

**Subsurface Exploration
and Geotechnical Report**

**Manhattan Corporate
Technology Park**



April 27, 2001

Mayor Bruce Snead
City of Manhattan, Kansas
City Hall, 1101 Poyntz Avenue
Manhattan, Kansas 66502-5497

RE: Manhattan Corporate Technology Park
Wildcat Creek Road and Technology Circle
Manhattan, Kansas
Job No. 2015102

Dear Mayor Snead and City Commissioners:

The City of Manhattan retained GeoSystems Engineering, Inc. to undertake a subsurface exploration of the Manhattan Corporate Technology Park (MCTP). The main focus of the subsurface exploration was to delineate areas where subsurface conditions could require atypical construction techniques or time frames to develop buildings, parking lots and roads.

We are pleased to report that we have completed the assigned task. We have developed drawings and other data allowing us to assign a constructability rating for the lots that remain to be developed at the Corporate Technology Park.

The following report describes the methods used to collect and evaluate the subsurface data, and provides drawings and maps that identify areas where problem soils and/or shallow groundwater conditions exist. It also provides general geotechnical engineering recommendations for site preparation and foundation design to deal with the soil and/or shallow groundwater conditions that are encountered.

The City of Manhattan and potential developers should recognize that the subsurface exploration and general geotechnical engineering recommendations presented in this report are not intended as a substitute for the more detailed subsurface exploration that would normally be required when an individual parcel or building site is developed within the MCTP. Each prospective building site will have a unique set of subsurface and groundwater conditions that must be individually addressed within the context of the particular foundation loading conditions, site grading requirements and pavement traffic conditions of a given project. Specific geotechnical engineering recommendations must be developed for each of the remaining building sites.

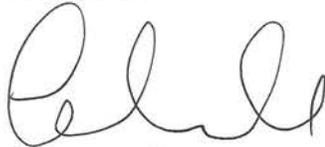
Manhattan Corporate Technology Park
Manhattan, Kansas
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This completes our current scope of services for this project. We would like to thank Mr. Scott Crain, your City Engineer, for all the help and assistance that he provided. We appreciate the opportunity to be of service to the City of Manhattan on this project. If you have any questions regarding this report or if we can be of further service in any way, please contact us at your convenience.

Respectfully submitted,
GeoSystems Engineering, Inc.



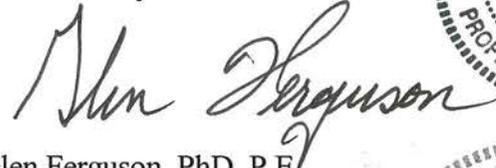
John J. Zey, P.E.
Kansas: 8574



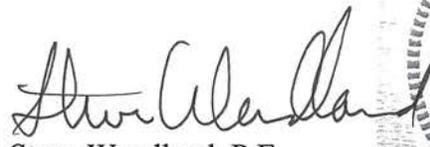
Christian Mordhorst, P.E.
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Reviewed By:



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Kansas: 12618



EXECUTIVE SUMMARY

The City of Manhattan retained GeoSystems Engineering, Inc. to undertake a subsurface exploration of the Manhattan Corporate Technology Park (MCTP). The main focus of the subsurface exploration was to delineate areas where subsurface conditions could require atypical construction techniques or time frames to develop buildings, parking lots and roads.

The information obtained from the borings and other sources indicated that the MCTP site has areas that are underlain by shallow groundwater and soil conditions that could impact site development. These areas have been delineated on Figure 101 in Appendix A, which indicates a constructability rating for the remaining lots in the MCTP development. As can be seen from the figure, the MCTP development has been divided into areas that have been shaded in **green, red and blue**.

Green shaded areas have been assigned a high constructability rating. These are areas within the MCTP development that are underlain by typical river valley and upland soil deposits that are not expected to pose any special construction measures during development.

Areas shaded in **red** on Figure 101 were assigned a low constructability rating. In these areas, there was evidence of soil and/or shallow groundwater conditions that may increase development costs or require a longer construction period. Most of the lots that were assigned a low constructability rating were due to shallow groundwater as opposed to problem soil conditions. For the areas with a low constructability rating, the data indicates that dewatering in conjunction with soil stabilization, undercutting and/or preloading of the onsite soils may be required to develop stable subgrades for support of building foundations, floor slabs and pavement sections.

Blue shaded areas have been assigned an intermediate constructability rating and are indicative of those areas that fall between high and low rated areas. These areas are not expected to have significant groundwater problems or problems with soft, natural soils. Rather, most of these areas have been filled or disturbed by previous site grading or construction. Site development in these areas may require more extensive site preparation to develop subgrades that are suitable for support of building foundations, floor slabs and pavements.

As can be seen from Figure 101, the vast majority of the MCTP site is not expected to require any special construction techniques or extended time frames for development. Even the sites that have been assigned a low constructability rating can be successfully developed with the aid of an experienced and knowledgeable geotechnical engineer.

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Appendix A

Figure 101 - Proposed Delineation Diagram

Appendix B

Figure 1 – Boring Location Diagram

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2 – Boring Locations & Contour Diagram

3 – Boring & Section Locations Diagram
Sections

Appendix C

Figure 11 – Apparent Features Diagram

12 – Site Soil Associations

13 – Soil Type Boundaries

14 – Historical Aerial Photo of 1995

15 – Extent of Previously Reported
Groundwater Problems

16 – Inferred Groundwater Contours

Table T-2 – List of Documents

Prepared by:

GeoSystems Engineering

Presented:

April 27, 2001

Table T - 2 : List of Documents Reviewed (Page 1 of 2)

Job No. 2015102

No.	Description	Date	Source
1	Soil Survey of Riley County and Part of Geary County, Kansas	June 1975	USDA, Soil Conservation Service
2	Official Kansas Transportation Map	1991 - 1992	State of Kansas
3	Aerial Photo: ZA-5G-192 - Date of Photography: August 17, 1950		
4	Aerial Photo: 30-507 - Date of Photography: March 1986	01.01.1989	Conley, Kight & Eckford, Inc.
5	Aerial Photo - Date of Photography: April 1995	04.10.2001	Schwab-Eaton, P.A.
6	City Commission Agenda Memo	08.31.2000	City of Manhattan
7	Drawing Page 1 - Boring Locations at MCTP*	08 / 2000	City of Manhattan
8	Proposed Cessna Site. Preliminary soil investigation	10.24.1994	Wayne W. Williams
9	Baseline Soil and Groundwater Assessment, Proposed [MCTP]	01.21.1997	DPRA
10	Geotechnical Engineering Report. Project Tech	05.15.1998	Terracon
11	Soils Investigation For Western Wireless Site in MCTP	03.12.1999 **	R.M. Haynie & Associates
12	Wireless Building	04.07.1999	Donald M. Duncan
13	Geotechnical Engineering Report. Western Wireless Project	04.28.1999	Terracon
14	Soils Investigation For Corp. Drive Subgarde in [M]CTP	01.13.2000 **	R.M. Haynie & Associates
15	Drawing: Preliminary Plat - MCTP - Unit 1	April 1998	Schwab-Eaton, P.A.
16	Drawing: Preliminary Plat - MCTP - Unit 2	Feb. 1999	BG Consultants, Inc.
17	Drawing: Preliminary Plat - MCTP - Unit 3	April 1999	BG Consultants, Inc.
18	Drawing: Preliminary Plat - MCTP - Unit 4	May 12, 1999	BG Consultants, Inc.
19	Drawing Set - MCTP - San. Sewer Improvements, Phase 2	July 26, 1999	BG Consultants, Inc.
	Sheet 1 of 18 Title Sheet		
	Sheet 2 Final Plat		
	Sheet 3 Project Location & Misc. Details		
	Sheet 4 to 13 Plan and Profile Sheet Sewer		
	Sheet 14 to 16 Plan and Profile Sheet Force Main		
	Sheet 17 Sanitary Sewer Construction Details		
	Sheet 18 Pump Station		
20	Drawing Set - MCTP - Street, Storm & San. Sewer Improvements	June 4, 1999	BG Consultants, Inc.
	Sheet 1 of 13 Title Sheet		
	Sheet 2 Final Plat		
	Sheet 3 Plan and Profile Sheet		
	Sheet 4 Street Details		
	Sheet 5 Storm Sewer Construction Details		
	Sheet 6 Inlet and Manhole Details		
	Sheet 7 to 11 Cross Sections	all missing	
	Sheet 12 Plan and Profile Sheet	missing	
	Sheet 13 Sanitary Sewer Construction Details	missing	

* MCTP = Manhattan Corporate Technology Park

** approximate

Table T - 2 : List of Documents Reviewed (Page 2 of 2)

Job No. 2015102

No.	Description	Date	Source
21	Drawing Set - MCTP* - Street & Storm Drainage Improvements	Dec. 10, 1999	BG Consultants, Inc.
	Sheet 1 of 61 Title Sheet		
	Sheet 2 Final Plat		
	Sheet 3 Project Location Map & Summary of Quantities		
	Sheet 4 to 6 Street Plan and Profile Sheets		
	Sheet 7 to 29 Street Cross Sections	all missing	
	Sheet 30 to 31 Line A - Plan and Profile Sheets		
	Sheet 32 to 35 Line A - Cross Sections	all missing	
	Sheet 36 Line B - Plan and Profile Sheets		
	Sheet 37 Line C - Plan and Profile Sheets		
	Sheet 38 to 40 Line C - Cross Sections	all missing	
	Sheet 41 Line D - Plan and Profile Sheets		
	Sheet 42 to 43 Berm - Plan and Profile Sheets		
	Sheet 44 to 55 Cross Sections	all missing	
	Sheet 56 Street Detail Sheet		
	Sheet 57 Sidewalk Details		
	Sheet 58 Storm Sewer Construction Detail		
	Sheet 59 Ditch Inlet, Type 1		
	Sheet 60 Reinforced Concrete Manhole		
	Sheet 61 Elliptical Pipe Detail		
22	Drawing Set - MCTP - Water Utility Extension - Phase 1	June 1999	Schwab-Eaton, P.A.
	R1 (of 8) Title Sheet		
	R2 to R8 Plan & Profile		
23	Drawing Set - Project Tech - Street Improvements	04.13.1998	City of Manhattan
	Sheet 1 of 6 Title Sheet		
	Sheet 2 Plan & Profile		
	Sheet 3 Details		
	Sheet 4 to 5 Cross-Sections		
	Sheet 6 Site Grading Cross-Sections		
24	Boring Log - MCTP	04.19.2001	Schwab-Eaton, P.A.

* MCTP = Manhattan Corporate Technology Park

SUBSURFACE EXPLORATION AND GEOTECHNICAL REPORT
MANHATTAN CORPORATE TECHNOLOGY PARK
WILDCAT CREEK AND TECHNOLOGY CIRCLE
MANHATTAN, KANSAS

Job No. 2015102

April 27, 2001

INTRODUCTION

GeoSystems has completed the subsurface exploration and geotechnical engineering services that were requested for the Manhattan Corporate Technology Park (MCTP). The purpose of the subsurface exploration was to delineate areas within the MCTP site where subsurface conditions could require atypical construction techniques or time frames to develop buildings, parking lots and roads.

Because the MCTP was a relatively large development, encompassing more than 200 acres, our approach to developing comprehensive information on the site subsurface and groundwater conditions relied on the following facets.

