED FROM U.S.G.S. 7.5 MINUTE SERIES MAP
KOSMOSDALE, IND-KY

FIGURE 1

2.2 Site Topography

The landfill sites, the processing plant site, and the generating station all lie within the Ohio River Valley region. The valley is U-shaped, having a broad, relatively flat bottom and steep valley walls. The present valley of the Ohio River was cut into shale, limestone and dolamite of Ordovician, Silurian and Devonian age during glacial times. The bottom of the cut is approximately 130 feet below the present floodplain. These formations dip to the west/southwest at about 40 feet per mile. The valley, bounded on both sides by bedrock hills, was later filled to its present level with glacial outwash, sand, gravel, and river deposits (alluvium) of Pleistocene and recent age. The alluvium consists of sand, gravel and a blanket of recent silt and clay. The alluvium and glacial outwash are connected hydraulically with the Ohio River in this area. See Figures 2 and 3 for general geologic and hydrogeologic sections.

Two topographic zones exist within western Jefferson County: floodplains and terraces. Floodplains occur along the Ohio River and its tributaries and occupy only a small percentage of the total area. Floodplain topography is essentially level or gently sloping. Terraces adjoin the floodplains along the Ohio River and its tributaries and exhibit gentle slopes ranging from zero to six percent. The processing plant is located on a terrace of the Ohio River.

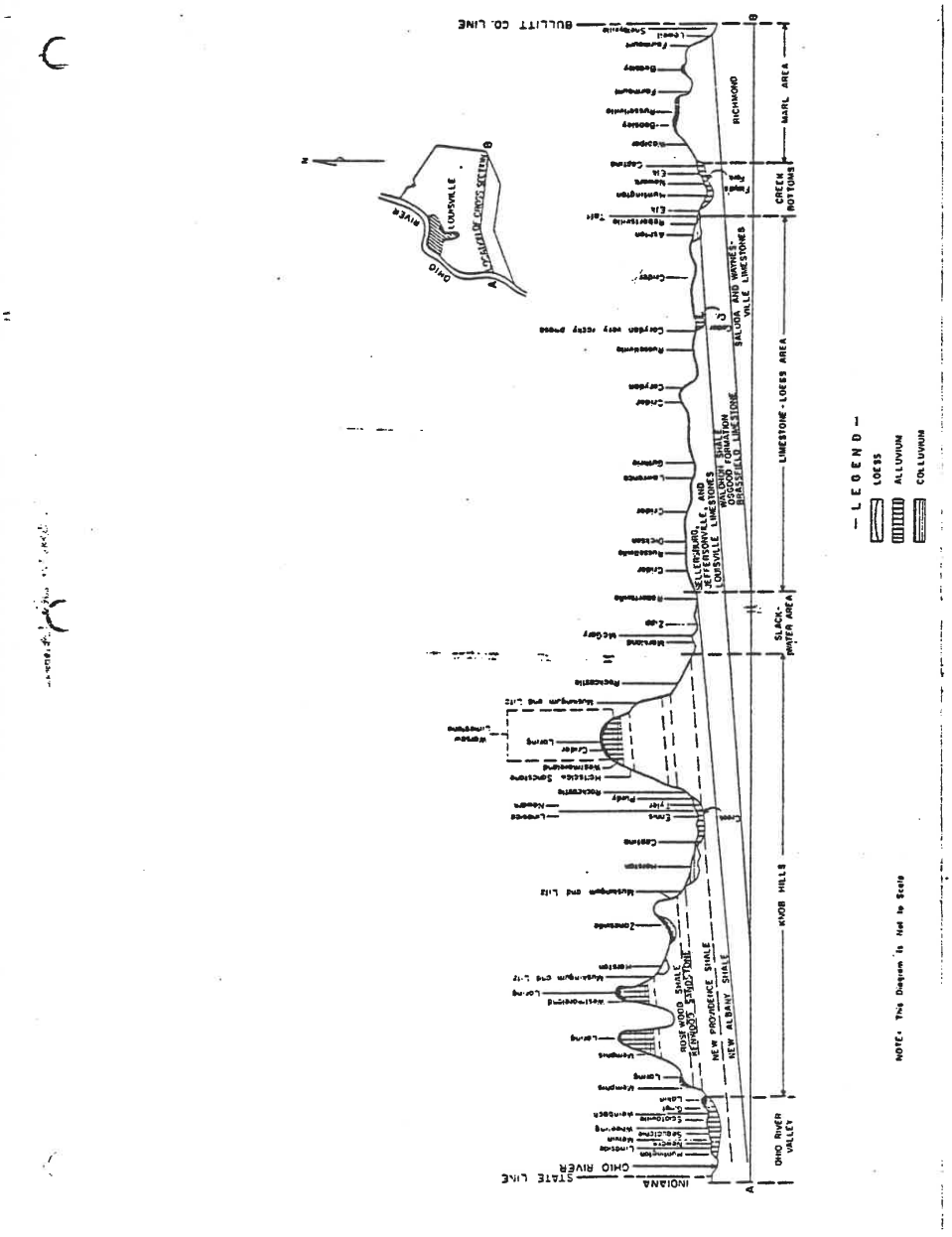


FIGURE 2 - DIAGRAMMATIC EAST-WEST CROSS SECTION OF JEFFERSON COUNTY SHOWING GEOLOGIC FORMATIONS AND RELATED SOILS.

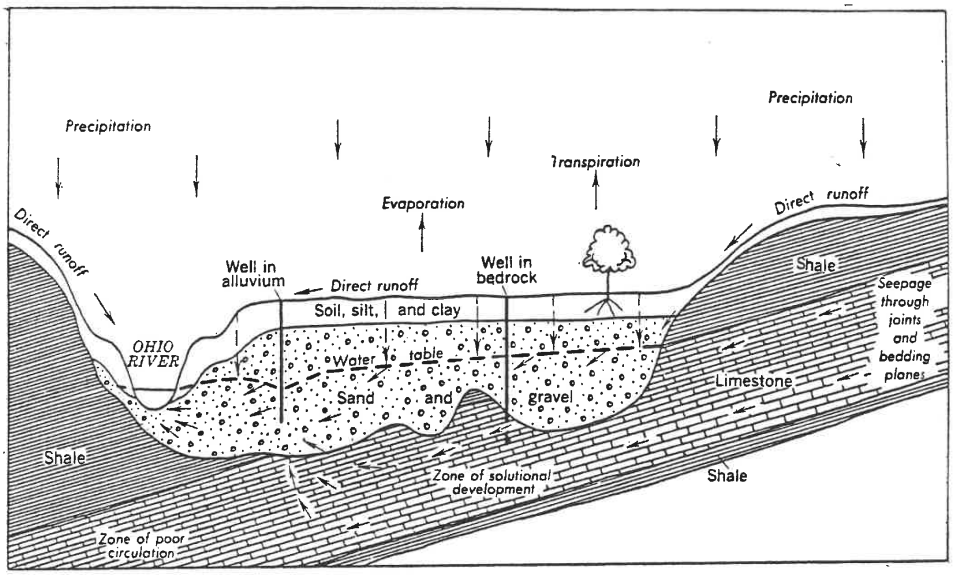


FIGURE 3

HYDROLOGIC CYCLE IN THE LOUISVILLE, KENTUCKY AREA

2.3 Site Descriptions

The following is a brief description of the topography and physical features of each of the proposed landfill disposal sites for processed material (FGD sludge, fly ash and additive). The locations and approximate extent of the proposed sites are shown on Figure 1 and Drawing CA-10606.

2.3.1 Site A

Site A is located south of the Mill Creek Station between the Ohio River and Dixie Highway (Route 31). The area has a bowl-shape configuration, and varies in elevation from a low point of about 405 in the southwest corner of the site to about elevation 430 on the west, adjacent to the river bank, and to about elevation 440 on the east near the public road. The site has a plan area of about 70 acres. The site was proposed to be an ash pond and was excavated to the present topography with that in mind prior to classifying this area as a proposed disposal site.

2.3.2 Site B

Site B is east of the Mill Creek Station and is bounded on all sides by either the railroad access loop or an access road to the coal handling area. The site consists of two (one large and one small) depressions created by the construction of the embankment for the railroad access loop track and other railroad car unloading equipment. The base of the depressions is approximately 30 feet below existing railroad operating grade, elevation 460. A water course currently drains through the larger area. Site B has a plan area of approximately 50 acres.

2.4 Soils Within the Disposal Areas

In the Ohio Valley, the soil consists of deep alluvium that was washed from the upper drainage basin of the Ohio River. These soils are primarily of the Wheeling catena and are located on the terraces, but some are of the Huntington catena and are on the bottoms of the slopes and within the floodplains. Most of these soils are nearly level. These soils range from poorly drained to well drained. Their degree of wetness varies either because of compact subhorizons or a temporary high water table. The alluvium within the river valley is connected hydraulically with the river.

The Wheeling-Weinbach-Linsdale soils group are level to sloping soils on terraces and bottoms along the Ohio River. The soil group consists of very broad, nearly level ridges that have narrow side slopes running down to the bottoms along small branches. These branches are mostly parallel to the Ohio River and form a dominant drainage pattern. This association thus consists of long, narrow strips that are parallel to the drainage system. Most of the sloping areas are well drained, and the level, or nearly level, areas are mostly either moderately or somewhat poorly drained. This soil association ranges from half a mile wide along the northern edge of the county to more than 4 miles wide on the western side. The total acreage is about 14 percent of the county.

Wheeling, Weinbach, and Linsdale soils each cover about 25 percent of this association. Wheeling soils cover 10 percent, and the Weinbach, Linsdale soils about 15 percent. Wheeling soils are deep, well-drained soils on terraces. Normally, they have a surface layer of brown, friable, silt loam and a subsoil of yellowish-brown, silty clay loam. Weinbach soils are moderately deep, somewhat poorly drained soils on terraces. Generally they have a surface layer of grayish-brown, silt loam and a subsoil of brown, silty clay loam mottled with gray. Linsdale soils are deep, moderately well-drained soils on bottoms. Generally they have both a surface layer and a subsoil of dark-brown silt loam. All of these soils developed in mixed alluvium that washed from the upper part of the Ohio River drainage basin. All are underlain by stratified sand, silt, and clay, in places mixed with gravel below a depth of 4 to 8 feet.

Minor soils in this association are the moderately well-drained Sciotoville soils on terraces; the well-drained Sequatchic soils along the Ohio River bank and on low ridges, and the moderately well-drained to poorly drained Newark and Melvin soils on bottoms. Also in this association is the very deep Lakin loamy fine sand, which is the principal sandy soil in the area. This soil occurs mainly in hummocky places near the base of hills on the eastern edge of the valley.

2.5 Subsurface Investigation

An exploratory subsurface investigation was conducted for each of the proposed landfill sites. The drilling and testing were performed by Atec Associates of Louisville, Kentucky. The program consisted of 8 test borings with groundwater monitoring wells installed in 6 of the borings. The program was completed during October, 1979. The locations of test borings B-1 and B-2, and monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, and MW-6 are shown on Drawing CA-10606. The logs of the borings are presented in Appendix B.

The borings were advanced using hollow-stem augers and Standard Penetration Tests were performed at 5-foot intervals. Soil samples were obtained by means of split spoon sampling in conjunction with the Standard Penetration Testing procedure. Depths to groundwater were noted during the drilling work and are presented on the driller's logs. Monitoring well installation procedures and groundwater information are further detailed later in this section.

The Unified Soil Classification System has been used to classify the soil materials. These classifications are shown on the boring logs, Drawings CA-10621 and CA-10622.

Also shown on Drawing CA-10606 are previously completed test borings. The logs of these borings are presented in Appendix D.

TABLE I

TEST BORING/MONITORING WELL SCHEDULE
MILL CREEK STATION
LOUISVILLE GAS AND ELECTRIC COMPANY

Test Boring	Ground Surface Elevation	Depth of Boring	Bottom Elevation	Elev. of Water Level During Boring
B-1	428.8	70	358.8	400.3
B-2	434.8	70	364.8	402.3
MW-1	439.8	100	339.8	399.8
MW-2	460.5	100	360.5	*
MW-3	446.1	101	345.1	401.1
MW-4	437.0	100	337.0	*
MW-5	440.6	100	340.6	401.6
MW-6	433.8	70	363.8	397.3

* Water levels during progress of borings were not recorded.

Borings MW-5 and MW-6 were drilled in the vicinity of Site A. MW-5 was drilled east of the landfill site, while MW-6 was drilled west of the site, between the landfill area and the Ohio River. These two borings were placed in this area to confirm the data from the previous test borings in the area. MW-5 encountered 22 feet of alluvium consisting of layers of stiff, clayey silt and medium dense, silty sand. The remainder of the boring (78 feet to elevation 340.6) was glacial outwash consisting of medium dense sand, 55 feet thick, and dense sand and gravel, 23 feet thick. Groundwater was encountered at elevation 401± during the progress of the work.

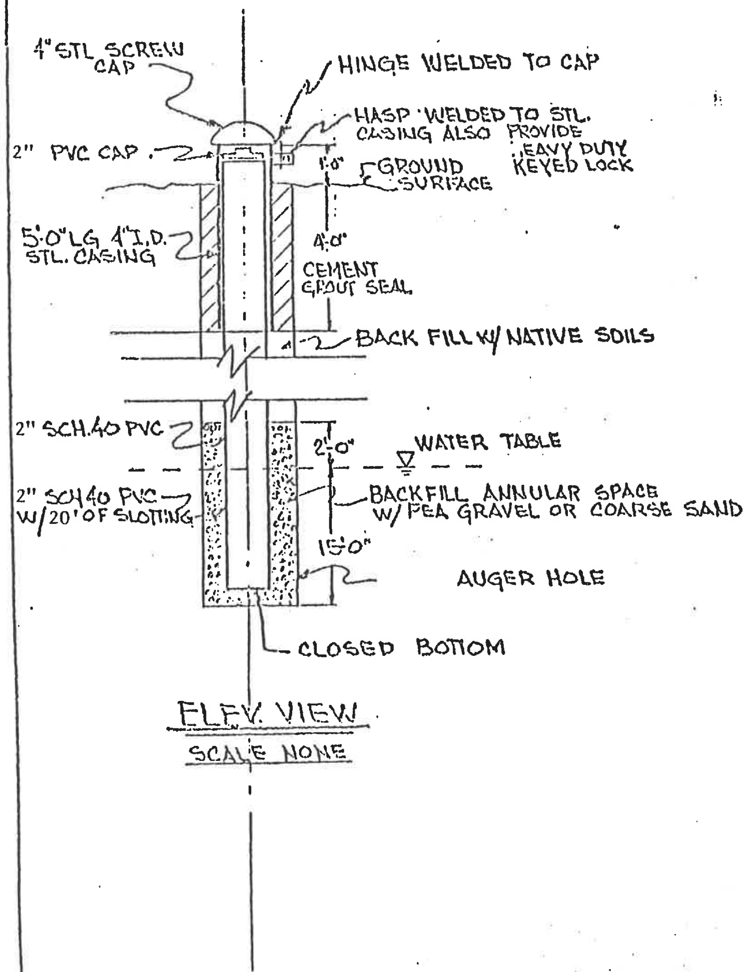
MW-6 encountered 37 feet of alluvium consisting of silt, clay, and sand mixtures. The remaining 33 feet of the boring was glacial outwash consisting of layers of loose, silty sand, stiff, sandy clay, and dense sand and gravel. The water level in the boring was noted at elevation 397±.

Borings B-1 and B-2 and monitoring wells MW-1, MW-2, MW-3, and MW-4 were completed in the vicinity of Site B. In borings MW-1 and MW-3, east of the landfill site, alluvium underlays the site to elevation 420±. The alluvium consists of stiff, silty clay and clayey silt mixtures. Beneath the alluvium is the glacial outwash which consists of dense sand, and sand and gravel zones. The groundwater elevation in the area was elevation 400±. Borings B-1 and B-2 were drilled within the landfill area. The alluvium layer extends again to elevation 420± with the glacial outwash beneath it. The groundwater within the area is at elevation 400±.

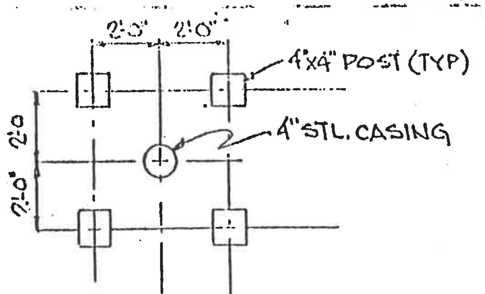
Borings MW-2 and MW-4 are west of the landfill area. The alluvial layer extends to elevation 410±. The alluvium consists of stiff silty and clayey zones. Glacial outwash underlays the alluvium. The outwash consists of medium dense sand and sand and gravel zones. Groundwater was recorded at elevation 400± shortly after the progress of the work.

2.6 Monitoring Well Installation and Groundwater Conditions

Monitoring wells were installed in various test borings upon their completion by Atec and Associates in October 1979. See Drawing CA-10606 for Monitoring Well locations. The test borings were cleaned with the hollow stem augers and then filled with drilling fluid that decomposed after 48 hours. The augers were withdrawn and 2-inch diameter PVC pipe was lowered to the bottom of the test boring. The bottom 20 feet of the monitoring well was slotted. After the pipe was placed in the boring, pea gravel was placed in the annullus between the boring and the well pipe to a level just above the slotted portion of the well. The remaining portion of the boring annullus was filled with native material. The top 4 feet of the well was filled with grout. See Figure 4 for typical monitoring well installation detail. The drilling fluid was allowed to decompose and then water was pumped into the wells to flush them and to insure that they were in good sampling condition. The sampling intervals (slotted section) for the monitoring wells are shown in Table II along with the latest water level elevations. The placement of the slotted section of the well was selected to insure that they remained within the water table, which fluctuates with the levels of the Ohio River. Accordingly, the wells were set below normal pool level of the Ohio River, elevation 383.



ELEV. VIEW
SCALE NONE



PLAN VIEW
SCALE NONE

NOTE: 4-5' long, 2" diameter steel posts were driven 1' into the ground around each Monitoring Well.

REV.NO.	DATE	DESCRIPTION OF REVISION

IU CONVERSION SYSTEMS INC.
PHILADELPHIA, PA.

TITLE:
TYPICAL GROUNDWATER MONITORING WELL INSTALLATION

SCALE: NONE	DATE: 4-20-78	PROJECT NO: 0605
DRAWN BY: DFB	Figure 4	
APPROVED BY: ESP		

TABLE II

SAMPLING INTERVAL OF MONITORING WELLS
AND GROUNDWATER LEVELS
MILL CREEK STATION
LOUISVILLE GAS AND ELECTRIC COMPANY

Monitoring Well	Elevation of Top of Well Section	Elevation of Bottom of Well Section	Groundwater Elevation 11/14/79
MW-1	359.8	339.8	400.8
MW-2	385.5	365.5	400.5
MW-3	365.1	345.1	401.1
MW-4	357.0	337.0	400.0
MW-5	360.6	340.6	402.6
MW-6	389.8	369.8	393.8

As noted previously, the alluvium of the Ohio River Valley is connected hydraulically with the river. Therefore, the groundwater in this area fluctuates with the river level. During the time of the drilling program, the Ohio River was above its normal pool level, elevation 383, to elevation 390 ±.

Based on various geologic and groundwater references, the groundwater within the valley drains to the Ohio River. This was evidenced by the water level readings upon completion of the borings. The levels decrease from a high of about elevation 402 on the easterly end of the generating station to elevation 394± on the westerly end adjacent to the river. There were no indications of perched water conditions within the various sites.

There are no residential groundwater users downgradient of the landfill areas. LG&E uses groundwater for the electrical production at the Mill Creek station. The bases of all of the landfill areas are well above the groundwater level.

3.0 SOLID WASTE CHARACTERISTICS

The raw solid wastes which will be generated by the Mill Creek Station and treated and disposed of on site will consist of fly ash and flue gas desulfurization (FGD) sludge. There will be no coal cleaning processes, and thus no pyritic wastes will be generated. Normally, all fly ash from Units 1, 2, 3, and 4 will be combined with the FGD sludge in the waste stabilization plant. Processed FGD sludge, consisting of blended fly ash, dewatered FGD sludge, and lime (the stabilization additive), will comprise the solid wastes to be disposed.

The quantity and characteristics of individual wastes generated by Mill Creek Station primarily depend on the properties of coal to be utilized. Analyses of the coal exhibit expected long-term average ash and sulfur contents of 12% and 3%, respectively.

3.1 Fly Ash

The amount of waste ash is directly related to the ash content of the coal. With pulverized coal firing, about 85% of the ash will be collected as fly ash, the remainder as bottom ash. Electrostatic precipitators have been installed to remove fly ash as required to conform with air quality emission standards. The entire amount of fly ash produced from Units 1, 2, 3, and 4 will be mixed with the FGD sludge and lime to form processed FGD sludge for landfill disposal. Fly ash will be pneumatically conveyed from the main plant area to the fly ash storage silos at the stabilization facility for Units 1, 2, 3, and 4.

3.2 FGD Sludge

3.2.1 Raw FGD Sludge

In the sludge stabilization system, thickened FGD sludge will be pumped to a sludge surge tank, and then to vacuum filters for further dewatering. The resulting filtercake will contain approximately 50-55% solids. The filtrate will be returned to the thickeners, consistent with the closed-loop operation concept.

FGD sludge is composed of fine grained particles in the silt-size range. Calcium sulfite ($CaSO_3.1/2H_2O$) and calcium sulfate ($CaSO_4.2H_2O$) is expected to comprise about 90% of the solids in the sludge. Calcium sulfite forms fragile crystals which are largely responsible for the thixotropic nature of the sludge, i.e., it tends to liquefy when vibrated or otherwise disturbed.

The quantity of FGD sludge is basically determined by the amount of sulfur in the coal, the amount of SO_2 removed from the flue gas and the efficiency of the lime/SO_2 or limestone/SO_2 reaction, i.e., the operating stoichiometry of the FGD chemical process.

3.2.2 Stabilized FGD Sludge

The method of FGD sludge treatment is chemical stabilization before disposal. This method chemically precipitates and binds up many soluble constituents in the sludge to form essentially insoluble compounds.

In the stabilization facility, the FGD sludge filter cake will be conveyed to a mixer where it will be combined with fly ash and lime. Lime additive use will be 2 to 4% of the total dry solids processed. Material discharged from the mixer will contain approximately 60-65% solids by weight. Processed materials will be stockpiled via one of two radial stackers. The processed material will be left to condition for several days in the stockpile to yield a more handleable material.

The stabilization facility for Units 1, 2, 3, and 4 has been designed to produce approximately 85.8 tons (wet weight) of processed material per hour, based on 4% sulfur and 16% ash coal.

Stabilization reactions begin almost immediately after the addition of the fly ash and lime to the dewatered sludge. The primary reactions are between lime, fly ash, and water, which produce products identical to portland cement. Among these products are calcium, silicate, hydrates, and Ettringite ($3CaO.Al_2O_3.3CaSO_4.32H_2O$). The compounds exhibit engineering properties similar to cement chemistry systems.

In the landfill, chemical reactions continue indefinitely, but after 6 to 8 weeks, approximately 60 to 70% of the ultimate strength of the compacted material is essentially obtained. Processed FGD sludge compacted and cured for 30 days in the landfill will typically have a permeability of less than 5×10^{-6} centimeters per second and an unconfined compressive strength greater than 25 psi.

With time, permeability will likely decrease and unconfined compressive strength will increase as the slower chemical reactions progress. Some of the water initially present in the processed material as free moisture gradually becomes chemically bound as water of hydration; thus, stabilized FGD sludge is an unsaturated material. The low to negligible permeabilities, the age hardening characteristics, the lack of free water in the compacted stabilized sludge, and the landfill design promoting rapid runoff, reduce the potential for permeation and leachate production within the landfill.

4.0 GENERAL DESIGN AND OPERATION OF THE LANDFILL AREAS

4.1 Location and Capacity

The landfill areas are shown on Figure 1 and Drawing CA-10606. The estimated quantity of processed wastes for the Mill Creek stabilization facility for Units 1, 2, 3, & 4 is 1,240,000 tons (wet weight) per year. This is based on coal with a 3% sulfur and 12% ash content and a station load factor of 60%. The volume and life of each of the areas is shown in Table III.

4.2 Site Development

4.2.1 Landfill Area Preparation and Sequencing

Each landfill site will be developed as a series of small areas. That is, only small portions of the site will be developed/filled at any one time. Each segment will be contiguous to the others and will develop as an integral structure.

Before commencing disposal operations, an area of approximately ten (10) acres will be prepared. Preparation includes the removal of all trees, vegetation, topsoil and soft and deleterious zones to provide a suitable, well-drained stable surface for continual disposal. As each section of the landfill area is prepared, it will be graded in accordance with the initial grading plan for that area. The area should be prepared approximately five (5) acres ahead of the active landfill area.

TABLE III

LOUISVILLE GAS AND ELECTRIC
MILL CREEK PLANT

DATA ON PROPOSED LANDFILL SITES

SITE	PLAN AREA (Acres)	AVERAGE HEIGHT OF FILL (Feet)	CAPACITY (Cubic Yards)	LIFE (Years*)
A	70	130	8,300,000	9.0
B	50	30	2,200,000	2.4
TOTAL	109		10,500,000	11.4

*Life based on production rate of 1,240,000 tons/year for 3% sulfur, 12% ash coal, and a 60% load factor. Storage capacity conversion at 1.35 tons/cubic yard. Production quantity includes Mill Creek Units #1, #2, #3, and #4.

All surface soils removed during the landfill area preparation phase will be stockpiled for use as final cover. The soil stockpile will be seeded immediately to minimize erosion. Areas found to be unstable (i.e. incapable of adequately supporting grading equipment) during initial grading operations will be stabilized with on-site borrow materials.

As part of the site development work, all-weather access/haul road(s) will be constructed from the stockpile area to the initial active disposal area. The access road(s) will be continuously maintained to insure the efficient movement of stabilized material to the disposal area. The road(s) will shift with the progress of the active landfill area. A surface drainage system will be provided as part of the roadway design to insure access to the working face of the landfill. All roads will be located within the Mill Creek Station property limits.

4.2.2 Surface Water Runoff Control

The design of the landfill areas will include a surface drainage system to divert surface water runoff away from the landfill areas and to intercept surface water runoff from the active areas. The interceptor channels will be covered with vegetation. In areas where high velocities develop, rip-rap lining will be provided to deter accelerated erosion.

Surface water will be conveyed from the crest of the landfills and from the finished benches at convenient intervals by either rip-rap lined flumes or half-round pipes. These channels will discharge into the interceptor channels at the toe of the landfill. The interceptor channels will convey the flow to the sedimentation control facilities.

Active landfill areas will be graded to restrict surface water from entering the operations. Where necessary, appropriate temporary drainage swales will be installed within the disposal area to divert surface water runoff around the active fill areas.

Sedimentation control of surface drainage will be attained by constructing new sedimentation basins and channels at each site. Sufficient storage capacity and retention time will be provided to allow the sediment to settle out of the runoff prior to discharge. To minimize the potential for surface water runoff infiltrating to the groundwater, the new sedimentation facilities will be lined with stabilized material.

4.3 Landfill Operations

4.3.1 General

The physical characteristics of the processed materials will vary depending on the properties and chemistry of the sludge generated by the scrubber and the quality of the coal burned. The general guidelines presented here are appropriate for the range of materials that will be produced by the stabilization facility. Specific procedures for stockpile conditioning time, lift thickness, compaction effort required and in-place density range can only be developed after actual production and disposal operations begin.

The landfill areas will be operated one shift per day, five (5) days per week. Processed materials produced during the weekend will remain in the conditioning stockpiles at the various facilities. The radial stacker stockpile has sufficient surge capacity that hauling and placement operations could be delayed for up to ten (10) days at normal load during periods of severe inclement weather. The effect of inclement weather on the landfill operation will be minimized by preparing areas in advance for use during inclement weather and by developing a specific plan for response to adverse weather conditions.

As previously stated, the specifics will be fully dependent on the characteristics of the material produced and the actual conditions encountered during placement. The general information and experience gained by following this outline will be used to develop a specific plan of operation for these facilities.

4.3.2 Management and Technical Direction

A landfill supervisor will be responsible for directing and monitoring the placement of processed materials according to the Solid Waste Management Plan. The landfill supervisor will maintain weekly reports on the landfill operations and quality control monitoring.

4.3.3 Stockpiling of Processed Materials

The radial stacker stockpile areas will be operated in a manner which will allow for initial conditioning of processed materials. The stockpile will be managed such that the oldest material is removed first. Radial stacker positioning will be controlled to identify the various age materials, thus allowing controlled removal. The landfill supervisor will have sole responsibility for positioning of the stacker and establishment of adequate conditioning times. This will be done in conjunction with the processing facility supervisory personnel. Adequate stockpile conditioning will be determined by the amount of time required for the material to obtain an initial set to permit transport and placement of the material in the landfill. The stockpile conditioning time will vary depending on ambient weather conditions, solids content, and the amount of lime present in the mix.

4.3.4 Loading and Transportation of Processed Materials

Processed materials will be loaded and hauled to the landfill sites for disposal. All weather haul roads will be provided from the radial stacker stockpile area of the stabilization facilities to the limit of the landfill sites. As the fill progresses, additional haul roads will be constructed from natural granular materials or available on-site clean, coarse bottom ash.

The maintenance for all haul roads will consist of promptly removing any waste materials which might fall from the trucks onto the haul roads, regrading, and watering or spraying to eliminate dusting.

4.3.5 Equipment

The following type of equipment will be provided for the loading, transport and placement of the processed materials, estimated to be 6700 tons (wet weight basis) per day for Units 1, 2, 3, and 4. Specific models of equipment will be determined later.

Loading - Rubber tired front end loader(s) of sufficient capacity to handle the daily production volume.

Transport - Off-highway truck(s) of sufficient number to adequately handle the daily production volume.

Placement - Low ground pressure bulldozer(s) for spreading, initial compaction and grading of the materials to facilitate drainage.

Compaction - Smooth steel drum compactor(s) to achieve the specified in-place dry density.

4.3.6 Spreading, Grading and Compaction of Processed Materials

All processed materials will be spread and graded in layers varying from 24 to 36 inches in depth (loose depth thickness). The materials will then be compacted to achieve a minimum dry density of 65 lbs./cu. ft. and to seal the surface from potential saturation during periods of rainfall. All materials deposited in the landfill site each day will be spread, compacted and graded each day to provide positive drainage away from the working area. A working surface slope of at least three (3) percent will be maintained at all times to prevent surface ponding and facilitate surface drainage. The landfill area will be developed in lifts of 20 feet at a maximum side slope of 2.5 horizontal to 1 vertical. Each lift will have a bench around the solid waste fill to control surface drainage and erosion due to runoff. The benches will slope toward the toe of the next lift on a grade of 15%. See specific site plans for landfill lines and grades.