1. A thorough review of existing subsurface information obtained from boring logs and geotechnical reports developed by others; notes and other written or oral information from City Inspectors and Contractors that have previously worked at the site.
2. An examination of existing geologic maps, USDA soil survey maps and aerial photographs of the site to identify areas where former stream channels and/or other isolated geologic features may exist.
3. Subsurface exploration work carried out by GeoSystems to develop additional information on subsurface conditions in key areas identified by our review of the existing information. This included sixty (60) exploratory test borings and the installation of nine (9) permanent piezometers to allow long term monitoring of groundwater levels.

BACKGROUND INFORMATION

We understand that the approximately 200-acre Manhattan Corporate Technology Park (MCTP) site was purchased by the City of Manhattan in the mid 1990's. The streets, sewers, drainage channels and other infrastructure were essentially completed in the latter part of 2000, with final grading and completion of some of the open channel drainageways continuing into the early part of 2001.

It is understood that shallow groundwater and unstable soils were initially encountered during the construction of the northern half of Corporate Drive. These conditions resulted in additional construction expense and time delays in completing the work. It is further understood that shallow groundwater and unstable soils were encountered during the preliminary site grading work of Lot 4, which was being developed for the Western Wireless building. Lot 4 was ultimately abandoned by Western Wireless, who chose instead to locate their building on Lot 28 in the MCTP.

SUBSURFACE EXPLORATION PROCEDURES

The planning for the subsurface exploration work began with a thorough review of the available subsurface information developed by others, as well as an examination of soil survey maps developed by US Department of Agriculture, aerial photographs from 1950, 1986 and 1995 and various plans, topographic maps and other relevant information on the geology of the MCTP site. Table T-2 in Appendix C lists the documents that were obtained and reviewed. This Appendix also lists a number of figures that summarize the applicable findings and/or present other miscellaneous data.

The subsurface exploration for this project was conducted in two separate phases. The initial phase was performed between February 6 and February 9, 2001 and consisted of twenty-five (25) borings. These borings were generally drilled in areas where only a limited amount of subsurface data was available. The information from this phase was used in conjunction with the data developed by others to gain an understanding of the general geology and potential problem areas within the MCTP site. The second phase of the exploration focused on obtaining subsurface and groundwater information in areas where shallow groundwater and/or potentially problem subsurface conditions were identified from the previous

borings and other data. The second phase of the subsurface was conducted between March 14 and 21, 2001 and consisted of thirty-five (35) borings, including the installation of nine (9) permanent piezometers to allow long term monitoring of the groundwater table.

Figure 1 in Appendix B shows the approximate locations of the borings with reference to the existing City Streets, Lot lines and boundary of the MCTP. The boring locations were initially established by GeoSystems personnel. Following completion of the field work, the coordinates and surface elevations of the borings were surveyed by Schwab-Eaton, P.A. This information is presented on the individual boring logs, which are contained in Appendix B of this report.

The borings were performed with a truck-mounted, rotary drill rig using solid-stem augers to advance the boreholes. Representative samples of the onsite soils were obtained at selected intervals using the Shelby tube and split-barrel sampling procedures outlined in ASTM Specifications D-1587 and D-1586, respectively. The Shelby tube sampling procedure utilizes a thin walled, steel tube with a sharp cutting edge that is pushed hydraulically into the bottom of the boring to obtain relatively undisturbed samples of cohesive or moderately cohesive soils. The split-barrel sampling procedure utilizes a standard 2-inch O.D. split-barrel sampler that is driven into the bottom of the boring with a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampler the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Resistance Value (N). These "N" values are indicated on the boring logs at the depth of occurrence and provide an indication of the consistency of cohesive and moderately cohesive soils, and the relative density of sands and other granular materials.

The soil samples were sealed and returned to our laboratory for further examination, classification and testing. Boring records are presented in the Appendix of this report and include: soil descriptions, consistency and relative density evaluations, boring depths, sampling intervals and observed groundwater conditions. Conditions encountered in each of the test borings were monitored and recorded by a field geologist. Field logs included visual classification of the materials encountered during drilling, as well as drilling characteristics. Final boring logs are presented in Appendix B of this report and represent an interpretation of the field logs combined with laboratory observation and testing of the samples.

Piezometers were installed at selected boring locations, following completion of drilling and sampling operations. Borings where piezometers were installed are denoted on Figure 1 (Appendix B), by having the boring number underlined, i.e. B-47. Piezometers were installed at boring locations B-27, B-30, B-32, B-35, B-37, B-41, B-43, B-47 and B-57. Details of screened length per piezometer and screened depth are as indicated on the individual boring logs in Appendix B.

LABORATORY TESTING PROCEDURES

Unconfined compression, water content, and density tests were performed on representative portions of the undisturbed samples obtained by the Shelby tube sampler. A calibrated hand penetrometer was used to determine the approximate unconfined compressive strength when samples were deformed or of insufficient size for performing an unconfined compression test. Moisture contents of the disturbed samples obtained by the split-barrel sampler procedure were also determined. The results of the laboratory tests are presented on the respective boring logs.

Atterberg Limits tests were conducted on representative samples of the soil types encountered across the site. These tests provide information on the plasticity of the soil, which is a basis for soil classification and for estimating the potential of soils to change volume with variations in moisture content. Results of these tests are also indicated on the respective boring logs in Appendix B of this report.

As part of the testing program, the soil samples were classified by a geotechnical engineer using visual and manual procedures outlined in ASTM D-2487 and D-2488. The descriptions of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Estimated group symbols according to the Unified Soil Classification System are shown on the boring logs. A brief description of this classification system is included in Appendix B of this report.

SITE CONDITIONS

The MCTP site is located west of the Manhattan Regional Airport, about 3.5 miles southwest of Manhattan, Kansas on Highway K-18. The project site is bounded by Wildcat Creek Road on the west, an existing single-family dwelling on the north, the Manhattan Regional Airport to the east, and an existing

single-family residence to the south. The land west of Wildcat Creek Road is part of the Fort Riley Military Reservation and is generally higher in elevation than the project site.

Prior to the mid 1990's, the MCTP site was predominantly undeveloped, agricultural land. Aerial photographs from 1950, 1986 and 1995 indicated that most of the land was under cultivation, prior to the MCTP development. At the present time, the areas east of Corporate Drive and Sykes Boulevard are cultivated fields. A farmstead, consisting of a residential structure and other farm buildings, was located on Lots 6 and 7 as late as the 1995 aerial photograph.

The general topographic features of the MCTP site are indicated by the contours shown on Figure 2, which is contained in Appendix B of this report. Figure 2 was developed from the April 1999, Preliminary Plat of MCTP - Unit 3, which was prepared by BG Consultants, Inc. The contours indicate that the ground surface generally slopes downward from west to east. There was some rounding at the ends of apparent ridges that form the terraces along the west side of the property. Existing grades in the western half of the site are about 30 feet higher than the northeastern corner of the site, and about 45 feet higher than the southeastern corner of the MCTP site.

To date, the majority of the MCTP site is undeveloped. As indicated by Figure 11 in Appendix C, Lots 2, 5 and 28 have been developed. This figure also indicates the presence of three visible drainage swales over the southern part of the site, as well as an erosional feature, a wet area, and soil stockpiles and an area where fill was observed to have been placed.

The area land around a detention pond near the northeastern corner of the site appears to be 5 to 6 feet higher than the lower lying land to the east of the perimeter fence. It is understood that the detention pond was excavated to its present level. There was also a large diameter drainage pipe that discharges into this retention pond. The pipe appears to have the same alignment as the overlying earth covered drainage swale. Hence, it appears that earth fill has been developed around and above the drainage pipe. Additional berms were observed elsewhere on site.

Aerial photographs indicated that two small creeks previously flowed across the MCTP site. The creeks have been captured at Wildcat Creek Road, and appear to flow underground through storm water pipes

that were recently constructed as part of the MCTP site infrastructure development. It would seem that the water from the former north creek is being transported via a storm pipe that daylights in a detention area, located near the northeastern corner of the site. It is understood that the water from the former south creek flows into the northern of the two concrete lined drainage channels, shown on Figure 11 in Appendix C.

PHYSIOGRAPHY

It is often of interest, to identify to what extent the results of a subsurface investigation confirm earlier published reports of surficial geology. According to the official Kansas Transportation Map of 1991-1992, the site is located in the Flint Hills section of the Great Plains physiographic region of Kansas. The Flint Hills region is a dissected area which has eroded into sedimentary deposits of the Permian Period. During recent geologic history, the area has been mantled with wind deposited loess soils. The loess mantle is relatively thin and in many areas, has been removed by erosion with residual soils being encountered at the surface. Due to the degree of weathering, individual deposits are not always readily discernable.

The Soil Survey of Riley County and Part of Geary County, Kansas, published by the US Department of Agriculture, Soil Conservation Service in June 1975 (herein denoted as the USDA Survey), indicates on a General Soil Map, that there are two Soil Associations on the project site. The lower lying area is described as the Eudora-Haynie-Sarpy Association, which is defined as deep, nearly level silt loams, very fine sandy loams, and loamy fine sands; on terraces and flood plains. The higher area is described as the Smolan-Geary Association, and is defined as deep, gently sloping and sloping silt loams and silty clay loams; on high terraces and uplands. The approximate boundary of these two units is shown on Figure 12 in Appendix C.

References to terraces are typically suggestive of past continental glaciation. According to other published information, it is believed that the Kansas River, which flows just to the south and east of the MCTP site, was approximately the southern terminus of a large continental glacier that once covered much of the northern half of North America. Terraces typically formed along the sides of the glacier, which would have been formed in either a lake or river environment. Hence the bedding pattern would be

complex, consisting of finer grained sediments in the placid environment of a lake, and more complex interbedding or interlayering in an environment of flowing water along the edge of the glacier. After the glacier melted, there are the highlands at the edge of the former glacier that then undergo some slumping and erosion and are mantled over time by wind blown loess deposits.

Within the present day river valleys, typical fluvial action continues to deposit soils consisting of interbedded and interlayered gravel, sands, silts and clays. Gravel is deposited by a very fast flowing river, while sand is deposited by somewhat slower moving water. Silts and clays, being very fine grained, can be transported a considerable distance by slow moving waters or slack water where water velocity is very low. Hence, the grain size deposited, is also an indication of the river levels and the velocity of the water flow.

Indications that the subsurface conditions at the MCTP site may be complex, are confirmed by USDA Soil Survey Sheet Number 30, which provides a more detailed breakdown of the soil types across the MCTP site. The soil series identified on the survey map are defined by characteristics of the surficial soils. The specific soil type within a given area is dependent upon a number of factors including parent material, topography, groundwater conditions, and other factors that influence the profile of the surficial soils. These characteristics provide insight as to subsurface conditions within a given area.

The approximate extent of the soil series identified is shown on Figure 13 in Appendix C. Briefly, there appear to be five soil series present on the site. The low lying area over the southeastern quarter of the site is defined as a "Ch" type which is defined as, Chase silty clay loam. A majority of the site is covered by an "Re" type which is defined as, Reading silt loam, 1 to 3 percent slopes. The northwestern and the southwestern quarters of the site are described as "Sn" and "Sm" types which are define respectively as Smolan silt loam, 4 to 8 percent slopes and Smolan silt loam, 1 to 4 percent slopes. Around the middle eighth of the western edge of the site is a lobe described as "Sm". Over a small portion of the southern side of the property is an area described as "So" which is defined as, Smolan silty clay loam, 4 to 8 percent slopes, eroded. The northeastern corner of the property is described as "Rd" which is described as Reading silt loam, 0 to 1 percent slopes. As can be noted, the soil types pertain more to differentiation of slope inclination than to different soil types. Also indicated on this document source, are intermittent flows of the north and south creeks. Intermittent means that flow is not year around, but an occasional

occurrence that dries up at some point in time during the course of a hot spring or summer period. The north creek disappears approximately at the third point into the property, while the south creek extends approximately to the halfway point.

Generally, loam describes a mixture of various diameters of soil particles, with clay being of the smallest and finest size, then silt, and finally a sand size. Sand sizes are typically associated with free-draining properties, while clay is very fine grained and poorly drained. Silt is an intermediate sized material. Loam soils are as a rule easily erodible. This has been verified by the erosional feature located at the northern center-point of the site as indicated by Figure 11 in Appendix C.

Subsurface Conditions

Specific subsurface conditions encountered at the boring locations are presented on the respective boring logs (see Appendix B). A number of sections were generated to provide a graphic illustration of the relevant soil types encountered in the borings. The general alignment of the following Sections 1 through 6 are indicated on Figure 3 in Appendix B. The stratification lines shown on the logs and sections represent the approximate boundaries between soil types; in-situ, the transition may be gradual.

The subsurface conditions encountered at the MCTP site consisted of loess, terrace and alluvial deposits that continued to the depths explored. In general, the soils that mantle the higher elevations of the site consisted of loess, which are wind deposited soils. The majority of these soils were described as clayey silts (CL/ML), lean clays (CL), lean to fat clays (CL/CH) and fat clay (CH), with trace amounts of fine sand. The loess soils at this site have undergone a relatively long period of weathering, which has resulted in significant higher clay contents and modification to the structure and texture of the silts and fine sands that were originally deposited. Laboratory tests performed on samples of the loess indicated that most of the loess soils were medium to stiff in consistency and of low to moderate plasticity.

A number of borings that were drilled in the transition area between the upland and valley floor, encountered terrace deposits that were deposited along the sides of the valley during periods of glacial activity. The terrace deposits at the MCTP site generally consist of silts, clays, sands, and clayey silts. These soils generally have no continuity in their layering across a given area, due to the complex process

of deposition along the edge of a glacier and subsequent erosion. The terrace deposits encountered on site, consisted of interlayered units of lean clays (CL), lean to fat clays (CL/CH) and fat clay (CH), which exhibited stiff to hard consistencies.

The alluvial soils at the MCTP site were generally confined to the lower elevations of the site, which are predominately east of Corporate Drive and Sykes Boulevard. Alluvial soils generally have little or no continuity in their layering across a given site, due to the complex process of erosion and deposition by the river. Near surface soils are normally a combination of deposits deposited by slack water during flooding and tend to be finer grained cohesive and moderately cohesive materials. There appeared to be a lobe of coarser grained material, which extended up from the south through Lots 15, 14, 21, 22, 13 and 12. The coarser grained materials were encountered below depths of 4 to 11 feet and appear to have been deposited by faster flowing water. The material below this depth generally grades from sandy silts and silty sands to medium to coarse sands and gravel near the bottom of the river channel.

It should be recognized that in a fluvial environment, abandoned channels and other features are often present that may be filled with soft, highly plastic clays, organic silts and other cohesive soils. Although these features were not encountered in the borings, and were not evident on the aerial photographs and maps that were reviewed, these features exist in the Kansas River Valley and may underlie portions of the MCTP site. One such buried former stream channel may have been encountered on Lot 4, during the initial site grading work for the Western Wireless Building. One of the contractors that worked on the project reported a channel-like feature of limited width that was filled with saturated, organic silts and clays. A number of borings were drilled in this area, but we were not successful in identifying the location of the buried channel.

Existing fill was encountered in a number of test borings. The fill was generally composed of local clay soils that were probably placed to fill low-lying areas and/or to modify the grades next to the existing streets when the MCTP site was initially developed. The thickness of the fill ranged from about 2 feet to as much as 7 feet at the boring locations. Laboratory tests performed on samples of the fill indicated that it was generally stiff to very stiff in consistency.

Results of the Atterberg Limits tests performed on samples of the existing fill and natural clay soils indicated that most of the soils at the MCTP site have low to moderate shrink-swell potential, with Liquid Limits generally between 35 to 50 percent. High shrink-swell potential clays, having Liquid Limits in the range of 50 to 67 percent, were encountered at some locations. Except for soils at discrete depths in some borings, the moisture content of surficial soils (fill and natural soils) appeared to be within acceptable ranges. Some of the soils encountered at depths of about 3 to 8 feet in Borings B-8, B-9, B-21, B-30 and B-53, and at depths of 1 to 3 feet in Borings B-12 and B-14 were desiccated at the time the borings were performed. Soils in a desiccated state generally have a higher potential for swelling.

GROUNDWATER OBSERVATIONS

Groundwater observations were made both during and after completion of drilling operations. The depths to water are shown on the individual boring logs in Appendix B. Of the sixty borings that were drilled, twenty-five (25) of the borings remained dry and no visible groundwater seepage was observed during drilling or 24 hours after completion of the borings. The borings that remained dry included Borings B-9 through B-20, B-25, B-29, B-31 through B-34, B-50, B-52 B-54 through B-56, B-58 and B-60. Five of the test borings (B-5, B-7, B-38, B-51, B-53) were dry after completion of drilling operation and had an accumulation of groundwater when the 24-hour readings were obtained. The remaining borings encountered groundwater both during drilling and 24 hours after completion of the borings. Groundwater levels ranged from about 3 to 24 feet below existing ground levels at these times.

To allow monitoring of groundwater levels over a longer period of time, GeoSystems installed nine piezometers at selected locations within the MCTP site. The cohesive and moderately cohesive soils that underlie the higher elevations of the MCTP site have relatively low permeabilities and observations over an extended period of time is generally required to define long term groundwater conditions. The sands and sandy soils that underlie the lower elevations generally have moderate to high permeabilities and the short-term water observations most likely correspond to the regional groundwater table. Groundwater levels obtained between March 21 and April 19, 2001 are recorded in Table T-1.

Figure 16 in Appendix C is a contour map of the groundwater conditions that existed at the MCTP site at the time the field work was conducted. The contours were developed from groundwater information

obtained from the borings. The contours clearly indicate the general location of the former north creek that extended through the uplands to the river valley, through Lots 6, 7, 8 and 9. Although less well defined, the contours also indicate the probable course of the former south creek, which apparently extended through Lots 29, 28, 23 and 24 and 12.

TABLE T-1 PIEZOMETER WATER LEVELS

	B-27	B-30	B-32	B-35	B-37	B-41	B-43	B-47	B-57
3/13/01	--	11.0	--	--	--	--	--	--	--
3/14/01	24.5	--	Dry	--	7.0	--	--	--	--
3/19/01	--	--	--	11.0	--	6.0	--	--	--
3/20/01	--	--	--	--	--	--	4.0	--	--
3/21/01	--	--	--	--	--	--	--	7.0	20.0
4/4/01	19.1	7.3	Dry	10.6	7.5	6.0	4.8	7.0	14.1
4/10/01	19.0	7.1	Dry	11.0	7.9	6.2	5.0	7.3	14.3
4/19/01	18.9	7.0	Dry	11.0	7.6	5.9	4.9	7.2	14.2

Groundwater levels are in feet. Dry indicates that no groundwater was observed.

Groundwater levels may fluctuate due to seasonal variations in rainfall, runoff, the level of the Kansas River, as well as other factors that were not evident at the time the borings were performed. Groundwater levels are generally higher in the spring and early summer months, when precipitation levels are greatest. During the fall and winter months, groundwater levels normally decline.

ANALYSIS AND RECOMMENDATIONS

Based on the information obtained from the borings and other sources, GeoSystems developed Figure 101 in Appendix A, which indicates the constructability rating for the remaining lots in the MCTP development. As can be seen from the figure, the MCTP development has been divided into areas that have been shaded in **green, red and blue**. **Green** shaded areas have been assigned a high constructability rating, **blue** areas have been assigned an intermediate constructability rating and **red** shaded areas have been assigned a low constructability rating. The following paragraphs provide an explanation of the constructability ratings.

The areas that are shaded in **green** on Figure 101 were assigned a high constructability rating. In these areas, there was no evidence of or shallow groundwater or subsurface conditions that would require atypical construction techniques or time frames to develop buildings, parking lots and roads. For the areas with a high constructability rating, the data indicates that office/warehouse type structures can generally be supported on conventional shallow spread footings. Multi-story structures with column loads in excess of 250 kips and/or buildings with very low settlement tolerances may have to be supported on other types of foundations, such as piling or drilled piers.

The subsurface data also indicates that standard subgrade preparation methods can be used to develop subgrades that would be suitable for support of building floor slabs and pavements in the high constructability areas. Standard subgrade preparation would include stripping of topsoil, moisture conditioning, recompaction and proofrolling of the subgrade prior to placement of structural fill and/or construction of floor slabs and pavements. In areas where fat clays are present near finished floor levels, standard subgrade preparation would also include undercutting of building areas to allow placement of 12 to 18 inches of select, low volume change material or stabilized soil below grade supported floor slabs. Underdrains or other special measures to control groundwater levels would generally not be required in areas assigned a high constructability rating. The soils encountered below any organic topsoil layers would be suitable for use as structural fill.

Areas shaded in **red** on the Figure 101 were assigned a low constructability rating. In these areas, there was evidence of subsurface conditions and/or shallow groundwater that may require atypical construction

techniques and/or time frames to develop buildings, parking lots and roads. Most of the lots that were assigned a low constructability rating had shallow groundwater, which could hamper site grading and development of a suitable building pad. For the areas with a low constructability rating, the data indicates that dewatering in conjunction with soil stabilization, undercutting and/or preloading of the onsite soils may be required to develop stable subgrades for support of building foundations, floor slabs and pavement sections. Sites located in the **red** shaded areas will require site-specific geotechnical reports that address temporary dewatering requirements during construction as well as underdrains and/or other measures to permanently lower groundwater levels in areas that will be impacted by the planned construction.

Buildings constructed in the **red** shaded areas could be supported on conventional spread footings, post-tensioned slabs, piling and/or other foundation systems. The type of foundation best suited for a specific site will depend on the magnitude of the foundation loads, type and configuration of the proposed structure, finished grades and other aspects that are unique to the project being developed. Because of this, the selection of foundation systems should be made by a geotechnical engineer that has specifically been retained for the subject site.

Subgrade preparation in the **red** shaded areas may require undercutting to remove existing fill and/or soft, naturally deposited soils in order to develop stable subgrades for support of building floor slabs and pavements. Soil stabilization, preloading and other options can be used in lieu of undercutting. The selection of appropriate methods for site preparation, stabilization and/or subgrade preparation should be the prerogative of the geotechnical consultant retained for the project lot in question.

The intermediate **blue** rating on Figure 101 is indicative of those areas that fall between high and low rated areas. The areas that have been shaded in **blue** are not expected to have significant groundwater problems or problems with soft, natural soils. Rather, the **blue** shaded areas within the MCTP site have been identified as having been previously filled or disturbed by previous site grading or construction. Site development in the **blue** shaded areas may require more extensive site preparation work to develop grades that are suitable for placement of structural fill or for support of building foundations, floor slabs and pavements.

It is anticipated that most of the sites in this area can be developed by undercutting and removing the uncontrolled fill that was previously placed, and replacing this material with controlled structural fill. Based on the information obtained from the borings, it is anticipated that much of the existing fill can probably be reused to develop structural fill sections for support of building foundations, floor slabs and pavement sections. Dewatering in localized areas may be required during construction of foundations and deeper utility lines.