4.3.7 Final Cover

Once an area has reached an elevation two (2) feet below the finish grades, two (2) feet of compacted soil cover will be applied. The cover soil will be placed and compacted on all exterior slopes and benches after final grade has been reached in that portion of the landfill area. Cover soils will be obtained from site clearing and grading operations and from on-site borrow areas. On areas that will be maintained below final grade for a period greater than 6 months, 12 inches of temporary soil cover will be placed.

4.3.8 Revegetation

After the final cover soils have been placed and compacted, a revegetation program will be initiated to stabilize the cover soils and minimize erosion. This program will be implemented as soon as weather permits seed bed preparation, and when seasonal conditions are suitable for the type of vegetation to be used.

All reseeded areas will be maintained by refilling rain-washed gullies, reseeding, mulching and watering as necessary.

The District Soil Conservation Service Agent will be consulted for a recommended seed mixture for use in revegetating the soil-covered slopes.

All temporarily covered areas will be vegetated in accordance with this section.

4.4. Hydrologic/Hydraulic Analysis

The surface water runoff calculations for the Mill Creek Station were based on climatological data for the Louisville, Kentucky area. All of the surface drainage channels were designed for the peak runoff from a 100-year frequency storm of 6-hour duration. For the Louisville area, this equals 4.6 inches of rainfall. A unit runoff hydrograph was developed using the Design of Small Dams method and Runoff Curve No. 80. The peak flow for this storm was 2.32 cubic feet per second (cfs) per acre.

The sedimentation basins were designed to retain at least the runoff from a 10 year frequency storm of 24 hour duration. For the Louisville area, this corresponds again to 4.6 inches of precipitation. Again using Runoff Curve No. 80, the cumulative amount of runoff was 0.21 acre-feet per acre of disturbed landfill area. This is the unit design volume for sizing the sedimentation ponds.

The discharge from the sedimentation basins was based on a theoretical value of 2 cfs per acre of watershed. All hydrologic and hydraulic calculations are included in Appendix C for easy reference.

5.0 OPERATION OF THE LANDFILL SITES

The following section outlines the development and operation of each specific landfill site.

5.1 Site A

Site A is located south of the Mill Creek Station between the Ohio River and Dixie Highway (Route 31). The area has a bowl-shaped configuration, and varies in elevation from a low point of elevation 405± in the southwest corner to elevation 430± on the east and west edges. The area has been used as a borrow area for plant construction fill material. The site has an area of about 70 acres and an estimated volume of 8.3 million cubic yards.

The general concept for the development of Site A is shown on Drawings CA-10607, CA-10608, and CA-10609. The surface drainage system will consist of interceptor channels, surface drainage channels and flumes. All surface water runoff from the landfill area will be conveyed to the sedimentation basin in the southwesterly corner of the landfill site. For cross-sections of the landfill and surface drainage facilities, see Drawings CA-10610 through CA-10615.

The sedimentation basin dike will be constructed of natural soils, and the outlet structure installed prior to commencing disposal operations. The dike will be constructed to elevation 428 to remove the site from the 5-year floodplain. The area upstream of the dike will be covered with a 5-foot thick layer of stabilized material to limit the infiltration of surface water runoff into the groundwater regime. The sedimentation area will be prepared in accordance with Section 4.2.1.

The landfill will be developed from the northwest corner and proceed south to the edge of the sedimentation control area, and then east in front of the plant fill to the proposed floodwall. The area will be developed in small segments and will be prepared in accordance with Section 4.2.1. A dike of stabilized material to elevation 445 will be initially constructed around each segment of the disposal area to protect the site from the 100-year flood. The 100-year flood level is elevation 444 in this area. After the dike is constructed, a base layer 5-feet thick of stabilized material will be spread and compacted over the prepared surface within the diked area. Interceptor channels will be constructed along the toe of slope of the dike in stabilized materials as the dike is constructed. As more stabilized material is placed inside the diked area, the level of the fill surface will rise to the dike crest level, elevation 445. At this point, the area will be pitched a minimum of 3 percent to facilitate drainage to the interceptor channels. The landfill in the area defined by Drawing CA-10608 will progress to elevation 460±. As final and temporary grades are achieved, an earth surface seal will be placed as outlined in Section 4.3.6. The area will be revegetated as soon as practicable thereafter. Surface drainage facilities, as shown on Drawing CA-10608, will be provided as necessary to maintain temporary surface water runoff control.

The landfill will progress from the configuration shown on Drawing CA-10608 to the configuration shown on Drawing CA-10609. Surface drainage facilities will be constructed as necessary as the landfill advances. The landfill will be progressed as a series of terraces from the initial development. Areas achieving final grade will be covered with

earth in accordance with Section 4.3.6. Each new area developed will have a flood protection dike constructed prior to commencing landfill operations in the new area.

The landfill will then progress to final grade in segments with the sedimentation control facility the last area to be filled. The final grading plan is shown on Drawing CA-10607.

5.2 Site B

Site B is east of the Mill Creek Station and is bounded on all sides by either the railroad access loop or an access road to the coal handling area. The site consists of two (one large and one small) depressions created by the excavation of borrow material for the construction for the railroad access loop track embankment, and other railroad car unloading equipment. The site has an area of about 50 acres and an estimated volume of 2.2 million cubic yards. Before landfill operations begin, a 48-inch diameter reinforced concrete pipe (RCP) will be installed within the area. This pipe will connect the existing drainage pipeline outlet and inlet within the landfill area. In addition, a port will be maintained at the south end of the pipe to serve as the discharge facility for this area.

The landfill area within the track loop will be prepared in accordance with Section 4.2.1. Initially, a sedimentation basin will be constructed in the southerly portion of the site. A three (3) foot layer of stabilized material will be placed over the sedimentation basin to limit the infiltration of surface water runoff to the groundwater regime. The landfill will be developed from the sedimentation control facility north along the west side of the site in terraces. As each segment attains final grade, a new terrace

will be progressed. As the landfill approaches the northerly edge of the site, the landfill will be progressed south along the east side of the site. As each area achieves final grade, the area will be covered with soil and vegetated in accordance with Sections 4.3.7 and 4.3.8. See Drawings CA 10616 and 10617 for the development of the landfill and Drawings CA 10618 through CA 10620 for sections.

The surface water runoff from each segment will be directed to the southerly section for sedimentation control. All surface drainage facilities will be constructed as required by the landfill development. The sedimentation control facility will move upgrade (east) with the development of the fill.

6.0 GROUNDWATER MONITORING PROGRAM

Groundwater monitoring wells, as noted on Drawing CA 10606, were installed in the landfill area. Initially, all wells will be sampled to obtain a composite standard against which subsequent water quality data can be measured. A list of the analyses to be performed initially to establish the background water quality standard and then annually is provided in Table IV. Once fill operations have commenced, the upgradient wells will be used for continuing background water quality monitoring. The downgradient wells will be used to monitor any changes in the quality of the groundwater passing beneath the disposal area. The groundwater flows west toward the river. The upgradient wells are MW-1, MW-3, and MW-5. The downgradient wells are MW-2, MW-4, and MW-6. The analyses listed in Table V will be performed quarterly once the fill operations have begun. These analyses will provide adequate indication should any pollutants enter the groundwater from the disposal area.

Before water quality sampling, the static water level in each monitoring well will be recorded. The static water levels will be used to determine the annual fluctuation in the groundwater elevations for the disposal area. The filling of the disposal area should not affect the existing dominant direction of the groundwater flow.

Each groundwater monitoring well will be purged before sampling. After the water level has returned to the approximate level noted before purging, a water quality sample will be taken. The water quality samples will be taken with a clean hand baler and will be placed in clean plastic sampling jars and sealed. All samples will be kept cool until delivery to the laboratory for testing. All water quality samples will be delivered to the laboratory promptly to prevent any significant deterioration in the quality of the sample.

TABLE IV

ANALYSES TO BE PERFORMED
TO ESTABLISH BACKGROUND WATER QUALITY
AND TO BE PERFORMED ANNUALLY

Alkalinity
- MO
- Phenolphthalein

Arsenic
Barium
Cadmium
Calcium
Chloride
Chromium
Copper
Cyanide
Fluoride
Foaming Agents
pH
Hardness, as $CACO_3$
Iron - Total
Lead
Manganese
Mercury
Sodium
Selenium
Silver
Sulfates
Sulfites
Total Suspended Solids
Total Dissolved Solids
Zinc

TABLE V
ANALYSES TO BE PERFORMED
QUARTERLY

Alkalinity	Sodium
Calcium	Sulfates
Chloride	Sulfites
Hardness	Total Dissolved Solids
pH	Iron

7.0 QUALITY CONTROL AND TESTING

A landfill quality control program will be used to determine the in-place properties of the plant produced Poz-O-Tec. It will also be used to determine the best handling technique for placement of the particular material consistency produced by a plant. Such items as length of stockpile conditioning time, lift thickness and compaction effort required to achieve the desired final properties will be determined through a landfill quality control program. The landfill quality control program will be coordinated with the plant quality control program. The characteristics of the material produced by the plant will be monitored in order for the landfill quality control program to be effective.

APPENDIX A

LANDFILL FORMS

IU CONVERSION SYSTEMS, INC.

WEEKLY ACTIVITY REPORT

WEEK OF _____ THROUGH _____ DATE _____

SUMMARY OF WEATHER CONDITIONS

	SUNNY, CLOUDY, RAIN, SNOW, ETC.	DAILY TEMPERATURE		PRECIPITATION	
		High	Low	Rain	Snow
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

COMMENTS: _____

_____

_____

SUMMARY OF DAILY INSPECTION ITEMS

I. Processed Material Stockpiles

A. Stockpile P-1

1. Quantity of Processed Materials in Stockpile:

Monday A.M.: _____ Added: _____ Removed: _____

2. Quality of Processed Materials:

Solids: _____ Lime: _____ Days of Conditioning: _____

3. Condition of Stockpile Base:_____

_____

_____

_____

4. Comments:_____

_____

_____

_____

B. Stockpile P-2

1. Quantity of Processed Materials in Stockpile:

Monday A.M._____ Added:_____ Removed:_____

2. Quality of Processed Materials:

Solids:_____ Lime:_____ Days of Conditioning:_____

3. Condition of Stockpile Base:_____

_____

_____

_____

4. Comments:_____

_____

_____

_____

WEEKLY REPORT
Page Three

II. LANDFILL OPERATING EQUIPMENT

A. Stockpile Loading:

	Equipment	Hours	Tons
P-1			
P-2			

B. Hauling of Stockpile Conditioned Material:

	Equipment	Hours	Tons
P-1			
P-2			

C. Placement and Grading:

Equipment	Hours	Tons

D. Compaction:

Equipment	Hours	Tons

III. ACTIVE DISPOSAL AREAS

A. Section(s)_____

B. Material Characteristics (solids, lime, age, etc.)_____

C. Placement, Grading, and Compaction:_____

WEEKLY REPORT
Page Four

III. ACTIVE DISPOSAL AREAS (Cont'd)

D. Surface Conditions:_____

_____

_____

E. Comments:_____

_____

_____

A. Section(s)_____

B. Material Characteristics (solids, lime, age, etc.)_____

_____

_____

C. Placement, Grading, and Compaction:_____

_____

_____

D. Surface Conditions:_____

_____

_____

E. Comments:_____

_____

_____

WEEKLY REPORT
Page Five

IV. INACTIVE DISPOSAL AREA

Description: _____

_____

_____

V. GENERAL COMMENTS ON LANDFILL OPERATION

_____

_____

_____

_____

_____

VI. RECOMMENDATIONS

_____

_____

_____

VII. VISITORS TO SITE

_____

_____

VIII. QUALITY CONTROL PROGRAM

_____

_____

_____

_____

Attachment: Landfill Activity Plan,
Weekly Landfill Q.C. Report

Submitted by: _____

07114

LANDFILL QUALITY CONTROL TESTING

Compressive Strength, Permeability and Leaching

By ____________________

Sample I.D.	Date Sampled (1)	Date Produced (2)	Wet Density Lbs/Ft³ (3)	Moisture Content % D.W.B. (4)	Dry Density Lbs/Ft.³ (5)	% Solids (6)	% Lime Initial (7)	% Lime @ Casting (8)	Test To Be Performed						Comments
									Compressive Strength			Perme-ability		Leach-ing	
									28d	60d	90d	28d	60d		

APPENDIX B

BORING LOGS

K-1

ATEC Associates, Inc.
Consulting Geotechnical & Materials Engineers

RECORD OF
SOIL EXPLORATION

REPLY TO: 1846 Cargo Court
Louisville, Ky. 40299
(502) 491-9523

Home Office: Indianapolis
Offices: Atlanta/Baltimore/Birmingham/Cincinnati/Dallas/Freeport/
Houston/Louisville/Salisbury/Washington, D.C./York
Affiliates: Beckley/Norfolk/Santa Rosa/Riyadh

CLIENT Louisville Gas and Electric Company — BORING NO. 1 (Page 1 of 2)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/23/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN R. Hackman
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SURFACE ELEVATION– 428.8

SOIL CLASSIFICATION	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 in. 3-6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
Brown moist loose CLAYEY SILT (CL-ML)			0		4-4-6			
			5	1	4 4/6	100		
	8.5							
Brown moist loose SILTY SAND (SM)			10	2	3 5/5	10		
			15	3	3 5/7	50		
	16.0							
Brown moist medium dense SAND (SP)			20	4	9 17/19	75		
			25	5	9 11/9	50		
	28.5							
Brown wet loose SAND (SW) with traces of fine gravel			30	6	4 6/6	50		
				7	9 14/13	100		

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS 28.5 FT.
AT COMPLETION ____ FT.
AFTER ____ HRS. ____ FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

Consulting Geotechnical & Materials Engineers

RECORD OF SOIL EXPLORATION

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Louisville, Ky. 40299
(502) 491-9523

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Offices: Atlanta/Baltimore/Birmingham/Cincinnati/Dallas/Freeport/Houston/Louisville/Salisbury/Washington, D.C./York
Affiliates: Beckley/Norfolk/Santa Rosa/Riyadh

CLIENT Louisville Gas and Electric Company — BORING NO. 1 (Page 2 of 2)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/23/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN R. Hackman
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION SURFACE ELEVATION–	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
- Dense from 43.5 ft.			40	8	18 14/13	33		
			45	9	16 16/19	100		
	47.0							
Brown wet dense fine SAND (SP)			50	10	11 18/17	100		
	55.0		55	11	8 12/22	20		
Brown wet dense SAND (SW)			60	12	14 21/32	100		
			65	13	15 16/21	100		
	67.5							
Gray wet dense SAND (SP) BOTTOM OF TEST BORING 70.0'			70	14	12 15/15	100		

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

Consulting Geotechnical & Materials Engineers

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CLIENT Louisville Gas and Electric Company — BORING NO. 2 (Page 1 of 2)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/22/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN R. Hackman
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SURFACE ELEVATION– 434.8

SOIL CLASSIFICATION	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	Sample No.	SPT •• Blows/6 In. 3–6 In. Increments	SPT •• Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
Brown moist medium stiff CLAYEY SILT (CL-ML)			0					
			5	1	3 4/6	100		
	7.5							
Brown dry loose to medium dense SAND (SP)			10	2	4 4/4	75		
			15	3	5 5/7	100		
			20	4	8 10/10	100		
	22.5							
Brown moist medium dense to dense SAND with gravel (SW)			25	5	7 11/13	100		
			30	6	9 23/32	100		
	32.0							
Brown & gray wet dense SAND (SW) with gravel			35	7	13 20/21	100		