With proper site preparation methods, it is anticipated that most single-story office/warehouse type structures can be supported on conventional shallow spread footings that bear in the naturally deposited soils or controlled structural fill. The final selection of appropriate foundations will depend on the specific requirements of the individual project, and should be the prerogative of the geotechnical consultant retained for specific projects.

CONCLUSIONS

The subsurface data obtained from the borings and other sources indicated that the MCTP site has areas that are underlain by shallow groundwater and subsurface conditions that may require atypical construction techniques and/or time frames to develop buildings, parking lots and roads. These areas have been delineated in Figure 101 in Appendix A to the extent possible, given the limitation of the exploration budget for this project. As can be seen from the figure, the vast majority of the MCTP site is underlain by typical river valley and upland soil deposits that are not expected to require any special construction techniques or extended time frames for development. Even the sites that have assigned a low constructability rating can be successfully developed with the aid of an experienced and knowledgeable geotechnical engineer.

LIMITATIONS OF REPORT

The City of Manhattan should recognize that the subsurface exploration work and the general geotechnical engineering recommendations that were presented in this report are not intended as a substitute for the more detailed subsurface exploration that will be required when an individual parcel or building site is developed within the Manhattan Corporate Technology Park (MCTP). Each prospective

building site will have a unique set of subsurface and groundwater conditions that should be individually addressed within the context of the particular foundation loading conditions, site grading requirements and pavement traffic conditions of a given project. Specific geotechnical engineering recommendations should be developed for the specific building sites. Our report has delineated many of the areas where problem subsurface conditions and/or shallow groundwater conditions exist or can reasonably be expected. However, the City and prospective developers should not expect or assume that the subsurface data developed from this study is comprehensive enough to define every problem area within the MCTP site, nor is it intended to do so, given the scope of the exploration work.

OWNERSHIP OF DOCUMENTS

This report, including all boring logs, field data, field notes, laboratory test data, and other documents prepared by GeoSystems, remain the property of GeoSystems. The City of Manhattan has the right, under our agreement, to make additional copies of this report for distribution to future property owners without any additional cost to the City. The report should be reproduced and distributed in its entirety. Partial reproduction of portions of this report, such as the boring logs or figures, should not be permitted.

GENERAL COMMENTS

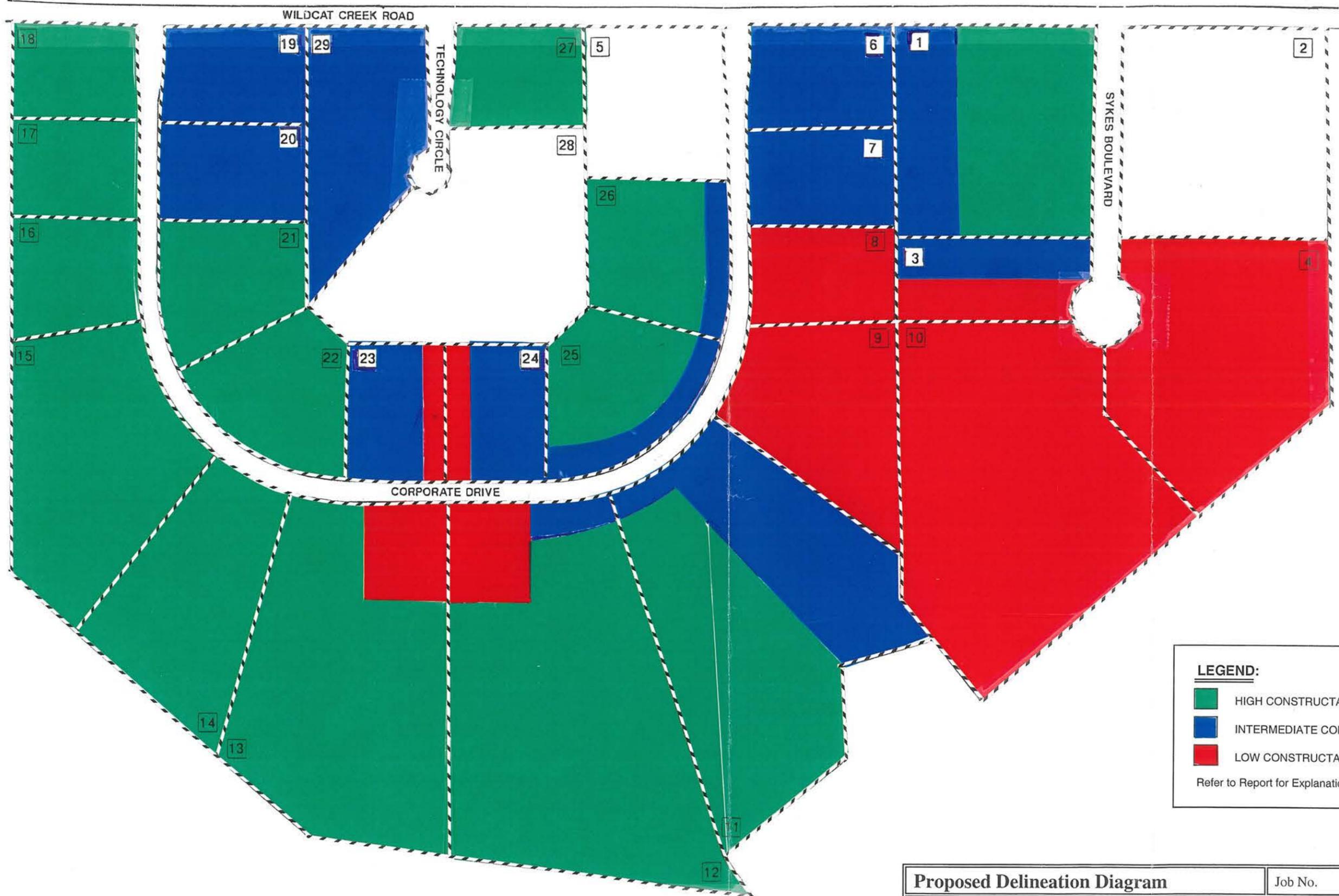
The analysis and recommendations submitted in this report are based upon the data obtained from the borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations, which may occur between borings or across the site. The nature and extent of such variations may not become evident until they are exposed during construction.

This report has been prepared for the exclusive use of the City of Manhattan for the specific application discussed, and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

The scope of our services did not include any environmental assessment or investigation for the presence of hazardous or toxic materials in the soil, bedrock, surface water, groundwater or air, on or below or around this site.



Appendix A



LEGEND:

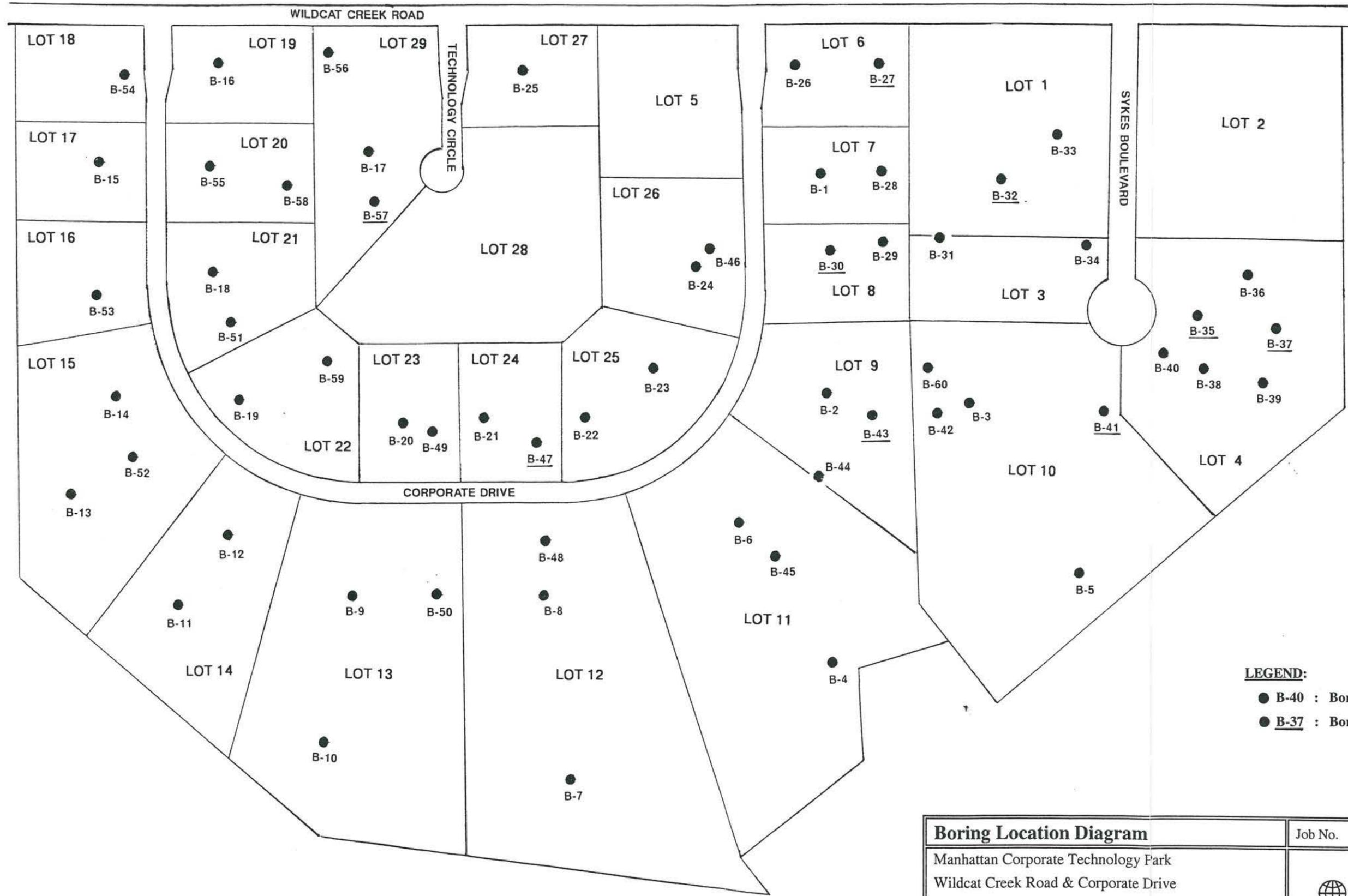
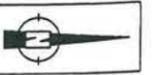
- HIGH CONSTRUCTABILITY
- INTERMEDIATE CONSTRUCTABILITY
- LOW CONSTRUCTABILITY

Refer to Report for Explanation of Terminology

Proposed Delineation Diagram		Job No. 2015102	FIGURE 101
Manhattan Corporate Technology Park Wildcat Creek Road & Corporate Drive Manhattan, Kansas			
Scale: 1 inch = 300 feet (approx.)	Approved By: CM		



Appendix B



LEGEND:
● B-40 : Boring
● B-37 : Boring with Piezometer

Boring Location Diagram		Job No. 2015102	FIGURE 1
Manhattan Corporate Technology Park Wildcat Creek Road & Corporate Drive Manhattan, Kansas			
Scale: 1 inch = 300 feet (approx.)	Approved By: CM		

LOG OF BORING NO. B-1

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park							
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas							
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION					
	PA									Surface Elevation: 1072.1					
1	ST	10		3710	101	22.8	CL		3.0	Topsoil , dark brown (6") FILL , lean clay, stiff, dark brown, trace fine sand					
2	ST	6		*9000	108	14.8	CL		5	LEAN CLAY , very stiff to hard, brown, highly desiccated, trace fine sand					
	PA								6.0	FAT CLAY , stiff, dark gray brown, blocky structure					
3	ST	14		3150	102	24.9	CH		10						
	PA								11.5	LEAN TO FAT CLAY , very stiff, gray brown, trace fine sand					
4	ST	19		7000	99	25.9	CL CH		15	BOTTOM OF BORING ATTERBERG LIMITS Sample 1, Depth 1-3 feet LL PL PI 46% 17% 29%					