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS 32.5 FT.
AT COMPLETION ____ FT.
AFTER ____ HRS. ____ FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

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CLIENT Louisville Gas and Electric Company — BORING NO. 2 (Page 2 Of 2)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/22/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN R. Hackman
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION SURFACE ELEVATION–	Stratum Depth, Ft.	Ground Water	Depth Circle, Ft.	Sample No.	SPT ** Blows/6 in. 3-6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
			40	8	19 24/32	100		
			45	9	19 17/14	75		
Brown wet dense fine to medium SAND (SP) with gravel	47.0							
			50	10	13 17/19	100		
Brownish-gray wet dense fine to coarse SAND (SW) with gravel	52.0							
			55	11	36 21/23	50		
Brown wet medium dense fine to medium SAND (SP)	57.0							
			60	12	10 12/16	75		
Brown wet dense fine to coarse SAND (SW) with trace of gravel	62.0							
			65	13	12 16/21	100		
Gray wet dense fine to medium SAND (SP) with trace of gravel	67.0							
BOTTOM OF TEST BORING 70.0 '	70.0		70	14	12 19/20	75		

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

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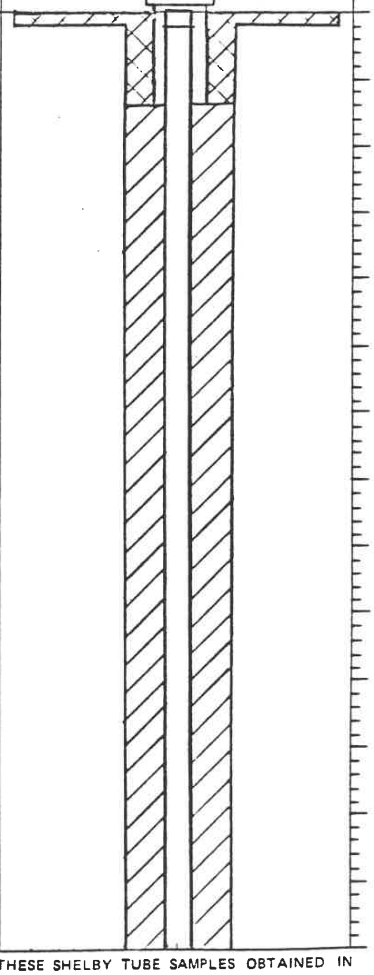
CLIENT Louisville Gas and Electric Company — BORING NO. MW-1 (Page 1 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/18/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD HSA — FOREMAN D. Bronk
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION SURFACE ELEVATION– 439.8	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	Sample No.	SPT ** Blows/6 in. 6 in. Increments	Recovery, %	Shelby Tube No.
TOP SOIL	1						
Brown Gray moist very stiff SILT (ML)	7		5	1	6 9/10	100	
Brown moist hard CLAYEY SILT (ML)	17		10	2	11 15/21	100	
			15	3	6 12/13	100	
Brown moist very stiff sandy CLAY (CL)	22		20	4	5 7/9	100	
Brown moist medium dense SAND (SP)			25	5	5 6/8	100	
			30	6	4 4/7	100	
			35	7	6 9/11	100	

BORING & SAMPLING NOTES



BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____ FT.
AT COMPLETION ____ FT.
AFTER ____ HRS. ____ FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-1 (Page 2 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DI 79410 — DATE 10/18/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN D. Bronk
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION SURFACE ELEVATION–	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
	37							
Brown wet dense SAND and gravel (SW)			40	8	6 6/9			
			45	9	37 29/19			
			50	10	21 21/17			
			55	11	10 21/25			
			60	12	17 28/25			
COBBLES	62							
Brown wet dense SAND (SP)			65	13	17 16/23			
	67							
Brown wet dense SAND with gravel			70	14	20 28/36			

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

Consulting Geotechnical & Materials Engineers

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Affiliates: Beckley/Norfolk/Santa Rosa/Riyadh

CLIENT Louisville Gas and Electric Company — BORING NO. MW-1 (Page 3 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/18/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD HSA — FOREMAN D. Bronk
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION SURFACE ELEVATION–	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 in. 3–6 in. increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
			75	15	12 17/21			
Brown dense SAND with gravel (SW)	77		80	16	21 24/24			
			85	17	21 38/50			
Brown wet very dense SAND and GRAVEL (SW-GW)	87		90	18	21/34			
			95	19	64/ 6"			
			100	20	21 32/25			
BOTTOM OF TEST BORING 100' Installed 100' PVC Pipe								

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

Consulting Geotechnical & Materials Engineers

RECORD OF SOIL EXPLORATION

REPLY TO: 1846 Cargo Court
Louisville, Ky. 40299
(502) 491-9523

Home Office: Indianapolis
Offices: Atlanta/Baltimore/Birmingham/Cincinnati/Dallas/Freeport/Houston/Louisville/Salisbury/Washington, D.C./York
Affiliates: Beckley/Norfolk/Santa Rosa/Riyadh

CLIENT Louisville Gas and Electric Company
PROJECT NAME Mill Creek IUCS
PROJECT LOCATION Jefferson County, Kentucky
BORING METHOD HSA
ROCK CORE DIA. _____ in.
SHELBY TUBE O.D. _____ in.

BORING NO. MW-2 (Page 1 of 3)
JOB NO. DL 79410 DATE 10/4/79
STATION
FOREMAN D. Bronk
INSPECTOR

SOIL CLASSIFICATION
SURFACE ELEVATION– 460.5

Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	Blows/6 in. 3–6 in. Increments	Recovery, %	Shelby Tube No.
		5	1	6 8/14	100	
7						
		10	2	12 20/33	70	
		15	3	8 14/24	100	
		20	4	3 10/17	100	
22						
		25	5	11 12/14	100	
27						
		30	6	9 12/12	100	
		35	7	9 10/12		

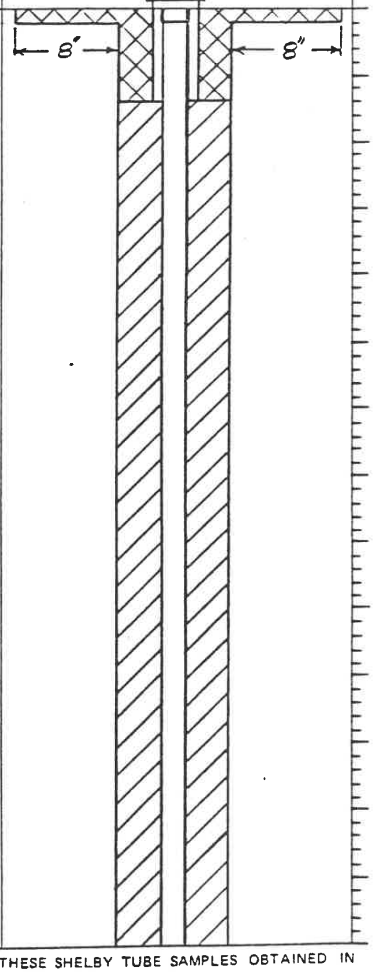
Brown moist stiff CLAYEY SILT (ML)

Brown moist hard CLAY (CL)

Brown moist very stiff SILT (ML)

Brown moist very stiff SILTY SAND (SM)

BORING & SAMPLING NOTES



BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS _____ FT.
AT COMPLETION _____ FT.
AFTER _____ HRS. _____ FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING _____ DRILLED A FEW FEET FROM BORING _____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

Consulting Geotechnical & Materials Engineers

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-2 (Page 2 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/4/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD HSA — FOREMAN D. Bronk
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION SURFACE ELEVATION–	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
	37							
Brown moist medium dense fine SAND (SP)	42		40	8	10 11/14	100		
Brown moist very stiff sandy CLAY (CL)	47		45	9	7 8/11	50		
Brown wet dense fine to coarse SAND	52		50	10	18 24/22	60		
Brown wet dense medium SILTY SAND	57		55	11	15 15/15	50		
Brown gray wet dense coarse SAND and GRAVEL			60	12	24/25	80		
			65	13	20 26/31	80		
			70	14	18 17/17	100		

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-2 (Page 3 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/4/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD HSA — FOREMAN D. Bronk
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION SURFACE ELEVATION–	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
	72.0							
Brownish gray wet dense fine to coarse SAND with gravel			75	15	23 20/21	90		
			80	16	24 30/23	100		
			85	17	23 23/30	100		
	87.0							
Brownish-red wet very dense fine to coarse SILTY SAND (SP)			90	18	26 35/50	90		
	92.0							
Gray wet dense fine to coarse SAND (SW) with gravel			95	19	17 19/15	100		
	100.0		100	20	16 23/34	100		
BOTTOM OF TEST BORING 100' Installed 95' PVC Pipe								

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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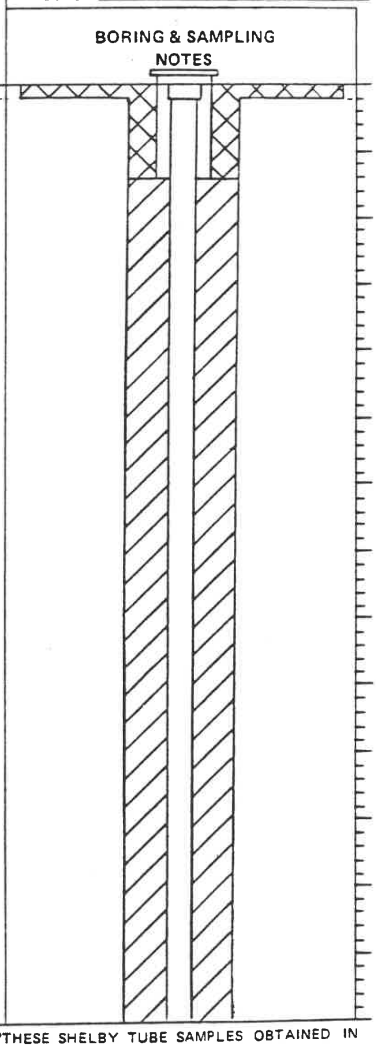
CLIENT Louisville Gas and Electric Company — BORING NO. MW-3 (Page 1 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/18/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN R. Hackman
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SURFACE ELEVATION– 446.1

SOIL CLASSIFICATION	Stratum Depth, Ft.	Depth Scale, Ft.	Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	Recovery, %	Shelby Tube No.
Brown moist very stiff CLAYEY SILT (ML)			1	3 7/9	75	
	7.0	5				
Brown moist stiff SILTY CLAY (CL)			2	3 6/8	100	
		10				
- wet from 13.5' - medium stiff from 13.5			3	4 5/4	100	
		15				
			4	3 5/4	100	
		20				
Brown moist medium dense SAND (SP)			5	10 11/14	75	
		25				
			6	7 10/11	50	
		30				
			7	10 12/12	75	
		35				

BORING & SAMPLING NOTES



BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-3 (Page 2 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. D1 79410 — DATE 10/18/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION (SURFACE ELEVATION–)	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
- Wet from 38.5'			35					
				8	11 14/16	75		
	42		40					
Brown wet very dense SAND (SW) with traces of fine gravel				9	19 36/31	100		
			45					
				10	14 29/39	100		
			50					
- Medium dense at 53.5' to 55'				11	7 11/16	75		
			55					
- Dense to very dense from 58.5'				12	11 19/21	100		
			60					
				13	9 19/41	75		
			65					
				14	49/ 48/50/14	100		
			70					

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
▽ NOTED ON RODS 46.5 FT.
▼ AT COMPLETION ____ FT.
▼ AFTER ____ HRS. ____ FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-3 (Page 3 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/18/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD / — FOREMAN
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION (SURFACE ELEVATION–)	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	Sample No.	SPT ** Blows/6 in. 3-6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
			70					
			75	15	25 45/54	100		
			80	16	7 14/10	100		
	82							
Gray wet dense SAND (SP)			85	17	11 15/19	75		
-Very dense from 88.5'			90	18	20 26/38	100		
			95	19	34 36/37	75		
			100	20	19 50/28	100		
BOTTOM OF TEST BORING 101.0' Set well at 101.0								

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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Affiliates: Beckley/Norfolk/Santa Rosa/Riyadh

CLIENT Louisville Gas and Electric Company — BORING NO. MW-4 (Page 1 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/17/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN R. Hackman
ROCK CORE DIA. ___ in. — INSPECTOR
SHELBY TUBE O.D. ___ in.

SURFACE ELEVATION- 437.0

SOIL CLASSIFICATION	Stratum Depth, Ft.	Sample No.	SPT ** Blows/6 in. 3-6 in. Increments	SPT ** Recovery, %	Shelby Tube No.
Brown moist medium stiff SILTY CLAY (CL)	7.5	1	4 4/5	25	
Gray moist very stiff SILT (ML) with some fine sand	17.5	2	8 9/10	65	
		3	7 9/9	100	
Gray brown moist stiff SILTY CLAY (CL)	22.5	4	3 4/7	100	
Brown wet medium stiff SILT (ML)	27.5	5	2 3/4	100	
Moist brown gray stiff SILTY CLAY with sand layers (CL)	32.0	6	7 6/7	100	
Gray wet stiff fine to coarse SAND (SW)	35	7	4 5/6	100	

Ground Water — Depth Scale, Ft.: 0, 5, 10, 15, 20, 25, 30, 35

BORING & SAMPLING NOTES

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS 28.0 FT.
AT COMPLETION ____ FT.
AFTER ____ HRS. ____ FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

Consulting Geotechnical & Materials Engineers

RECORD OF SOIL EXPLORATION

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-4 (Page 2 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/17/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN R. Hackman
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION (SURFACE ELEVATION–)	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	Blows/6 in. 3–6 in. Increments	Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
	37.5		35					
Brown wet medium dense fine to coarse SILTY SAND (SM) with gravel			40	8	5 10/14	75		
			45	9	17 19/21	75		
			50	10	7 9/12	50		
			55	11	11 18/24	75		
			60	12	13 13/16	100		
			65	13	8 11/15	0		
			70	14	12 18/21	75		

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

**THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-4 (Page 3 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DI 79410 — DATE 10/17/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN R. Hackman
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION (SURFACE ELEVATION–)	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
	72.5		70					
Wet gray brown medium dense fine to coarse SAND with gravel (SW)			75	15	11 14/21	25		
			80	16	46 50/40	35		
			85	17	32 33/42	100		
	87.0							
Wet brown very dense fine to coarse SAND with coarse gravel (SW)			90	18	18 26/32	75		
			95	19	60 50/19	80		
			100	20	13 16/21	75		
BOTTOM OF TEST BORING 100.0'								Set observation well at 100.0'

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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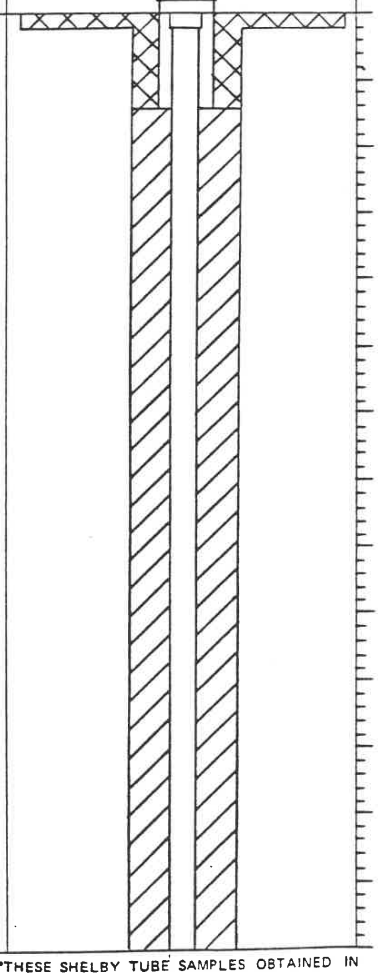
Affiliates: Beckley/Norfolk/Santa Rosa/Riyadh

CLIENT Louisville Gas and Electric Company — BORING NO. MW-5 (Page 1 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/15/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN D. Bronk
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SURFACE ELEVATION– 440.6

SOIL CLASSIFICATION	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	SPT ** Recovery, %	Shelby Tube No.
TOPSOIL	1						
Brown moist stiff CLAYEY SILT (ML)	7		5	1	5 6/9	100	
Brown wet medium dense silty fine SAND (SM)	17		10	2	4 6/7	100	
			15	3	4 4/6	100	
Brown moist medium dense fine to coarse SILTY SAND (SM)	22		20	4	6 9/14	100	
Brown moist medium dense fine to medium SAND (SP)			25	5	11 10/13	100	
			30	6	9 11/11	100	
			35	7	9 10/11	100	

BORING & SAMPLING NOTES



BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-5 (Page 2 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DI 79410 — DATE 10/15/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION (SURFACE ELEVATION—)	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
	37							
Brown wet medium dense SAND (SW)			40	8	9 11/12	100		
			45	9	7 11/16	100		
- Dense at 48.5 - 50.0			50	10	11 20/30	100		
	52							
Black wet medium dense SAND with gravel (SW)			55	11	20 13/14	100		
	57							
Brown wet medium dense SAND (SW)			60	12	9 14/16	100		
			65	13	7 15/20	100		
			70	14	25 28/34	100		

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

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CLIENT Louisville Gas and Electric Company — BORING NO. MW-5 (Page 3 of 3)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/15/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD — FOREMAN
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION SURFACE ELEVATION–	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 In. 3–6 In. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
			75	15	1 33/33	100		
	77							
Gray wet dense SAND and fine GRAVEL (GW)			80	16	17 22/24	100		
			85	17	17 50/NP	100		
	87							
Gray wet very dense coarse SAND with gravel (SW)			90	18	33 22/35	100		
	92							
Brown and gray wet very dense coarse SAND and fine GRAVEL (GW)			95	19	23 33/33	100		
	97							
Brown wet medium dense fine to medium clayey SAND (SC)			100	20	9 10/12	100		
BOTTOM OF TEST BORING 100' Installed 100' PVC pipe								

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS ____FT.
AT COMPLETION ____FT.
AFTER ____HRS. ____FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

K-1

ATEC Associates, Inc.

Consulting Geotechnical & Materials Engineers

RECORD OF SOIL EXPLORATION

REPLY TO: 1846 Cargo Court
Louisville, Ky. 40299
(502) 491-9523

Home Office: Indianapolis
Offices: Atlanta/Baltimore/Birmingham/Cincinnati/Dallas/Freeport/Houston/Louisville/Salisbury/Washington, D.C./York
Affiliates: Beckley/Norfolk/Santa Rosa/Riyadh

CLIENT Louisville Gas and Electric Company — BORING NO. MW-6 (Page 1 of 2)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/1/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD HSA — FOREMAN D. Bronk
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SURFACE ELEVATION– 433.8

SOIL CLASSIFICATION	Stratum Depth, Ft.	Depth Scale, Ft.	Sample No.	SPT ** Blows/6 in. 3–6 in. Increments	Recovery, %	Shelby Tube No.
Brown gray moist stiff SILT (ML)	7	5	1	4 5/5	50	
Brown moist stiff SILT (ML)	12	10	2	7 8/10	100	
Brown moist stiff CLAYEY SILT (ML)	17	15	3	5 7/10	100	
Brown moist medium stiff CLAYEY SILT (ML)	22	20	4	2 3/4	100	
Brown moist medium stiff sandy CLAY (CL)	32	25	5	4 3/3	10	
		30	6	6 8/6	2	1 *
Brown very moist medium stiff clayey fine SAND (SC)	35	35	7	4 4/4	33	

BORING & SAMPLING NOTES

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS 36.5 FT.
AT COMPLETION ____ FT.
AFTER ____ HRS. ____ FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING MW-6-A DRILLED A FEW FEET FROM BORING MW-6
**STANDARD PENETRATION TEST

ATEC Associates, Inc.

Consulting Geotechnical & Materials Engineers

RECORD OF SOIL EXPLORATION

REPLY TO: 1846 Cargo Court
Louisville, Ky. 40299
(502) 491-9523

Home Office: Indianapolis
Offices: Atlanta/Baltimore/Birmingham/Cincinnati/Dallas/Freeport/Houston/Louisville/Salisbury/Washington, D.C./York
Affiliates: Beckley/Norfolk/Santa Rosa/Riyadh

CLIENT Louisville Gas and Electric Company — BORING NO. MW-6 (Page 2 of 2)
PROJECT NAME Mill Creek IUCS — JOB NO. DL 79410 — DATE 10/1/79
PROJECT LOCATION Jefferson County, Kentucky — STATION
BORING METHOD HSA — FOREMAN D. Bronk
ROCK CORE DIA. ____ in. — INSPECTOR
SHELBY TUBE O.D. ____ in.

SOIL CLASSIFICATION (SURFACE ELEVATION–)	Stratum Depth, Ft.	Ground Water	Depth Scale, Ft.	SPT ** Sample No.	SPT ** Blows/6 in. 3—6 in. Increments	SPT ** Recovery, %	Shelby Tube No.	BORING & SAMPLING NOTES
	37							
Wet brown fine loose silty SAND (SM)			40	8	3 3/5	100		
			45	9	4 8/10	100		
	47							
Brown wet stiff SANDY CLAY (CL)			50	10	3 4/8	100		
			55	11	5 11/11	100		
			60	12	15 29/33	100		
	62							
Wet brown gray dense coarse SAND and GRAVEL			65	13	41 39/27	100		
BOTTOM OF TEST BORING 70.0'				14	33 50/11	100		
Installed 64' PVC Pipe			70					

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGER
DC – DRIVEN CASING
MD – MUD DRILLING
RC – ROCK CORING

GROUND WATER
NOTED ON RODS 36.5 FT.
AT COMPLETION ____ FT.
AFTER ____ HRS. ____ FT.

*THESE SHELBY TUBE SAMPLES OBTAINED IN BORING ____ DRILLED A FEW FEET FROM BORING ____
**STANDARD PENETRATION TEST

APPENDIX C

HYDRAULIC CALCULATIONS

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 1
JOB NO.
DATE 11-29-79
BY JWC

TITLE RUNOFF HYDROGRAPH
LOUISVILLE GAS & ELECTRIC

DETERMINE RUNOFF HYDROGRAPH FOR LOUISVILLE AREA TO BE USED IN DESIGNING DIVERSION AND INTERCEPTOR CHANNELS.

DESIGN STORM 6 HOUR DURATION, 100 YEAR Frequency

P_{100} = 4.6" LOUISVILLE AREA

SET UP UNIT HYDROGRAPH FOR UNIT AREA
SINCE ALL WATERSHEDS INVOLVED ARE SMALL,
SET TIME OF CONCENTRATION = 0

DETERMINE INCREMENTAL RUNOFF USING
DESIGN OF SMALL DAMS Procedure
use Runoff curve number of 80

Hourly intensities can be determined by
multiplying incremental runoff by time division
and area

Peak runoff volume = 0.58 in/15 mins x 4 $\frac{\text{incr}}{\text{hr}}$ x

= 2.32 cfs/acre see attached form for calculations

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 2
JOB NO.
DATE 11-29-79
BY JDJ C

TITLE UNIT HYDROGRAPH
LOUISVILLE GAS & ELECTRIC

WATERSHED: 1 ACRE
DESIGN STORM 6 HR 100 YR 4.6 INCHES
RUNOFF CURVE NO. 80

RAINFALL INTERVAL	TIME	DESIGN ACCUMULATIVE RAINFALL	DESIGN ACCUMULATIVE RAINFALL	DESIGN ACCUMULATIVE RUNOFF	DESIGN INCREMENTAL RUNOFF	DESIGN INCREMENTAL RUNOFF
HOURS	HOURS	DECIMAL	INCHES	INCHES	INCHES	CFS/AC
	0.25	0.02	0.092	0	0	0
1	0.50	0.04	0.184	0	0	0
	0.75	0.06	0.276	0	0	0
	1.00	0.08	0.368	0	0	0
	1.25	0.11	0.506	0	0	0
2	1.50	0.14	0.644	0	0	0
	1.75	0.18	0.828	0	0	0
	2.00	0.23	1.056	0.1	0.1	0.4
	2.25	0.41	1.886	0.5	0.4	1.6
3	2.50	0.60	2.760	1.08	0.58	2.32
	2.75	0.65	2.99	1.25	0.17	0.68
	3.00	0.70	3.22	1.42	0.17	0.68
	3.25	0.74	3.404	1.55	0.13	0.52
4	3.50	0.78	3.588	1.70	0.15	0.60
	3.75	0.81	3.726	1.80	0.10	0.40
	4.00	0.84	3.864	1.90	0.10	0.40
	4.25	0.86	3.956	2.00	0.10	0.40
5	4.50	0.88	4.048	2.10	0.10	0.40
	4.75	0.90	4.140	2.18	0.08	0.32
	5.00	0.92	4.232	2.24	0.06	0.24
	5.25	0.94	4.324	2.30	0.06	0.24
6	5.50	0.96	4.416	2.36	0.06	0.24
	5.75	0.98	4.508	2.42	0.06	0.24
	6.00	1.00	4.60	2.50	0.08	0.32

(3) *Significance of* I_a.—The insert on figure A–4 shows that I_a is equal to the rainfall that occurs before runoff starts. Physically, I_a consists principally of interception, infiltration, and surface storage. Equation (6), which relates I_a to S, is based on data from large and small watersheds in various parts of the country. Further refinement of equation (6) is not recommended, since the data needed to break I_a into components of interception, infiltration, and surface storage are seldom available on a watershed basis. For the same reason, adjustment of the coefficient 0.2 in equation (6) is not recommended.

(4) *System of curve numbering.*—For convenience in interpolation, the curves of figure A–4 are numbered from 100 to zero. The numbers are related to S as follows:

$$\text{Curve number} = \frac{1{,}000}{10+S} \qquad (7)$$

A curve for the case $I_a=0$, equation (3), is displaced to the right for the case $I_a=0.2S$, equation (1), by the amount of $0.2S$. Therefore, the curve numbers given in table A–2 should be used only with figure A–4 or with equation (1).

(5) *Antecedent moisture conditions.*—The amount of rainfall in a period of 5 to 30 days preceding a particular storm is referred to as antecedent rainfall, and the resulting condition of the watershed in regard to potential runoff is referred to as an antecedent condition. In general, the heavier the antecedent rainfall, the greater the direct runoff that occurs from a given storm. The effects of infiltration and evapo-transpiration during the antecedent period are also important, as they may increase or lessen the effect of antecedent rainfall.

Because of the difficulties of determining antecedent storm conditions from data normally

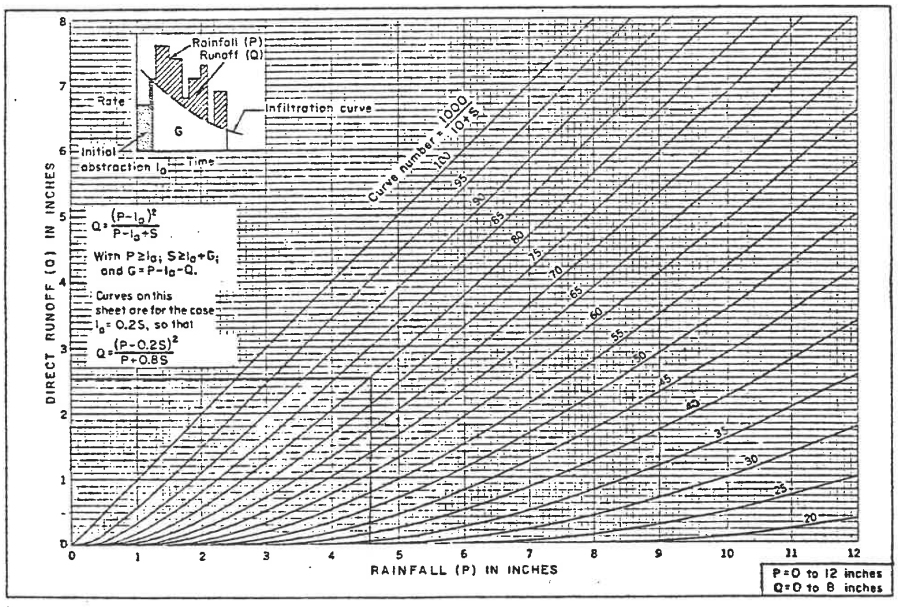


Figure A–4. Solution of runoff equation, $Q=\frac{(P-0.2S)^2}{P+0.8S}$. (Sheet 1 of 2.) (U.S. Soil Conservation Service.) 288–D–2549.

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 4
JOB NO.
DATE 11-29-79
BY JWC

TITLE RUNOFF VOLUME FOR SEDIMENTATION CONTROL

Use 24 hour duration and a 10 year frequency as design storm for sedimentation basin volumes.