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 12.0 feet W.D.	
▼ 12.5 feet @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 2-6-01	
BORING COMPLETED 2-6-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/25/01

LOG OF BORING NO. B-2

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
	PA							▲▲▲▲▲		Surface Elevation: 1061.0										
1	ST	7		4020	103	23.6	CL	/ / / / /		Topsoil, dark brown (6") <u>LEAN CLAY</u> , stiff to very stiff, brown, trace fine sand										
2	ST	5		3410	95	24.8	CL	/ / / / /	5											
	PA							/ / / / /		7.0 ▽ 1054.0										
3	ST	15		7120	102	23.8	CH	/ / / / /	10	<u>FAT CLAY</u> , very stiff, gray brown, trace fine sand										
	PA							/ / / / /		11.0 ▽ 1050.0										
4	ST	22		4080	99	29.9	CL	/ / / / /	15	<u>LEAN CLAY</u> , very stiff, light gray brown, trace fine sand										
										15.0 1046.0										
										BOTTOM OF BORING										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS			BORING STARTED 2-6-01		
▽ 11.0 feet W.D.			BORING COMPLETED 2-6-01		
▽ 6.8 feet @ 24 hrs. A.B.			DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion			APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-3

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
										Surface Elevation: 1066.4
	PA									
1	ST	4		2960	103	20.8	CL		3.5	1062.9
2	ST	11		2450	96	26.8	CL		5	
	PA								7.0	1059.4
3	ST	11		4270	100	25.7	CH		10	
	PA									
4	ST	22		9850	100	27.2	CH		15	1051.4
										BOTTOM OF BORING

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 11.0 feet W.D.
▼ 10.8 feet @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED 2-6-01	
BORING COMPLETED 2-6-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



LOG OF BORING NO. B-4

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park							
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas							
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION					
										Surface Elevation: 1056.1					
1	PA	5		5150	105	20.7			0.0	Topsoil , dark brown (6")					
	ST								3.0	LEAN CLAY , very stiff, brown, trace fine sand					
2	ST	10		6340	106	21.2			5.0	LEAN TO FAT CLAY , very stiff, dark gray brown, trace fine sand					
	PA								6.0	LEAN CLAY , stiff, brown, trace fine sand					
3	ST	8		3700	103	22.6			9.5						
	PA								10.0	SILTY SAND , loose to medium dense, fine to medium grained, light brown					
4	SS	18	11			19.6			15.0						
BOTTOM OF BORING															
ATTERBERG LIMITS Sample 1, Depth 1-3 feet															
<table style="margin: auto;"> <tr> <td style="text-align: center;"><u>LL</u></td> <td style="text-align: center;"><u>PL</u></td> <td style="text-align: center;"><u>PI</u></td> </tr> <tr> <td style="text-align: center;">40%</td> <td style="text-align: center;">17%</td> <td style="text-align: center;">23%</td> </tr> </table>										<u>LL</u>	<u>PL</u>	<u>PI</u>	40%	17%	23%
<u>LL</u>	<u>PL</u>	<u>PI</u>													
40%	17%	23%													

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 10.0 feet W.D.
▽ 9.5 feet @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED	2-6-01
BORING COMPLETED	2-6-01
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-5

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
	PA									
1	ST	10		4770	101	23.3	CH		2.5	FILL , fat clay, very stiff, dark brown 1058.1
2	ST	4		*4500	99	23.5	CL			FILL , lean clay, stiff, dark gray brown to black, organic odor
	PA								5	
									6.5	1054.1
3	ST	12		4490	100	23.6	CH			FAT CLAY , very stiff, dark gray brown, trace fine sand
	PA								10	▼
4	ST	24		4200	101	24.1	CH		15.0	1045.6
BOTTOM OF BORING										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS
▽ Dry W.D.
▼ 11.0 feet @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED 2-7-01	
BORING COMPLETED 2-7-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/25/01

LOG OF BORING NO. B-7

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
	PA							▲▲▲▲▲	0	Surface Elevation: 1051.6										
1	ST	7		6290	106	18.6	CL	/ / / / /	1	Topsoil, dark brown (6") LEAN CLAY , very stiff, brown, trace fine sand										
2	ST	5		7770	108	18.0	CL	/ / / / /	2											
	PA							/ / / / /	5	8.0 1043.6										
3	ST	6		9550	107	20.8	CH	/ / / / /	8											
	PA							/ / / / /	10	FAT CLAY , very stiff to hard, dark gray brown to brown, trace fine sand ▼										
4	ST	10		8140	101	22.7	CH	/ / / / /	15	15.0 1036.6										
* Calibrated Penetrometer										BOTTOM OF BORING										

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

Dry W.D.
 10.2 feet @ 24 hrs. A.B.
 Backfilled @ Completion

BORING STARTED	2-7-01
BORING COMPLETED	2-7-01
DRILL RIG	ATV-45
DRILLER	DD
APPROVED	JJZ
JOB NO.	2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-8

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 297,646.0 E - 1,688,019.5 DESCRIPTION Surface Elevation: 1055.1									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA									FILL , lean clay, very stiff, dark brown 3.0 1052.1									
1	ST	6		5580	112	14.6	CL												
2	ST	6		1650	110	4.9	SC			4.5 SANDY CLAY , medium, brown 1050.6									
	PA							5		SILTY SAND , loose to medium dense, fine to medium grained, poorly graded, light brown to reddish brown 10 15.0 1040.1									
3	SS	14	7			15.2	SM												
	PA							10		BOTTOM OF BORING									
4	SS	18	12			14.6	SM												

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 9.0 feet W.D.	
▼ 9.5 feet @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 2-7-01	
BORING COMPLETED 2-7-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-9

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
										N - 297,070.2 E - 1,688,026.3 <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: right;">Surface Elevation: 1053.9</p>										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet											
	PA									FILL , lean clay, very stiff, brown										
1	ST	8		*5500	106	14.6	CL		3.0											
2	ST	6		9220	111	14.2	CL		5	LEAN CLAY , hard, brown, desiccated, trace fine sand										
	PA								8.0											
3	ST	24		2850	116	9.5	SC		10	SANDY CLAY , stiff, light brown										
	PA								11.0											
4	SS	16	13			7.0	SP		15	SAND , medium dense, fine to medium grained, light brown, trace silt										
									15.0											
										BOTTOM OF BORING										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS			BORING STARTED 2-7-01		
▽ Dry W.D.			BORING COMPLETED 2-7-01		
▼ Dry A.B.			DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion			APPROVED JJZ	JOB NO. 2015102	

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-10

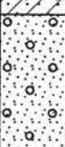
OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
	PA							▲▲▲▲▲	Surface Elevation: 1050.1	
1	ST	22		2720	92	21.5	CH	▨	5	Topsoil, dark brown (6") FAT CLAY , stiff to very stiff, dark gray brown, trace fine sand
2	ST	24		4600	101	22.7	CH	▨	6.0	
	PA							▨	10	1044.1
3	ST	10		6130	95	26.9	CH	▨	15	
	PA							▨	15.0	1035.1
4	ST	10		7230	94	27.9	CH	▨		
BOTTOM OF BORING ATTERBERG LIMITS Sample 2, Depth 3-5 feet LL 53% PL 18% PI 35%										
* Calibrated Penetrometer										

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	BORING STARTED 2-7-01	
☐ Dry W.D.	BORING COMPLETED 2-7-01	
☒ Dry @ 24 hrs. A.B.	DRILL RIG ATV-45 DRILLER DD	
Backfilled @ Completion	APPROVED JJZ JOB NO. 2015102	

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-11

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park							
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas							
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION					
	PA									Surface Elevation: 1049.5					
1	ST	6		5740	103	16.3	CL		3.0	Topsoil, dark brown (6") <u>LEAN CLAY</u> , very stiff, light brown, trace fine sand 1046.5					
2	ST	14		7650	110	16.6	CL SC		5.0	<u>SANDY LEAN CLAY</u> , very stiff, dark brown 1043.5					
	PA								6.0	<u>SAND</u> , medium dense, fine to medium grained, poorly graded, light brown					
3	SS	18	19			3.1	SP		10.0						
	PA								15.0						
4	SS	18	24			7.8	SP		15.0						
BOTTOM OF BORING															
ATTERBERG LIMITS Sample 1, Depth 1-3 feet															
<table style="margin: auto;"> <tr> <td><u>LL</u></td> <td><u>PL</u></td> <td><u>PI</u></td> </tr> <tr> <td>35%</td> <td>19%</td> <td>16%</td> </tr> </table>										<u>LL</u>	<u>PL</u>	<u>PI</u>	35%	19%	16%
<u>LL</u>	<u>PL</u>	<u>PI</u>													
35%	19%	16%													

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

∇ Dry W.D.

∇ Dry @ 24 hrs. A.B.

Backfilled @ Completion

BORING STARTED	2-7-01	
BORING COMPLETED	2-7-01	
DRILL RIG	ATV-45	DRILLER DD
APPROVED	JJZ	JOB NO. 2015102



LOG OF BORING NO. B-12

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 296,697.0 E - 1,687,855.7 DESCRIPTION
	PA								0	Topsoil, dark brown (6")
1	ST	17		16460	113	15.8	CH		3.0	FAT CLAY , hard, desiccated, gray brown
2	ST	20		6210	106	17.3	CL CH		5	LEAN TO FAT CLAY , very stiff, brown, trace fine sand
	PA								5.5	CLAYEY SAND , medium dense, brown, trace silt
3	ST	15		*3000	110	9.8	SC		10.0	SAND , medium dense, fine to medium grained, light brown, trace silt
	PA								15	BOTTOM OF BORING
	SS	14	19			3.6	SP		15.0	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

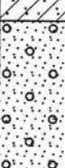
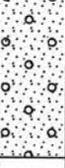
WATER LEVEL OBSERVATIONS

☒ Dry W.D.
☒ Dry @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED	2-7-01	
BORING COMPLETED	2-7-01	
DRILL RIG	ATV-45	DRILLER DD
APPROVED	JJZ	JOB NO. 2015102



LOG OF BORING NO. B-13

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park			
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas			
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	
	PA									Surface Elevation: 1049.8	
1	ST	11		4010	105	23.9	CL		3.0	Topsoil, dark brown (6") <u>LEAN CLAY</u> , very stiff, brown, trace fine sand 1046.8	
2	ST	20		4350	103	17.8	CL		5.0	<u>LEAN CLAY</u> , very stiff, light gray brown, trace fine sand 1043.8	
	PA								6.0	<u>SANDY LEAN CLAY</u> , very stiff, yellowish brown 1040.3	
3	ST	7		*5500	109	10.3	SC		9.5	<u>SAND</u> , medium dense, fine to medium grained, light brown, trace silt 1034.8	
	PA								10.0		
4	SS	13	23			3.1	SP		15.0	BOTTOM OF BORING <u>ATTERBERG LIMITS</u> Sample 1, Depth 1-3 feet LL 45% PL 18% PI 27%	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	BORING STARTED 2-7-01	
▽ Dry W.D.	BORING COMPLETED 2-7-01	
▽ Dry @ 24 hrs. A.B.	DRILL RIG ATV-45 DRILLER DD	
Backfilled @ Completion	APPROVED JJZ JOB NO. 2015102	