P_{10-24} = 4.6" - Louisville Area

Assuming a runoff curve number of 80, the surface runoff = 2.5 inches per acre

Ref U.S. Dept of Int, B. of Rec., DESIGN OF SMALL DAMS Pg. 541

$V = 2.5''/12'' \times 1 \text{ acre} = 0.21 \text{ acre ft/acre}$

Design vol = 0.21 acre ft/acre of disturbed area

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA

PAGE 5
JOB NO 2204
DATE 4 MAR 80
BY DS. MARTIN

TITLE LOUISVILLE GAS & ELECTRIC MILLCREEK
HYDRAULIC CALCULATIONS SITE "A"

SURFACE DRAINAGE CHANNEL (EAST PORTION)
USE MAY DRAIN to DESIGN CHANNEL
DRAINAGE AREA: 14.7 ACRES
DISCHARGE = 14.7 × 2.32 = 34 cfs
DESIGN CHANNEL WITH 1V:3H SIDE SLOPES
$n = .03$, $S = .005$
Assume $d = 2'$

$$A = \frac{6d^2}{2} = 12$$

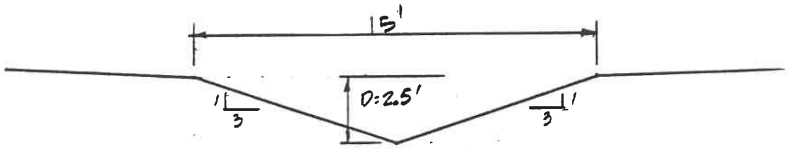
$$P = 2d\sqrt{10} = 12.65$$

$$R = \left(\frac{A}{P}\right)^{2/3} = \left(\frac{12}{12.65}\right)^{2/3} = .965$$

$$Q = \frac{1.49}{n}(A)(R)(S)^{1/2}$$

$$= \frac{1.49}{.03}(12)(.965)(.0707)$$

$$= 40.66 > 34 \text{ cfs}$$



SET CHANNEL DEPTH @ 2.5' to provide freeboard

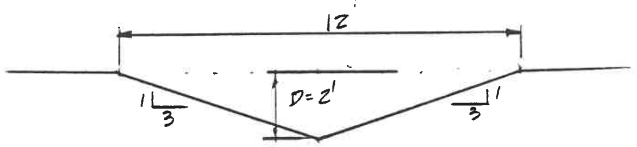
CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA

PAGE 6
JOB NO 2204
DATE 4 MAR 80
BY D.S. MARTIN

TITLE Louisville Gas & Electric Mill Creek
Hydraulic Calculations Site "A"

Surface Drainage Channel (West Portion)

A = 400' x 850' = 7.8 acres Q = 2.32 x 7.8 = 18 cfs
by inspection & reference to previous design



set d = 2' for flow depth & freeboard

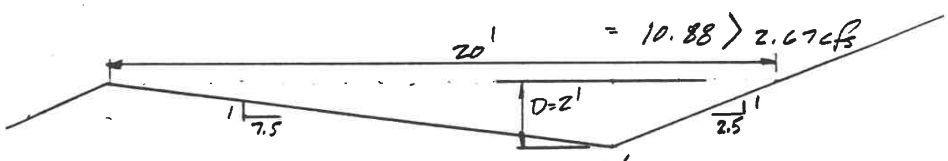
Bench Drain
Length of Slope 20' x 2.5" = 50'
Max Drainage Length = 1000'
Drainage Area = 1000 x 50/43560 = 1.15 acres
Design, Flow Q = 1.15 x 2.32 = 2.67

Assume "V" channel with 1':7.5" outboard slope
and 1':2.5" inboard slope, S = .005 n = .03
Use Mann.ngs Equation, Determine Flow Capacity
$Q = \frac{1.49}{n}(A)(R)^{2/3}(S)^{1/2}$ Assume d = 1

$A = \frac{10d^2}{2} = 5$ P = 10.25

$R = (A/P)^{2/3} = .62$ $Q = \frac{1.49}{.03}(S)(.62)(.0707)$

= 10.88 > 2.67 cfs



Set Channel Depth @ 2'
-Provide the following channel cross section

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA

PAGE 7
JOB NO 2204
DATE 4 MAR 80
BY J.S. MARTIN

TITLE Louisville Gas & Electric Mill Creek
Hydraulic Calculations Site "A"

FLUME DESIGN

DESIGN FOR LARGER OF THE FLUMES
RUNOFF 14.7 ACRES (CREST) + 9.6 ACRES (BOREN DRAIN) = 25.3 ACRES
25.3 ACRES × 2.32 cfs/ACRES = 58.7 cfs

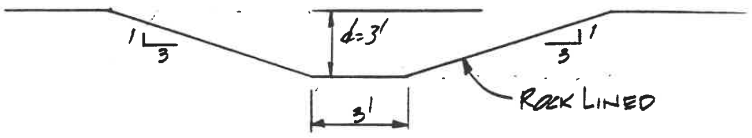
DETERMINE CROSS SECTION FOR ROCK LINED FLUME
WITH $S_o = 0.33$ $n = 0.04$

ASSUME TRAPEZOIDAL CHANNEL SECTION
3' WIDE, 2' DEEP, 1':3' SIDE SLOPES

$Q = \frac{1.49}{n}(A)(R)^{2/3}(S)^{1/2}$ d=1' and say $A = 3\ ft^2$ and $P = 3'$

$Q = \frac{1.49}{0.04}(3)(1)^{2/3}(0.33)^{1/2} = 64\ cfs > 58.7\ cfs$

Provide 1'-2' of freeboard



SET FLUME DEPTH @ 3'
PROVIDE THE FOLLOWING FLUME CROSS SECTION

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 8
JOB NO 2204
DATE 03-16-80
BY JWC

TITLE LOUISVILLE GAS & ELECTRIC CO.
MILL CREEK - HYDRAULIC CALC - SITE A

INTERCEPTOR CHANNEL ALONG TOE of SITE A LANDFILL

North and west sides of Landfill

From Flume on north slope, west to crest (el. 460) of Landfill A = 11.3 acres

Area of northerly slope (west half) from elev. 460 to elev. 480 = 50 x 700/43560 = 0.8 acres

Level area west of plant A = 500 x 250/43560 = 2.9 ac

West Face of Landfill, below elev. 460, to flume on west face 1100 x 100' = 2.5 ACRES

TOTAL AREA = 17.5
Q = q · A = 2.32 x 17.5 = 40.6 acres

Use "V" channel, 1V:3H SIDE SLOPES, S = 0.005
n = 0.03

from rating curve (attached),

d = 2' D = 3'

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 9
JOB NO 2204
DATE 03-17-80
BY JWC

TITLE LG&E - MILL CREEK - SITE A
HYDRAULICS

INTERCEPTOR CHANNEL
From FLUME ON NORTH SLOPE EAST TO SOUTHWEST CORNER

LEVEL AREA from flume (north slope) to flume (east slope) 200 x 1600 = 7.3 acres

$Q_1 = q \times A = 2.32 \times 7.3 = 17$ cfs

Flume on east slope
Crest area = 14.7 acres
Bench area = 9.6 acres
25.3 acres

$Q_2 = 25.3 \times 2.32 = 58.7$ cfs

$Q_T = Q_1 + Q_2 = 17 + 58.7 = 75.7$ cfs

Level Area to crest elev 460 200 x 700 = 3.2 acres

Sloped area elev 460 to elev. 430, south slope to flume 100 x 900 = 2 acres

$Q_T = Q_1 + Q_2 + Q_3$
$17 + 58.7 + (5.2 \times 2.32) = 87.8$ cfs

Flume on south slope
Bench drain 1300 x 350 = 10.4 acres
$Q = q \cdot A = 2.32 \times 10.4 = 24.2$ cfs

Embankment south slope from flume, west to river
100' x 800 = 1.8 acres

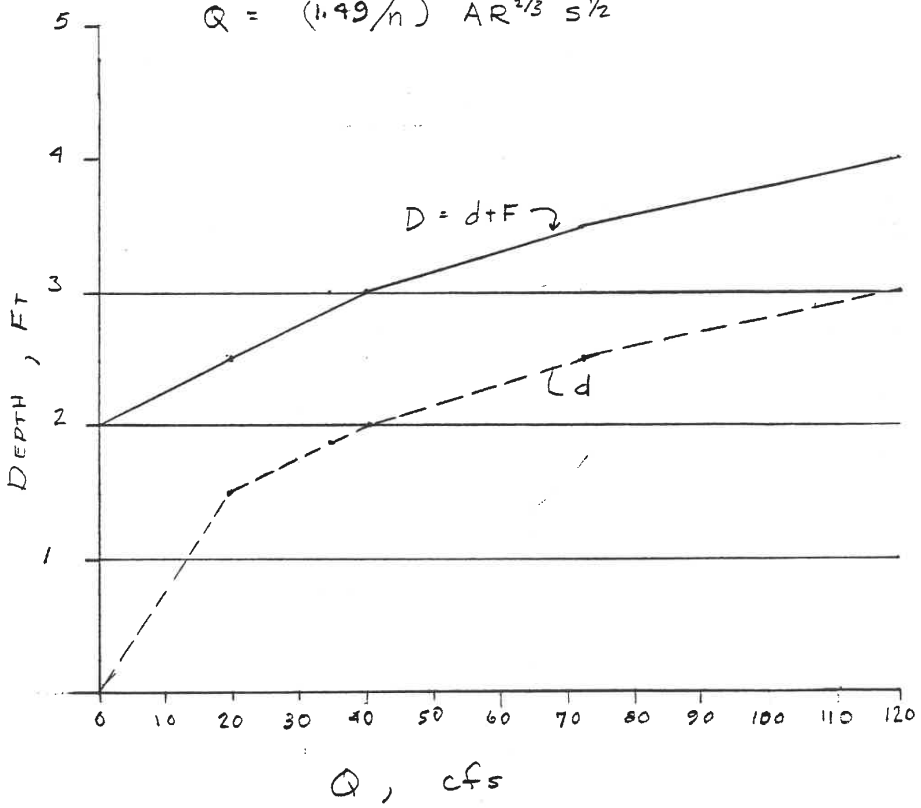
$Q_T = 87.8 + 24.2 + (1.8 \times 2.32) = 116.3$ cfs

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA

PAGE 10
JOB NO 2204
DATE 03-16-80
BY JWC

TITLE L G&E MILL CREEK
HYDRAULICS

RATING CURVE for "V" CHANNEL
1V: 3H SIDE SLOPES
n = 0.03 S = 0.005
d = flow depth F = free board = 1'
D = d + F
$Q = (1.49/n)\, AR^{2/3} S^{1/2}$



CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 11
JOB NO 2204
DATE 03-17-80
BY JWC

TITLE LG&E - Mill Creek - Site A
HYDRAULICS

INTERCEPTOR CHANNEL SIZING - East & South Slopes
From rating curve

Level AREA To East Flume — Q = 17 cfs, d = 1.5', D = 2.5'

East Flume to South Flume — Q = 87.8 cfs, d = 2.75', D = 3.75'

South Flume to Outlet — Q = 116.3 cfs, d = 3', D = 4'

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA

PAGE 12
JOB NO 2204
DATE 03-17-80
BY JWC

TITLE LG&E - MILL CREEK - SITE A
HYDRAULICS

Flow from Flume on west face of landfill

Area

Landfill crest	-	7.8 acres
Bench drains 1200 x 350'		9.6 acres
Embankment slope below elev 460		
700' x 100' =		1.6 acres
Total		19 acres

Flow: $Q = q \cdot A$
$= 2.32 \times 19 = 44$ cfs

Flow from Flume = 44 cfs

Channel along river bank

Flow: $Q_1 + Q_2 = 44 + 40.6 = 85$ cfs

from rating curve, $d = 2.6'$
$D = 3.75'$

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA

PAGE 13
JOB NO 2204
DATE 03-17-80
BY JWC

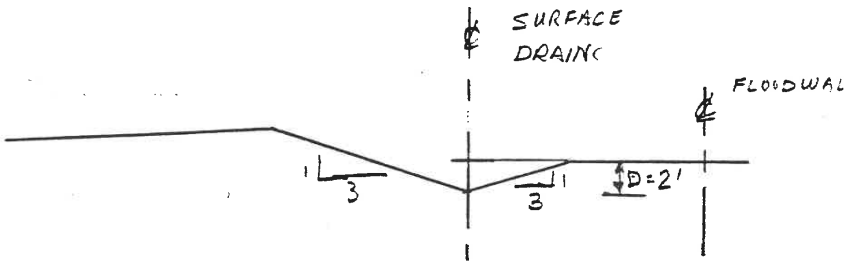
TITLE LGEE - MILL CREEK SITE A
HYDRAULICS

SURFACE DRAIN ALONG FLOODWALL

AFFECTED AREA (MAX) 30'x 1500' = 1 acre

Q_{DESIGN} = 1 x 2.32 = 2.3 cfs.

using rating curve for "V" channel
1V:3H side slopes d = <1'
D = 2'



CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 14
JOB NO 2204
DATE 03-17-80
BY JWC

TITLE L G&E - MILL CREEK - SITE A
HYDRAULICS

SEDIMENTATION CONTROL FACILITY

DESIGN REQUIREMENTS
Total area = 70 acres
Assume a maximum disturbed area of 1/3 total area
A_D = 70/3 ≈ 25 acres

SEDIMENTATION CONTROL FACILITY
REQUIRED VOL = 0.21 × 25 = 5.25 acre-ft

BOTTOM OF SEDIMENTATION POND TO HAVE A 3' THICK BASE LAYER OF STABILIZED WASTE.

ASSUME A DEPTH OF THE BASIN OF 5'

$V = A \cdot D$ 5.25 acre-ft = 5' · A
A = 1.05 acres = 45800 ft²
B = $\sqrt{A}$ = 215'

OUTFLOW FROM BASIN

25 acres × 2 cfs/acre = 50 cfs

use 36" ϕ discharge pipe

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA

PAGE 15
JOB NO 2204
DATE 03-17-80
BY JWC

TITLE LG&E - MILL CREEK - SITE B
HYDRAULICS

SURFACE DRAINAGE CHANNEL

AREA = 50 acres
DESIGN DISCHARGE = 50 x 2.32 = 116 cfs

BASED ON RATING CURVE for "V" channel
with 1V:3H side slopes

d = 3' D = 4'

SEDIMENTATION BASIN

MAXIMUM DISTURBED AREA = 10 acres

VOL. REQ'D = 10 x 0.21 = 2.1 acre-ft = 92,000 FT³

V = A · D say D = 5'

92,000 = A · 5
A = 18,300
B = $\sqrt{A}$ = $\sqrt{18300}$ = 135' SQUARE

use 36"Ø discharge pipe from basin

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 16
JOB NO 2204
DATE 03-17-80
BY JWC

TITLE LG&E - Mill Creek - Site B
Hydraulics

Interceptor Channel - along toe of slope of west slope

Area = 1600' x 50' = 1.8 acres

$Q = q \cdot A = 2.32 \times 1.8 = 4.3$ cfs.

By inspection, use "V" channel with 1V: 3H side slopes with a depth of 1FT

CALCULATION SHEET
IU CONVERSION SYSTEMS, INC.
PHILADELPHIA, PA.

PAGE 17
JOB NO 2204
DATE 03-18-80
BY JWC

TITLE LOUISVILLE GAS & ELECTRIC
STABILITY ANALYSIS

STABILIZED MATERIAL UNCONFINED COMPRESSIVE STRENGTH MIN VALUE = 25 psi = q

COHESIVE STRENGTH, $c_e = q/2 = 25/2 = 12.5$ psi

Determine stability of landfill embankment slope using stability numbers * assuming
1) homogeneous material
2) $\phi = 0$
3) no seepage condition
4) toe circle failure

* REF. FUNDAMENTALS OF SOIL MECHANICS - D. Taylor pg 459

max. slope angle of landfill

Horizontal length 450'
Vertical Height 560 - 430 = 130'
$V/H = 130/450 = 0.2889 = \tan^{-1} i = 16.1°$

Using Fig. 16.26 $i = 16.1°$ $\phi_d = 0$ $D = 1$

$c_d/\gamma H = 0.09$

$\gamma = 100$ PCF $H = 130'$ (max)

$c_d = 0.09 \times 100^{PCF} \times 130' = 1170$ PSF
$= 1170/144 = 8.125$ psi

$F.S = c_e/c_d = 12.5/8.125 = 1.54$ = Factor of Safety.

APPENDIX D

PREVIOUSLY COMPLETED TEST BORING LOGS

CONCRETE PILE COMPANY
GOW DIVISION

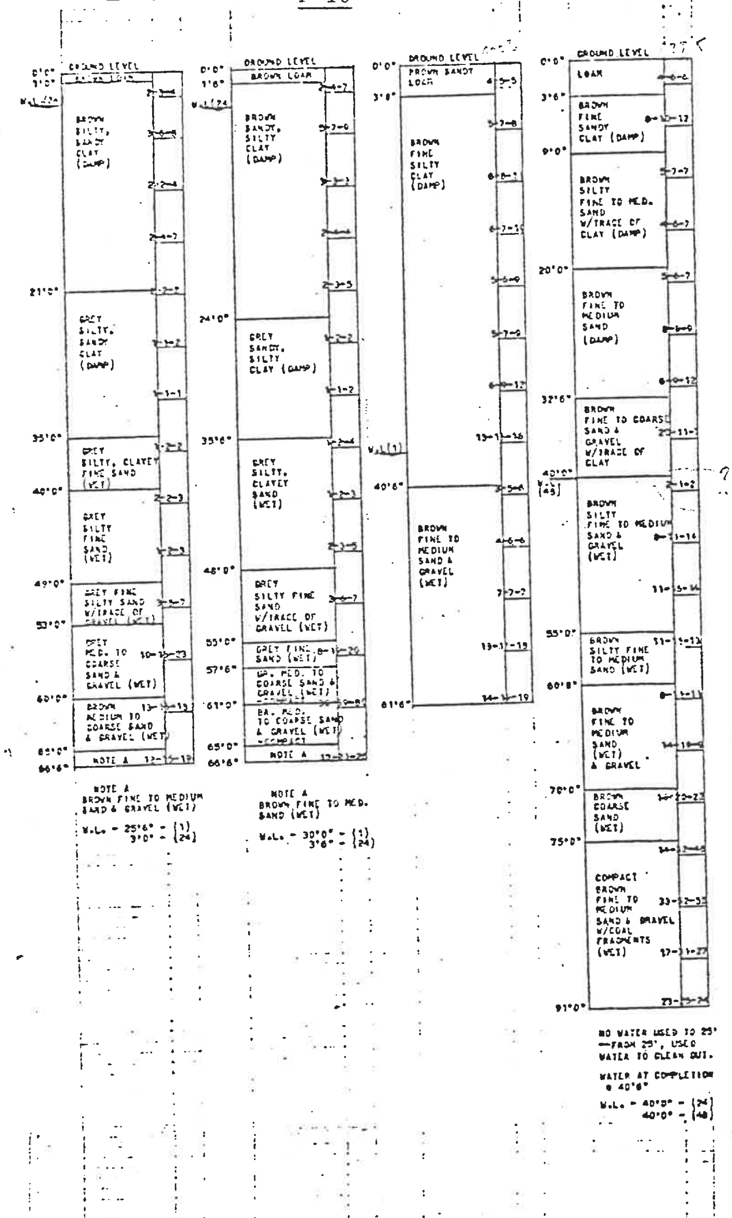
To PIONEER SERVICE & ENGINEERING COMPANY Date FEBRUARY 17, 1968

Location of Borings LOUISVILLE GAS & ELECTRIC COMPANY - MOSMOSDALE SITE - LOUISVILLE, KENTUCKY

All borings are plotted to scale of 1" = 8 ft. using as a fixed datum.

P - 10

No 8 No P-10 No 9 No 9



Classifications are made by visual inspection

Water levels (WL): Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc. may cause changes in these levels.

Figures in right hand column indicate number of blows required to drive

Total Footage 295'-6"
Foreman F. J. BRUCE - C. BRIGHT
Job No. ECB-13609-P3
Classification by FOREMEN

TEST BORING REPORT

RAYMOND

CONCRETE PILE COMPANY

GOW DIVISION

P - 16

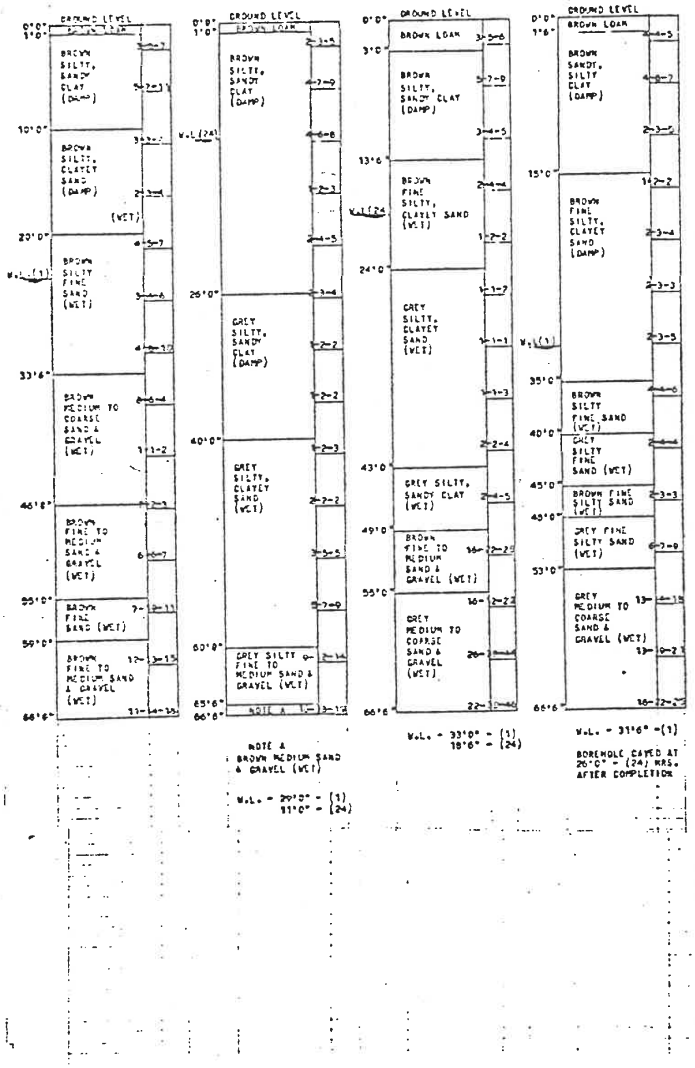
To PIONEER SERVICE AND ENGINEERING COMPANY Date FEBRUARY 17, 1968

Location of Borings LOUISVILLE GAS & ELECTRIC COMPANY - ROBINSDALE SITE - LOUISVILLE, KENTUCKY

All borings are plotted to scale of 1" = 8 ft. using as a fixed datum.

No. 10 No. (11) No. 13 No. P-16

228



Classifications are made by visual inspection

Water levels (W.L. Figure indicates hour of reading) Inches after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels

Figures in right hand column indicate number of blows required to drive 2" O.D. Sampling pipe SEALED using 140 lb. weight falling 30 inches

Total Footage 266'-0"

Foreman L. BRIGHT - F. J. BRUCE

Job No. ECG-12609-P8

Classification by FOREMEN

Sheet 4 of 7

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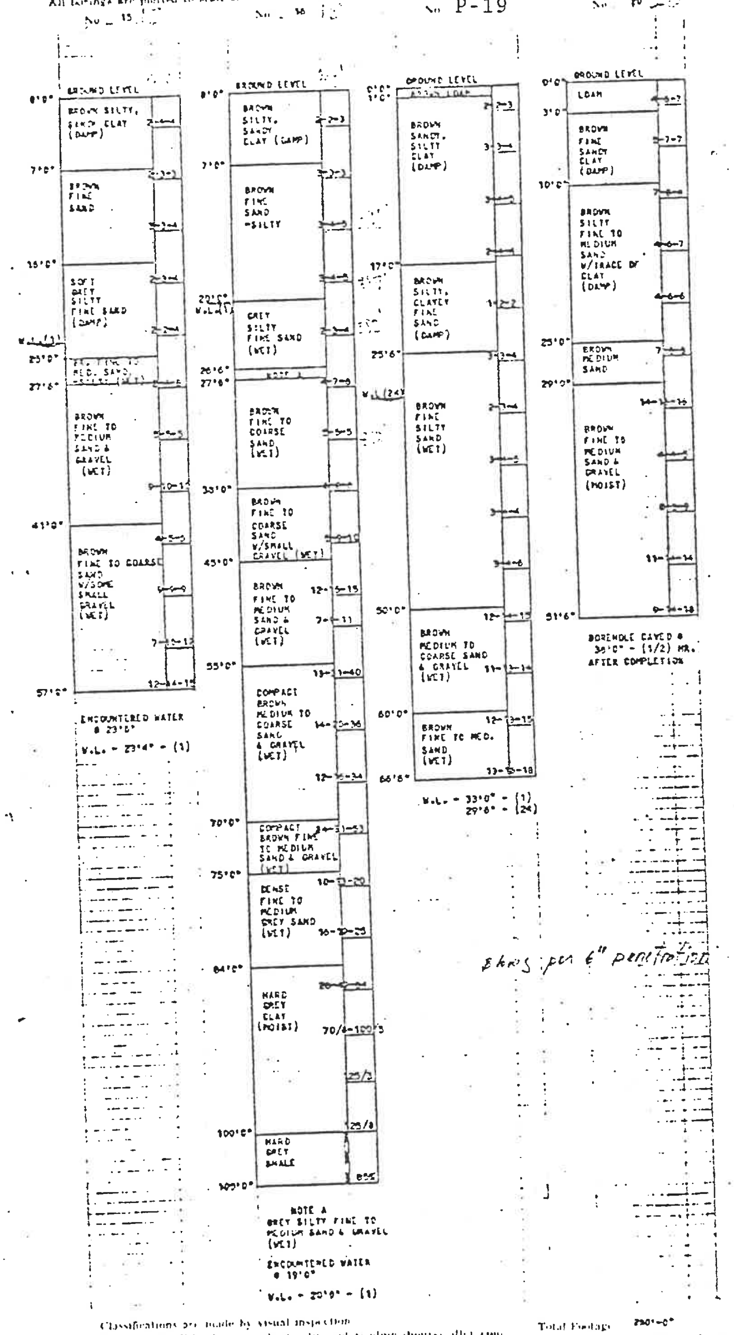
To

Location of Borings LOUISVILLE GAS & ELECTRIC COMPANY - MILL CREEK SITE - LOUISVILLE, KENTUCKY

as a fixed datum.

All borings are plotted to scale of 1" = 8 ft. using



Classifications are made by visual inspection.

Water levels (W.L.): Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc. may cause changes in these levels.

Total Footage 290'-0"

Foreman F. J. KRUKI - E. BRIGHT

Job No. ECB-33609-PB

Ch. Foreman FOREMAN

TEST BORING REPORT

RAYMOND

CONCRETE PILE COMPANY

GOW DIVISION

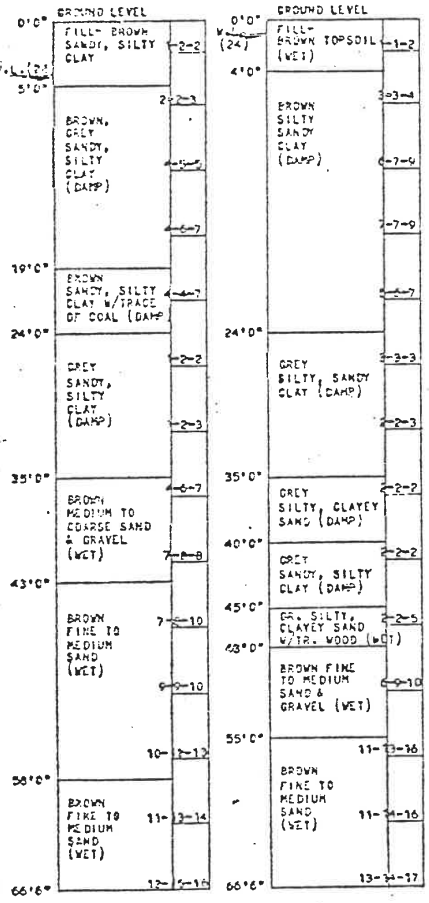
P - 26

To PIONEER SERVICE & ENGINEERING COMPANY Date FEBRUARY 17, 1968

Location of Borings LOUISVILLE GAS & ELECTRIC COMPANY - KOSMOSDALE SITE - LOUISVILLE, KENTUCKY

All borings are plotted to scale of 1" = 8 ft. using as a fixed datum.

No B-25 No. P-26 No No



Classifications are made by visual inspection

Water levels (WL) Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels

Figures in right hand column indicate number of blows required to drive 2" O.D. sampling pipe ~~maximum~~ 6" using 140-lb. weight falling 30 inches

Total Footage 133'-0"

Foreman E. J. KRUCK - E. BRIGHT

Job No ECB-13609-P8

Classification by FOREMEN

Sheet 7 of 7

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MILTON M. GREENBAUM ASSOCIATES, inc. • CONSULTING ENGINEERS

TEST BORING REPORT

CLIENT: Louisville Gas & Electric Company P. N. D-399

PROJECT: Mill Creek Plant HOLE NO. 5

LOCATION:

DRILLER: T. Grounds LOGGED BY: T. Grounds DATE STARTED: 10-18-69

ELEVATION REFERENCE: 442.8' DATE COMPLETED: 10-18-69

DEPTH TO WATER: IMMEDIATELY DAYS AFTER

NOTES Type & Size of Hole Type of Bit or Spoon Loss of Drilling Water	DESCRIPTION & Classification of Materials	Depth	Samples for testing	No. Blows & Core Recovery %
Standard Penetration: [illegible]" Split Spoon 140 lb. Hammer 30" Drop	Dry- Tan Silt Clay		P	5-7
			P	5-6
			P	4-7
			P	10-13
		5'	P	7-8
	Moist Brown Silt Clay		P	12-16
			P	8-13
			P	12-14
			P	6-8
		10'	P	12-15
			P	8-6
			P	9-13
			P	5-3
			P	9-7
		15'	P	7-7
	Moist Silt Clay Sand and Silt Sand Laminations		P	6-8
			P	2-3
			P	4-4
			P	5-4
		20'	P	6-9
	Moist Silt Clay		P	5-4
			P	5-6
			P	4-4
			P	6-6
		25'	P	5-7
6 1/2" O.D. Auger	Moist Silty Very Fine Grained Sand		X	
			X	
			X	
			X	
		30'	X	
	Wet Clean Sand		P	4-7
			P	10-[illegible]
		35'		

PENETRATION RESISTANCE (Blows per foot) • Actual ○ Extrapolated 20 40 60 80

EXPLANATION

No. of BLOWS. ...... Record number of blows required for 6 inches penetration if 25 blows result in less than 6 inches penetration, record depth penetrated, thus 25/4 indicates 4" penetration with 25 blows

DESCRIPTION AND CLASSIFICATION OF MATERIALS .... Describe soil type, with emphasis on inplace or natural condition. Include soil classification group symbol. EXAMPLE: SAND medium, clean [illegible], firm, [illegible], uncemented, (SP).

[illegible] RESISTANCE ..... [illegible]

SAMPLES. .... P-Penetration, X-Auger, W-Wash, C-Core.

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MILTON M. GREENBAUM ASSOCIATES, inc. • CONSULTING ENGINEERS

TEST BORING REPORT

CLIENT Louisville Gas & Electric Company P. N. D-399

PROJECT Mill Creek Plant HOLE NO. 6

LOCATION

DRILLER T. Grounds LOGGED BY J. Grounds DATE STARTED 10-16-69

ELEVATION REFERENCE 444.6' DATE COMPLETED 10-16-69

DEPTH TO WATER: IMMEDIATELY none DAYS AFTER

NOTES Type & Size of Hole Type of Bit or Spoon Loss of Drilling Water	DESCRIPTION & Classification of Materials	Depth	Samples for testing	Log	PENETRATION RESISTANCE (Blows per foot) ● Actual ○ Extrapolated 20 40 60 80	No. Blows & Core Recovery	%
6 1/2" O. D. Auger	2" Topsoil		x				
	Dark Brown Clay Silt Moist		x				
		5'	x				
		10'	x				
		15'	x				
	Brown Wet Silt		x				
		20'	x				
		25'	x				
	Brown Moist Fine Sand 27'-30'		x				
		30'	x				

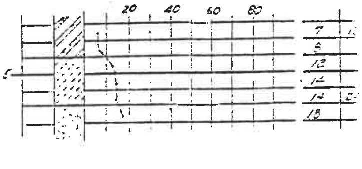
EXPLANATION

No. of BLOWS....... Record number of blows required for 6 inches penetration if 25 blows result in less than 6 inches penetration, record depth penetrated; thus 25/4 indicates 4" penetration with 25 blows.