LOG OF BORING NO. B-14

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 296,351.4 E - 1,687,455.9 <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: right;">Surface Elevation: 1059.1</p>									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA							▲▲▲▲		Topsoil, dark brown (6")									
1	ST	19		7900	100	18.0	CL CH	▨▨▨▨	3.0	LEAN TO FAT CLAY , very stiff, desiccated, light brown									
2	ST	22		*4500	114	11.4	SC	▨▨▨▨	5	SANDY LEAN CLAY , very stiff, light brown									
	PA							●●●●	6.0	SAND , medium dense, fine to medium grained, poorly graded, light brown									
3	SS	14	11			2.1	SP	●●●●	10										
	PA							●●●●											
4	SS	17	20			4.0	SP	●●●●	15	15.0 1044.1									
										BOTTOM OF BORING									

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS			BORING STARTED 2-7-01		
☑ Dry W.D.			BORING COMPLETED 2-7-01		
☑ Dry @ 24 hrs. A.B.			DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion			APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-15

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
	PA									Surface Elevation: 1086.0										
1	ST	8		5440	97	24.3	CH		2.5	Topsoil, dark brown (6") FAT CLAY , very stiff, dark brown										
2	ST	7		10100	110	17.1	CL		4.5	LEAN CLAY , very stiff, yellowish brown, trace fine sand										
	PA								5	SANDY LEAN CLAY , very stiff, light brown to reddish brown, trace fine sand										
3	ST	6		7230	112	14.5	CL SC		10	11.0 1075.0										
	PA								11.0	SANDY SILT , medium to stiff, fine grained, light reddish brown, trace clay										
4	ST	10		*3000	101	14.4	SM ML		15.0	1071.0										
										15 BOTTOM OF BORING										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 2-7-01		
☐ Dry W.D.		BORING COMPLETED 2-7-01		
☑ Dry @ 24 hrs. A.B.		DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion		APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-16

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
	PA									Surface Elevation: 1088.9										
1	ST	24		2560	99	22.0	CL CH			Topsoil, dark brown (6") LEAN TO FAT CLAY , stiff to very stiff, light brown to brown, trace fine sand										
2	ST	6		7840	108	20.3	CL CH		5											
	PA								7.5	1081.4										
3	ST	24		*4000	100	16.5	CL		10	LEAN CLAY , very stiff, brown, trace fine sand SANDY SILT , medium, fine grained, light brown to tan, trace clay										
	PA								11.5											
4	ST	9		*2000	92	15.9	SM ML		15	1073.9										
										BOTTOM OF BORING ATTERBERG LIMITS Sample 1, Depth 1-3 feet LL PL PI 49% 18% 31%										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
∇ Dry W.D.	
∇ Dry @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED	2-7-01		
BORING COMPLETED	2-7-01		
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-17

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
										Surface Elevation: 1073.5										
	PA							▲▲▲▲		Topsoil, dark brown (6")										
1	ST	10		2290	95	26.8	CL	/ / / /		<u>LEAN CLAY</u> , stiff, brown, trace fine sand										
2	ST	8		*2500	93	22.9	CL	/ / / /	5											
	PA							/ / / /	7.0	1066.5										
3	ST	18		2100	97	27.7	CL ML	/ / / /	10	<u>CLAYEY SILT</u> , medium to stiff, brown to reddish, trace fine sand										
	PA							/ / / /												
4	ST	19		1760	97	27.2	CL ML	/ / / /	15	1058.5										
										BOTTOM OF BORING										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
∇ Dry W.D.	
∇ Dry @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 2-8-01	
BORING COMPLETED 2-8-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



LOG OF BORING NO. B-18

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
	PA							▲▲▲▲▲		Topsoil, dark brown (6")
1	ST	6		*2000	104	6.1	SC	/ / / / /		<u>CLAYEY SAND</u> , loose to medium dense, dark brown
2	ST	3		*2500	101	10.8	SC	/ / / / /	5	
	PA							● ● ● ● ●	5.5	1074.3
3	SS	16	8			9.3	SP	● ● ● ● ●		<u>SAND</u> , loose, fine grained, poorly graded, light brown, trace silt
	PA							● ● ● ● ●	10	
4	SS	17	8			4.5	SP	● ● ● ● ●	15	1064.8
15										BOTTOM OF BORING

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 2-8-01	
☑ Dry W.D.		BORING COMPLETED 2-8-01	
☑ Dry @ 24 hrs. A.B.		DRILL RIG ATV-45	DRILLER DD
Backfilled @ Completion		APPROVED JJZ	JOB NO. 2015102



LOG OF BORING NO. B-19

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park							
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas							
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION					
	PA							▲▲▲▲▲	Surface Elevation: 1064.0						
1	ST	6		7820	106	21.2	CL CH	▨▨▨▨▨	3.5 1060.5	Topsoil , dark brown (6") LEAN TO FAT CLAY , very stiff, brown, trace fine sand					
2	ST	21		7580	104	17.4	CL	▨▨▨▨▨	5 1056.0	LEAN CLAY , very stiff, light gray brown, trace fine sand					
	PA							▨▨▨▨▨	8.0 1053.5						
3	ST	15		1630	105	22.1	CH	▨▨▨▨▨	10 1049.0	FAT CLAY , medium, brown					
	PA							▨▨▨▨▨	10.5						
4	SS	14	7			6.0	SM	●●●●●	15.0	SILTY SAND , loose, fine to medium grained, poorly graded, light brown					
BOTTOM OF BORING															
ATTERBERG LIMITS Sample 2, Depth 3-5 feet <table style="margin-left: auto; margin-right: auto;"> <tr> <td>LL</td> <td>PL</td> <td>PI</td> </tr> <tr> <td>46%</td> <td>16%</td> <td>30%</td> </tr> </table>										LL	PL	PI	46%	16%	30%
LL	PL	PI													
46%	16%	30%													

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	BORING STARTED 2-8-01	
	BORING COMPLETED 2-8-01	
	DRILL RIG ATV-45	DRILLER DD
	APPROVED JJZ	JOB NO. 2015102
▽ Dry W.D.		
▽ Dry @ 24 hrs. A.B.		
Backfilled @ Completion		



LOG OF BORING NO. B-20

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 297,219.5 E - 1,687,515.1 <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: right;">Surface Elevation: 1062.9</p>									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA							▲▲▲▲	0	Topsoil, dark brown (6")									
1	ST	10		6300	102	22.5	CH	//	5.0	FAT CLAY , very stiff, dark brown									
2	ST	5		3790	102	23.8	CH	//	5.0	1057.9									
	PA							//	5	LEAN CLAY , very stiff, gray brown mottled yellowish brown, trace fine sand									
3	ST	17		4370	100	27.4	CL	//	9.5	1053.4									
	PA							●●●●	10	SILTY SAND , loose, fine to medium grained, poorly graded, light brown									
4	SS	18	8			16.4	SM	●●●●	15.0	1047.9									
										BOTTOM OF BORING									

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS			BORING STARTED 2-9-01		
☐ Dry W.D.			BORING COMPLETED 2-9-01		
▼ Dry @ 24 hrs. A.B.			DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion			APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-21

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 297,463.9 E - 1,687,499.7 <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: right;">Surface Elevation: 1061.5</p>									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA							▲▲▲▲▲	0	Topsoil, dark brown (6")									
1	ST	24		11910	105	21.8	CH	▨▨▨▨▨	4.5	FAT CLAY , hard, desiccated, dark brown to brown									
2	ST	5		12790	110	19.4	CH	▨▨▨▨▨	5	1057.0									
	PA							▨▨▨▨▨	8.0	LEAN CLAY , gray mottled yellowish brown, trace fine sand									
3	SS	16	11			17.5	SM	●●●●●	10	1053.5									
	PA							●●●●●	15	SILTY SAND , loose to medium dense, fine to medium grained, poorly graded, light brown ▼									
4	SS	14	8			17.9	SM	●●●●●	15.0	1046.5									
										BOTTOM OF BORING									
										* Calibrated Penetrometer									

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽	8.0 feet W.D.
▼	9.5 feet @ 24 hrs. A.B.
Backfilled @ Completion	

BORING STARTED 2-9-01	
BORING COMPLETED 2-9-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-22

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
	PA							▲▲▲▲	0	Topsoil, dark brown (6")
1	ST	9		4770	96	25.6	CL CH	▲▲▲▲	2.5	<u>LEAN TO FAT CLAY</u> , very stiff, brown, trace fine sand 1058.0
2	ST	13		6320	98	27.5	CH	▲▲▲▲	5	<u>FAT CLAY</u> , very stiff, brown 1054.5
	PA							▲▲▲▲	6.0	<u>FAT CLAY</u> , stiff, dark gray, trace fine sand ▽ ▼
3	ST	24		3060	96	27.2	CH	▲▲▲▲	10	<u>FAT CLAY</u> , stiff, dark gray, trace fine sand 1049.5
	PA							▲▲▲▲	11.0	<u>LEAN CLAY</u> , stiff, gray, trace fine sand
4	ST	23		5990	106	20.7	CL	▲▲▲▲	15.0	1045.5
15										BOTTOM OF BORING

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 2-9-01		
▽ 7.0 feet W.D.		BORING COMPLETED 2-9-01		
▼ 7.5 feet @ 24 hrs. A.B.		DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion		APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-23

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 297,966.1 E - 1,687,343.9 DESCRIPTION									
										Surface Elevation: 1062.9									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA							▲▲▲▲	0	Topsoil, dark brown (6")									
1	ST	10		1320	93	25.3	CL	▨	2.5	LEAN CLAY , medium, gray brown, trace fine sand									
2	ST	12		5780	103	23.6	CL	▨	5	LEAN CLAY , very stiff, gray brown yellowish brown, trace fine sand									
	PA							▨	6.0	LEAN TO FAT CLAY , stiff, light gray, trace fine sand									
3	ST	24		2290	92	27.6	CL CH	▨	10	FAT CLAY , stiff, brown									
	PA							▨	10.0	FAT CLAY , stiff, brown									
4	ST	24		2350	100	24.1	CH	▨	15	BOTTOM OF BORING									
										15.0									
										1047.9									

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 11.0 feet W.D.	
▽ 9.5 feet @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED		2-9-01	
BORING COMPLETED		2-9-01	
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-24

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
	PA							▲▲▲▲▲		Surface Elevation: 1068.3
1	ST	24		4510	105	18.5	CL	/ / / / /		Topsoil , dark brown (6")
2	ST	11		*3500	104	20.3	CL	/ / / / /	5	LEAN CLAY , very stiff, reddish brown, trace fine sand
	PA							/ / / / /	8.0	
3	ST	12		1520	97	29.0	CH	/ / / / /	10	FAT CLAY , medium, brown to reddish brown ▼
	PA							/ / / / /	11.0	▽ 1057.3
4	ST	24		2840	97	26.5	CL CH	/ / / / /	15	LEAN TO FAT CLAY , stiff, brown, trace fine sand
								/ / / / /	15.0	1053.3
BOTTOM OF BORING										
ATTERBERG LIMITS Sample 1, Depth 1-3 feet										
			LL	PL	PI					
			38%	16%	22%					

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 11.0 feet W.D.	
▽ 9.2 feet @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 2-9-01	
BORING COMPLETED 2-9-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-25

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 297,567.7 E - 1,686,473.4
										DESCRIPTION
									Surface Elevation: 1081.7	
	PA								2.0	1079.7
1	ST	10		9280	106	21.4	CH		4.5	1077.2
	PA								5	
2	ST	13		2890	102	20.4	CL		10	
	PA								11.0	1070.7
3	ST	16		1630	90	27.0	CL ML		15.0	1066.7
BOTTOM OF BORING										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

∇ Dry W.D.

∇ Dry @ 24 hrs. A.B.

Backfilled @ Completion

BORING STARTED		2-9-01	
BORING COMPLETED		2-9-01	
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



LOG OF BORING NO. B-26

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park	
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas	
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet
N - 298,382.7 E - 1,686,445.0 DESCRIPTION Surface Elevation: 1072.5									
	PA							▲▲▲▲▲	0.8
Topsoil, dark brown (9") Elevation: 1071.7									
1	ST	12		1760	96	26.1	CL	/ / / / /	3.5
LEAN CLAY, medium, dark brown, trace fine sand Elevation: 1069.0									
2	ST	10		1320	88	28.0	CL ML	/ / / / /	5
CLAYEY SILT, medium, dark brown to gray brown, trace fine sand Elevation: 1064.5									
	PA							/ / / / /	8.0
FAT CLAY, very stiff, gray brown, trace fine sand Elevation: 1061.5									
3	ST	21		4580	94	28.0	CH	/ / / / /	10
LEAN CLAY, stiff, light brown, trace fine sand Elevation: 1057.5									
	PA							/ / / / /	11.0
4	ST	23		2550	100	24.9	CL	/ / / / /	15
BOTTOM OF BORING									

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 8.0 feet W.D.	
▽ 7.5 @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 3-14-01	
BORING COMPLETED 3-14-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GeoSystems
ENGINEERING INC.

LOG OF WELL NO. B-27

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION		WELL LOG
										Surface Elevation: 1081.4		
	PA								0.6	Topsoil, dark brown (7")	1080.8	
1	ST	7		4460	94	26.5	CH			<u>FAT CLAY</u> , very stiff, dark brown to gray brown		
2	ST	8		6950	101	22.3	CH		5			
	PA								6.0		1075.4	
3	ST	12		3740	102	20.5	CL			<u>LEAN CLAY</u> , stiff, brown to reddish, trace fine sand		
	PA								10			
4	ST	13		2490	90	27.1	CL					
	PA								15		1066.4	
5	ST	14		1360	94	26.3	CL ML			<u>CLAYEY SILT</u> , medium, light brown, trace fine sand		
	PA								20			

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 23.0 feet W.D.	
▽ 18.9 feet on 4/19/01	
Backfilled @ Completion	

BORING STARTED 3-14-01	
BORING COMPLETED 3-14-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GeoSystems
ENGINEERING INC.

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-28

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 298,641.6 E - 1,686,755.5 <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: right;">Surface Elevation: 1074.1</p>									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA							1.0	Topsoil, dark brown (12") 1073.1										
1	ST	12		3850	100	24.5	CL	3.0	<u>LEAN CLAY</u> , stiff, brown, trace fine sand 1071.1										
2	ST	10		7140	103	23.2	CH	5.0	<u>FAT CLAY</u> , stiff to very stiff, gray brown 1067.6										
	PA							6.5	<u>LEAN CLAY</u> , stiff, reddish brown, trace fine sand 1063.1										
3	ST	20		3890	100	22.2	CL	10.0	<u>CLAYEY SILT</u> , medium, reddish brown, trace fine sand 1059.1										
	PA							11.0	<u>CLAYEY SILT</u> , medium, reddish brown, trace fine sand 1059.1										
4	ST	11		1850	89	35.0	CL ML	15.0	BOTTOM OF BORING <u>ATTERBERG LIMITS</u> Sample 2, Depth 3-5 feet LL 56% PL 21% PI 35%										
* Calibrated Penetrometer																			

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS			BORING STARTED 3-13-01		
▽ 13.0 feet W.D.			BORING COMPLETED 3-13-01		
▽ 12.5 @ 24 hrs. A.B.			DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion			APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-29

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park			
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas			
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	
Surface Elevation: 1069.8											
								▲▲▲▲	0.9	Topsoil , dark brown (10") 1068.9	
1	ST	7		3640	90	29.2	CL CH	▨▨▨▨	3.0	FILL , lean to fat clay, stiff, dark brown, trace fine sand 1066.8	
2	ST	24		780	92	25.8	CH	▩▩▩▩	5.5	FAT CLAY , soft to medium, dark brown 1064.3	
								▧▧▧▧	12.5	LEAN CLAY , stiff, light brown, trace fine sand 1057.3	
3	ST	18		2280	97	26.6	CL	▦▦▦▦	15.0	CLAYEY SILT , medium, light brown, trace fine sand 1054.8	
4	ST	24		1690	101	23.7	CL ML	▤▤▤▤		BOTTOM OF BORING	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	BORING STARTED 3-13-01	
	BORING COMPLETED 3-13-01	
	DRILL RIG ATV-45	DRILLER DD
	APPROVED JJZ	JOB NO. 2015102
▽ Dry W.D. ▼ Dry @ 24 hrs. A.B. Backfilled @ Completion		

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/25/01

LOG OF WELL NO. B-30

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park			
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas			
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION			WELL LOG
										Surface Elevation:			
									0.8	Topsoil, dark brown (9")	1067.4	1066.6	
1	ST	9		5350	95	25.2	CH			<u>FAT CLAY</u> , very stiff, dark brown, highly desiccated below 3 feet			
2	ST	24		6970	94	13.4	CH		5				
									7.5		▽	1059.9	
3	ST	18		6330	97	25.9	CH		10	<u>FAT CLAY</u> , very stiff, gray brown, trace fine sand			
									12.5		▽	1054.9	
4	ST	23		2160	108	23.4	CL ML		15	<u>CLAYEY SILT</u> , medium to stiff, light brown to light gray brown, trace fine sand			
									20				
5	ST	24		1940	94	27.5	CL						

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽	13.0 feet W.D.
▽	7.1 feet on 4/19/01
Installed 2-inch Piezometer	

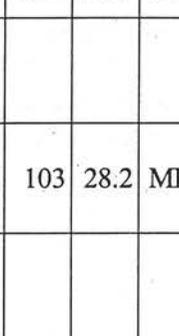
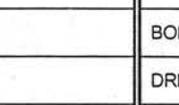
BORING STARTED		3-13-01	
BORING COMPLETED		3-13-01	
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



GeoSystems
ENGINEERING INC.

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF WELL NO. B-30

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park	
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas	
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	WELL LOG
6	ST	18	940	103	28.2	ML			22.0 25.0	1045.4 1042.4	
* Calibrated Penetrometer										BOTTOM OF BORING	

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	BORING STARTED 3-13-01	
▽ 13.0 feet W.D.	BORING COMPLETED 3-13-01	
▽ 7.1 feet on 4/19/01	DRILL RIG ATV-45 DRILLER DD	
Installed 2-inch Piezometer	APPROVED JJZ JOB NO. 2015102	

LOG OF BORING NO. B-31

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 298,817.2 E - 1,686,951.1 DESCRIPTION									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA								0.8	Surface Elevation: 1075.1									
									3.0	0.8' Topsoil, dark brown (9") 1074.3 LEAN CLAY , very stiff, brown									
1	ST	7		4700	103	23.1	CL		5.0	1072.1									
2	ST	8		3870	105	17.4	CL		7.5	SANDY LEAN CLAY , stiff, reddish brown									
	PA								10.0	1067.6									
3	ST	8		580	100	17.8	ML		11.0	SANDY SILT , soft to medium, fine grained, light brown									
	PA								15.0	1064.1									
4	ST	19		3550	98	21.3	CL ML		15.0	CLAYEY SILT , stiff, reddish brown, some fine sand									
									15	1060.1 BOTTOM OF BORING									

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ Dry W.D.	
▽ Dry @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 3-13-01	
BORING COMPLETED 3-13-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GeoSystems
ENGINEERING INC.

LOG OF WELL NO. B-32

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	N - 298,998.1 E - 1,686,775.1		WELL LOG
										DESCRIPTION		
										Surface Elevation: 1086.3		
1	PA								3.0	LEAN TO FAT CLAY , stiff, reddish brown		
2	ST	6		3890	102	23.6	CL		5.0	LEAN CLAY , stiff, reddish brown, trace fine sand		
3	PA								12.0	SANDY SILT , medium, fine grained, light brown		
4	ST	6		2390	100	19.8	CL		17.0	CLAYEY SILT , stiff, light brown, trace fine sand		
5	PA								20.0	SANDY SILT , medium, fine grained, light brown		
	ST	12		*2000	100	11.8	ML			CLAYEY SILT , stiff, light brown, trace fine sand		
	PA									CLAYEY SILT , stiff, light brown, trace fine sand		
	ST	10		3380	108	20.9	CL ML			CLAYEY SILT , stiff, light brown, trace fine sand		

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 3-14-01		
☒ Dry W.D.		BORING COMPLETED 3-14-01		
☒ Dry on 4/19/01		DRILL RIG ATV-45	DRILLER DD	
Installed 2-inch Piezometer		APPROVED JJZ	JOB NO. 2015102	

LOG OF WELL NO. B-32

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park	
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas	
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	WELL LOG
	PA										
6	ST	15	1750		88	25.9	CL ML		25.0	<u>CLAYEY SILT</u> , medium, brown, trace fine sand	
									25	BOTTOM OF BORING	
										<u>ATTERBERG LIMITS</u> Sample 2, Depth 3-5 feet	
										LL 35% PL 20% PI 15%	
* Calibrated Penetrometer											

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	BORING STARTED 3-14-01	
▽ Dry W.D.	BORING COMPLETED 3-14-01	
▽ Dry on 4/19/01	DRILL RIG ATV-45 DRILLER DD	
Installed 2-inch Piezometer	APPROVED JJZ JOB NO. 2015102	

LOG OF BORING NO. B-33

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
	PA									Surface Elevation: 1092.3										
1	ST	6		*5500	106	21.8	CL			LEAN CLAY , stiff to very stiff, brown to reddish brown, trace fine sand										
2	ST	8		2330	99	24.6	CL		5											
	PA									8.0 1084.3										
3	ST	6		1590	94	17.6	CL ML		10	CLAYEY SILT , medium to stiff, light brown, trace fine sand										
	PA									15.0 1077.3										
4	ST	5		2820	97	20.9	CL ML		15	BOTTOM OF BORING ATTERBERG LIMITS Sample 1, Depth 1-3 feet LL PL PI 38% 19% 19%										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
☒ Dry W.D.	
☒ Dry @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 3-14-01	
BORING COMPLETED 3-14-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-34

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park							
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas							
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION					
	PA									Surface Elevation: 1083.8					
1	ST	5		8180	99	23.6	CL		3.0	<u>LEAN CLAY</u> , very stiff, brown, trace fine sand 1080.8					
2	ST	10		8850	106	21.5	CH		5.0	<u>FAT CLAY</u> , very stiff, reddish brown					
	PA								7.0	1076.8					
3	ST	20		1880	96	13.5	ML		10.0	<u>SANDY SILT</u> , medium, fine grained, light brown					
	PA								12.0	1071.8					
4	ST	5		2420	100	14.8	CL ML		15.0	<u>CLAYEY SILT</u> , medium to stiff, light brown, trace fine sand 1068.8					
15.0										BOTTOM OF BORING					
<u>ATTERBERG LIMITS</u> Sample 1, Depth 1-3 feet <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><u>LL</u></td> <td style="text-align: center;"><u>PL</u></td> <td style="text-align: center;"><u>PI</u></td> </tr> <tr> <td style="text-align: center;">38%</td> <td style="text-align: center;">19%</td> <td style="text-align: center;">19%</td> </tr> </table>										<u>LL</u>	<u>PL</u>	<u>PI</u>	38%	19%	19%
<u>LL</u>	<u>PL</u>	<u>PI</u>													
38%	19%	19%													