DESCRIPTION AND CLASSIFICATION OF MATERIALS . . . Describe soil type, with emphasis on inplace or natural condition. Include soil classification group symbol. EXAMPLE SAND, medium, clean, moist, firm, dense, uncemented, (SP).

PENETRATION RESISTANCE Plot, as shown to right, with dashed lines showing the material considered to be represented by each penetration value.

SAMPLES............ P-Penetration, X-Auger, W-Wash, C-Core



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MILTON M. GREENBAUM ASSOCIATES, inc. • CONSULTING ENGINEERS

TEST BORING REPORT

CLIENT: Louisville Gas & Electric Company — P. N. D-399

PROJECT: Mill Creek Plant — HOLE NO. 1 (2nd Drilling)

LOCATION: Inside Cofferdam

DRILLER: T. Grounds — LOGGED BY: T. Grounds — DATE STARTED: 11-6-69

ELEVATION REFERENCE: 391 — DATE COMPLETED: 11-6-69

DEPTH TO WATER: IMMEDIATELY 9' — DAYS AFTER

NOTES: Type & Size of Hole, Type of Bit or Spoon, Loss of Drilling Water	DESCRIPTION & Classification of Materials	Depth	Samples for Testing	No. Blows & Core Recovery
5 1/2" Hollow Stem Auger	Silt- Sand Brown		x x x	
Standard Penetration: 2" Split Spoon, 140 lb. Hammer, 30" Drop	Grey Moist Silt Sand	5'	p p x x	4-4 / 5-6
	Grey Brown Fine Wet Running Sand	10'	x p p x x	-1 / 1-2
	Brown Grey Fine Wet Sand- Silt	15'	x p p x x	3-4 / 4-6
	Coarse Clean Wet Sand- Small Gravel- Some Fine Sand	20'	x p p x x	-4 / 3-6
	Coarse Clean Wet Sand Small Gravel	25'	x p p x x	-5 / 6-6
	Medium Wet Sand- Some Shale Medium Rock- Coarse Sand	30'	x p p x x	10 / 10-12
	Fine Medium Wet Sand	35'	x p p x x	-9 / 13-12
	Coarse Sand- Small Medium Gravel Small Recovery		x p p	-13 / 19-23

PENETRATION RESISTANCE (Blows per foot): o Actual, Extrapolated; 20, 40, 60, 80

EXPLANATION (continued)

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MILTON M. GREENBAUM ASSOCIATES, inc. • CONSULTING ENGINEERS

TEST BORING REPORT

CLIENT: Louisville Gas & Electric Company — P. N. D-399

PROJECT: Mill Creek Plant — HOLE NO. 1 (2nd Drilling) continued

LOCATION: Inside Cofferdam

DRILLER: T. Grounds — LOGGED BY: T. Grounds — DATE STARTED: 11-6-69

ELEVATION REFERENCE: 391 — DATE COMPLETED: 11-6-69

DEPTH TO WATER: IMMEDIATELY 9' — DAYS AFTER

NOTES Type & Size of Hole Type of Bit or Spoon Loss of Drilling Water	DESCRIPTION & Classification of Materials	Depth	No. Blows & Core Recovery
6 1/2" Hollow Stem Auger			
Standard Penetration: 2" Split Spoon 140 lb. Hammer 30" Drop	Coarse Clean Sand- Small Gravel Wet	45'	30-33 33-40
	Fine Medium Sand - Small Gravel Wet	50'	50*-33 40-46
	Coarse Gravel and Sand- Wet	55'	30-36 38-46
	Medium Sand- Small Gravel Wet	60'	30-38 43-50
	Medium Large Gravel Coarse Sand- Wet	65'	40-39 44-48
	*Taken inside hollow stem auger		

PENETRATION RESISTANCE (Blows per foot): ○ Actual, □ Extrapolated; scale 20, 40, 60, 80

EXPLANATION

No. of BLOWS: Record number of blows required for 6 inches penetration. If 25 blows result in less than 6 inches penetration, record depth penetrated, thus 25/4 indicates 4" penetration with 25 blows.

DESCRIPTION AND CLASSIFICATION OF MATERIALS: Describe soil type, with emphasis on ... [illegible]

PENETRATION RESISTANCE: [illegible]

SAMPLER: [illegible] ... Undisturbed, C Core

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LOG OF BORING NO. AT-78 Page 2 of 2

Mill Creek Generating Station
Louisville Gas & Electric Company

PROJECT NO. E-78183 DATE: 8-22-79 LOCATION:

COMPLETION DEPTH	37.5 FT.
BORING METHOD	HSA
ROCK CORE DIA	IN.
SURFACE ELEVATION	

DEPTH SCALE FT	STRATUM DEPTH FT	SAMPLE DEPTH	STANDARD PENETRATION BLOWS/6 in. INCREMENTS	RECOVERY %	SHELBY TUBE
	42.5		16		
Brown wet dense SILTY fine to coarse SAND(SM) with little fine Gravel			14/21	100	
40					
45					

Unconfined Compressive Strength, TSF: 1 2 3 4 5
Natural Dry Density, PCF: 90 100 110 120 130
Water Content, % Plast. Lim., % Liq. Lim., %: 10 20 30 40 50
Standard Penetration, Blows/Ft.: 10 20 30 40 50

WATER LEVEL OBSERVATIONS

NOTED ON RODS	17	FT
AT COMPLETION		FT
AFTER HRS		FT

NOTES

ATEC ASSOCIATES

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LOG OF BORING NO. AT-78

Page 1 of 2

Mill Creek Generating Station
Louisville Gas & Electric Company

PROJECT NO. E-78283 DATE: 3-22-79 LOCATION:

COMPLETION DEPTH 37.5 FT.
BORING METHOD HSA
ROCK CORE DIA IN.
SURFACE ELEVATION

DEPTH SCALE FT		STRATUM DEPTH FT	SAMPLE DEPTH	STANDARD PENETRATION BLOWS/6 in. 3-6 in. INCREMENTS	RECOVERY %	SHELBY TUBE
	Brown moist soft SILTY CLAY (CL) with little to some fine Sand and trace Organics (fine roots)			2 2/3	100	
5	-Brown fine Silty Sand seam at 3.5 ft, medium stiff below 3.5 ft			3 3/5	100	
				3 3/4	100	
	-alternating layers of Silty Clay and Silty Sand below 8.5 ft			4 3/4	100	
10		10.5				
	Brown moist medium dense SILTY fine to medium SAND (SM) with Clayey Silt and Silty Clay seams	13.0		5 4/7	100	
15	Brown moist medium dense SILTY fine SAND(SM) to SANDY SILT (ML) with Silty Clay inclusions	15.5		3 6/5	100	
		18.0		3 4/5	100	
20	Brown moist loose SILTY fine to medium SAND (SM) with trace Clay and plastic Clay seam			2 3/5	100	
	Brown moist to very moist loose SILTY fine SAND (SM) with numerous Silty Clay and Sandy Silt layers			3 3/4	100	
25	-predominantly Silty Clay layering at 21 ft	25.5		3 7/5	100	
	-predominantly Sandy Silt layering at 23.5 ft	28.0		2 3/6	100	
	Brown wet soft SILTY CLAY (CL) with Sandy Silt and Silty Sand seams			3 4/8	100	
30	Brown very moist layered SANDY SILT (ML), SILTY SAND (SM) and SILTY CLAY (CL) -with trace Gravel and fine Sand seam at 36 ft			7 4/5	100	
				4 6/12	100	

Unconfined Compressive Strength, TSF: 1 2 3 4 5
Natural Dry Density, PCF: 90 100 110 120 130
Water Content, % ☒ Plast. Lim., % ☐ Liq Lim., %: 10 20 30 40 50
Standard Penetration, Blows/Ft.: 10 20 30 40 50

WATER LEVEL OBSERVATIONS

NOTED ON RODS 17 FT
AT COMPLETION FT
AFTER HRS. FT

NOTES

ATEC ASSOCIATES

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LOG OF BORING NO. AT-79

Mill Creek Generating Station
Louisville Gas & Electric Company

PROJECT NO. E-78203 DATE: 2-20-79 LOCATION:

COMPLETION DEPTH 35.0 FT.
BORING METHOD HSA
ROCK CORE DIA IN.
SURFACE ELEVATION

DEPTH SCALE FT		STRATUM DEPTH FT	SAMPLE DEPTH	STANDARD PENETRATION BLOWS/6 in. 3-6-6 INCREMENTS	RECOVERY %	SHELBY TUBE
	Brown moist medium stiff SILTY CLAY (CL) with little to some Sand and Silty Sand seam	3.0		3 2/4	100	
5	Brown moist medium stiff SILTY CLAY (CL) with trace fine Sand			3 3/4 3 4/4	90 100	
10		10.0			100	
	Brown moist medium stiff SANDY CLAY (CL) with Sand seams	13.0		3 4/4	75	
15	Brown moist loose laminated SILTY SAND, SANDY SILT and SILTY CLAY	15.5		3 2/3	100	
	Brown moist loose SILTY SAND (SM) with Silty Clay and Clayey Silt layers	18.0		2 3/3	100	
20	Brown very moist medium stiff to loose laminated SILTY CLAY, SILTY SAND and SANDY SILT			2 2/5 2 3/5	100 100	
25	-predominantly Silty Clay and Clayey Silt laminates at 21 ft -medium dense predominantly Silty Sand and Sandy Silt laminates at 26 ft with Silt layer			3 3/4 4 5/7	100 100	
30	-wet below 28.5 ft -Brown and Gray Silty Clay layer at 33.5 ft			4 6/8	100	
	Brown wet medium dense SILTY fine to coarse SAND (SM) and Gravel	34.0		17 13/14	100	

Unconfined Compressive Strength, TSF: 1 2 3 4 5
Natural Dry Density, PCF: 90 100 110 120 130
Water Content, % ▣ Plast. Lim., % ▣ Liq. Lim., %: 10 20 30 40 50
Standard Penetration, Blows/Ft.: 10 20 30 40 50

WATER LEVEL OBSERVATIONS
NOTED ON RODS 12.5 FT
AT COMPLETION FT
AFTER HRS FT

NOTES
-test hole caved at 10 ft

ATEC ASSOCIATES

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LOG OF BORING NO. AT-80 Page 1 of 2

Mill Creek Generating Station
Louisville Gas & Electric Company

PROJECT NO. S-78263 DATE: 2-21-79 LOCATION:

COMPLETION DEPTH 55.0 FT.
BORING METHOD HSA
ROCK CORE DIA IN.
SURFACE ELEVATION

DEPTH SCALE FT		STRATUM DEPTH FT	SAMPLE DEPTH	STANDARD PENETRATION BLOWS/6 in. (N-Value) INCREMENTS	RECOVERY %	SHELBY TUBE
	Brown moist stiff SILTY CLAY (CL) with trace Sand and Organics (fine roots)			5 6/8	100	
5						
	-organics absent below 8.5'			3 6/7	100	
10						
				4 5/6	100	
15						
		17.5				
	Brown moist loose SILTY SAND (SM) to SANDY SILT (ML) with Silty Clay seam			3 3/5	75	
20		22.0				
	Brown moist medium stiff SILTY CLAY (CL) with little Sand			3 2/6	100	
25						
	-Silty Sand seam at 28.5 ft			2 5/5	100	
30						
		32.5				
	Brown moist loose SILTY fine SAND (SM) with Sandy Silt and Silty Clay pockets			3 4/6	100	

Unconfined Compressive Strength, TSF: 1 2 3 4 5
Natural Dry Density, PCF: 90 100 110 120 130
Water Content, % ☒ Plast. Lim., % ☐ Liq. Lim., %: 10 20 30 40 50
Standard Penetration, Blows/Ft.: 10 20 30 40 50

WATER LEVEL OBSERVATIONS

NOTED ON RODS 38 FT
AT COMPLETION 45 FT
AFTER HRS. FT

NOTES

ATEC ASSOCIATES

P-135

LOG OF BORING NO. AT-80 Page 2 of 2

Mill Creek Generating Station
Louisville Gas & Electric Company

PROJECT NO. E-78283 DATE: 2-21-79 LOCATION:

COMPLETION DEPTH 55.0 FT.
BORING METHOD HSA
ROCK CORE DIA IN.
SURFACE ELEVATION

DEPTH SCALE FT	STRATUM DEPTH FT	SAMPLE DEPTH	STANDARD PENETRATION BLOWS/6 in. 3-6 in. INCREMENTS	RECOVERY %	SHELBY TUBE
40			2 3/4	100	
			2 3/5	100	
	43.0				
			3 2/6	100	
45	45.5				
			4 6/8	100	
	48.0				
			2 3/6	100	
50					
	51.8		7 6/10	100	
	53.0				
			20 20/18	100	
55					

Brown moist loose SILTY fine SAND (SM) with Sandy Silt and Silty Clay pockets

Brown very moist medium stiff CLAYEY SILT (ML) with little Sand to SANDY SILT (ML)

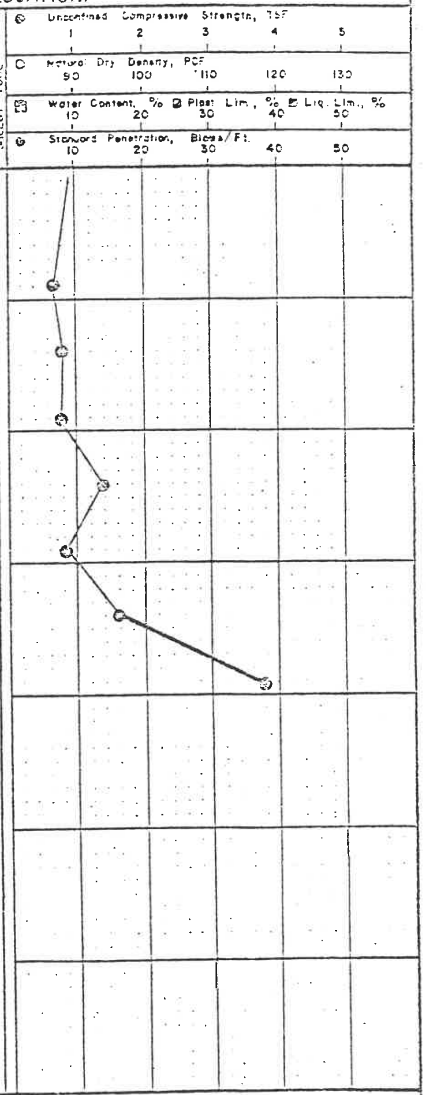
Brown moist medium dense SILTY fine SAND (SM)

Brown moist interlayered SILTY CLAY (CL) and CLAYEY SILT (ML) with some Silty Sand and Sandy Silt seams

-Silty Sand pocket at 51'

Gray moist medium dense SILTY fine SAND (SM)

Gray wet dense SILTY fine to coarse SAND (SM) with little Gravel



WATER LEVEL OBSERVATIONS

NOTED ON RODS	38	FT
AT COMPLETION	45	FT
AFTER HRS.		FT

NOTES
-two samples obtained for 51.0-52.5 ft interval
-3 ft heave into augers prevented 58.5-60.0 ft sample

ATEC ASSOCIATES

APPENDIX E

REFERENCES

REFERENCES

Application For Preliminary Landfill Site Approval for Disposal of Stabilized Power Plant Wastes, Louisville Gas & Electric Company, Mill Creek Station, Jefferson County, Kentucky, July 1979