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

Dry W.D.
 Dry @ 24 hrs. A.B.
 Backfilled @ Completion

BORING STARTED	3-14-01
BORING COMPLETED	3-14-01
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF WELL NO. B-35

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 299,591.8 E - 1,687,168.8 DESCRIPTION Surface Elevation: 1071.0		WELL LOG
	PA									3.0 1068.0		
1	ST	4		4730	95	23.0	CL CH					
2	ST	8		3260	102	21.0	CL		5	7.0 1064.0		
	PA									12.0 1059.0		
3	ST	22		1740	98	24.5	CL ML		10	12.0 1059.0		
	PA									15.0		
4	ST	15		610	100	27.4	ML		15	20.0		
	PA									20.0		
5	ST	20		*500	95	25.8	ML		20	* Calibrated Penetrometer		
	PA									* Calibrated Penetrometer		

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 3-19-01		
▽ 12.0 feet W.D.		BORING COMPLETED 3-19-01		
▽ 11.1 feet on 4/19/01		DRILL RIG ATV-45	DRILLER DD	
Installed 2-inch Piezometer		APPROVED JJZ	JOB NO. 2015102	

LOG OF WELL NO. B-35

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	WELL LOG								
	PA								21.5		1049.5								
										SILTY SAND , very loose, fine grained, light brown									
6	SS	18	5			25.4	SM		25		1046.0								
										BOTTOM OF BORING									
										ATTERBERG LIMITS Sample 2, Depth 3-5 feet									
										<table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><u>LL</u></td> <td style="text-align: center;"><u>PL</u></td> <td style="text-align: center;"><u>PI</u></td> </tr> <tr> <td style="text-align: center;">35%</td> <td style="text-align: center;">20%</td> <td style="text-align: center;">15%</td> </tr> </table>	<u>LL</u>	<u>PL</u>	<u>PI</u>	35%	20%	15%			
<u>LL</u>	<u>PL</u>	<u>PI</u>																	
35%	20%	15%																	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

 12.0 feet W.D.
 11.1 feet on 4/19/01
Installed 2-inch Piezometer

BORING STARTED	3-19-01
BORING COMPLETED	3-19-01
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



LOG OF BORING NO. B-36

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 299,740.2 E - 1,687,048.7
										DESCRIPTION
	PA									Surface Elevation: 1073.9
1	ST	9		6220	99	23.9	CH			FAT CLAY , very stiff, brown, trace fine sand
2	ST	6		4780	99	22.4	CH			
	PA								5	
									6.0	1067.9
3	ST	7		1750	102	24.0	CL ML			
	PA								10	
									12.0	1061.9
4	ST	20		2380	100	28.1	ML			
									15	
									15.0	1058.9
BOTTOM OF BORING										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 3-19-01		
▽ 13.0 feet W.D.		BORING COMPLETED 3-19-01		
▼ 14.5 feet @ 24 hrs. A.B.		DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion		APPROVED JJZ	JOB NO. 2015102	

LOG OF WELL NO. B-37

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										WELL LOG
									N - 299,827.5 E - 1,687,202.5											
									Surface Elevation: 1068.2											
	PA									FAT CLAY , very stiff, gray brown										
1	ST	12		4260	98	24.3	CH													
2	ST	21		4180	97	25.8	CH													
									5	5.5										
	PA									LEAN CLAY , stiff, light brown, trace fine sand										
3	ST	24		2320	98	26.8	CL													
									10	- increasing silt content with depth										
	PA																			
4	ST	24		2090	94	30.2	CL													
									15											
	PA																			
									17.5	1050.7										
5	ST	20		1220	98	24.8	ML			SANDY SILT , medium, fine grained, light brown										
									20											
									21.0	1047.2										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 7.0 feet W.D.
▼ 7.6 feet on 4/19/01
Installed 2-inch Piezometer

BORING STARTED	3-14-01
BORING COMPLETED	3-14-01
DRILL RIG	ATV-45
DRILLER	DD
APPROVED	JJZ
JOB NO.	2015102



LOG OF WELL NO. B-37

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	WELL LOG								
	PA							[Hatched Box]			[Well Log Diagram]								
6	ST	24		1360	98	28.6	CL ML	[Hatched Box]	25.0	CLAYEY SILT , medium, brown, trace fine sand	1043.2								
										BOTTOM OF BORING ATTERBERG LIMITS Sample 1, Depth 1-3 feet <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">LL</td> <td style="text-align: center;">PL</td> <td style="text-align: center;">PI</td> </tr> <tr> <td style="text-align: center;">64%</td> <td style="text-align: center;">21%</td> <td style="text-align: center;">43%</td> </tr> </table>		LL	PL	PI	64%	21%	43%		
LL	PL	PI																	
64%	21%	43%																	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 7.0 feet W.D.

▽ 7.6 feet on 4/19/01

Installed 2-inch Piezometer

BORING STARTED		3-14-01	
BORING COMPLETED		3-14-01	
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



LOG OF BORING NO. B-38

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
										Surface Elevation: 1065.0										
	PA									FAT CLAY , stiff, dark brown										
1	ST	24		2360	102	20.3	CH		2.5	1062.5										
2	ST	11		4960	98	24.3	CH			FAT CLAY , very stiff, gray brown										
	PA								5	▼										
3	ST	8		4180	93	28.8	CH			10.0										
	PA								10	SANDY SILT , stiff, fine grained, light brown, trace clay										
4	ST	21		2610	105	26.3	ML			15.0										
									15	BOTTOM OF BORING										
										ATTERBERG LIMITS Sample 2, Depth 3-5 feet LL PL PI 53% 23% 30%										
* Calibrated Penetrometer																				

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	BORING STARTED	3-14-01
▼ Dry W.D.	BORING COMPLETED	3-14-01
▼ 4.8 feet @ 24 hrs. A.B.	DRILL RIG	ATV-45
Backfilled @ Completion	DRILLER	DD
	APPROVED	JJZ
	JOB NO.	2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-39

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
Surface Elevation: 1066.3										
1	ST	9		4860	97	22.7	CL CH		2.0	FILL, lean to fat clay, very stiff, brown 1064.3
2	ST	14		3850	88	33.9	CL		5.0	FILL, lean clay, stiff, dark gray brown to black, trace organics
	PA								6.0	1060.3
3	ST	18		4370	94	28.0	CH		10.0	FAT CLAY, very stiff, dark brown to gray brown ▼
	PA								15.0	▽
4	ST	22		4910 7600	97 103	26.6 22.4	CH CH		15.0	1051.3
* Calibrated Penetrometer										
BOTTOM OF BORING										
ATTERBERG LIMITS Sample 2, Depth 3-5 feet LL PL PI 43% 20% 23%										

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 3-14-01		
▽ 12.0 feet W.D.		BORING COMPLETED 3-14-01		
▽ 8.1 feet @ 24 hrs. A.B.		DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion		APPROVED JJZ	JOB NO. 2015102	

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/25/01

LOG OF BORING NO. B-40

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
										N - 299,490.5 E - 1,687,280.7
										Surface Elevation: 1066.6
	PA							▲▲▲▲	0.8	Topsoil, brown (9") 1065.8
1	ST	7		3620	95	28.3	CH	▨▨▨▨		FAT CLAY , stiff, gray brown
2	ST	10		2440	94	27.5	CH	▨▨▨▨	5	
	PA							▨▨▨▨	7.0	▼ 1059.6
3	ST	15		3870	103	23.1	CL CH	▨▨▨▨	10	LEAN TO FAT CLAY , stiff, reddish brown, trace fine sand
	PA							▨▨▨▨	11.0	▽ 1055.6
4	ST	24		1490	94	29.4	ML	●●●●	15.0	SANDY SILT , medium, fine grained, light brown 1051.6
									15	BOTTOM OF BORING ATTERBERG LIMITS Sample 2, Depth 3-5 feet LL PL PI 67% 23% 44%
* Calibrated Penetrometer										

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 12.0 feet W.D.
▼ 5.7 feet @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED	3-14-01
BORING COMPLETED	3-14-01
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF WELL NO. B-41

OWNER/CLIENT City of Manhattan, Kansas	PROJECT NAME Manhattan Corporate Technology Park
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ARCHITECT/ENGINEER Schwab-Eaton, P.A.	LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas
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SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	DESCRIPTION	WELL LOG
										N - 299,312.8 E - 1,687,452.6	
										Surface Elevation: 1064.6	
	PA									FILL , fat clay, very stiff, gray brown	
1	ST	8		7700	103	22.5	CH		3.0		1061.6
2	ST	5		4300	98	23.0	CH		5	LEAN CLAY , very stiff, dark gray brown to black	
	PA								6.0		▼ 1058.6
3	ST	24		3080	100	25.0	CH		10		▽
	PA								15		
4	ST	24		3250	98	26.5	CH		15		
	PA								16.0		1048.6
5	ST	22		2410	100	23.8	CL ML		20	CLAYEY SILT , stiff, gray brown, trace fine sand	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 10.0 feet W.D.
▼ 5.9 feet on 4/19/01
Installed 2-inch Piezometer

BORING STARTED	3-19-01		
BORING COMPLETED	3-19-01		
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



LOG OF WELL NO. B-41

OWNER/CLIENT City of Manhattan, Kansas	PROJECT NAME Manhattan Corporate Technology Park
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ARCHITECT/ENGINEER Schwab-Eaton, P.A.	LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas
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SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	WELL LOG
	PA							[Diagonal Hatching]	22.0	1042.6	[Well Log Symbol]
6	ST	24		2040	91	31.7	CH	[Diagonal Hatching]	25.0	1039.6	[Well Log Symbol]
BOTTOM OF BORING											

* Calibrated Penetrometer.

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 10.0 feet W.D.

▽ 5.9 feet on 4/19/01

Installed 2-inch Piezometer

BORING STARTED		3-19-01
BORING COMPLETED		3-19-01
DRILL RIG	ATV-45	DRILLER
		DD
APPROVED	JJZ	JOB NO.
		2015102



LOG OF BORING NO. B-42

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 298,815.6 E - 1,687,467.7 <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: right;">Surface Elevation: 1065.3</p>									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA								0.8	Topsoil, dark brown (9")									
1	ST	8		4610	97	28.2	CH			FILL, fat clay, very stiff, dark gray brown to gray brown									
2	ST	10		4650	97	28.6	CH												
	PA								5										
	PA								6.0	LEAN CLAY, stiff, brown, trace fine sand									
3	ST	9		2040	94	26.5	CH		9.0	1059.3									
	PA								10	FAT CLAY, medium, dark gray brown									
4	ST	24		1110	94	27.9	CH		15	1056.3									
									15.0	1050.3									
										BOTTOM OF BORING									

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽	11.0 feet W.D.
▽	9.7 feet @ 24 hrs. A.B.
Backfilled @ Completion	

BORING STARTED		3-20-01	
BORING COMPLETED		3-20-01	
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/25/01

LOG OF WELL NO. B-43

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park			
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas			
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	WELL LOG
										Surface Elevation: 1060.2	
	PA								0.8	Topsoil, dark brown (7")	1059.5
1	ST	9		2720	95	22.1	CL CH		3.5	<u>LEAN TO FAT CLAY</u> , stiff, dark brown	1056.7
2	ST	22		1090	93	26.3	CL		5	<u>LEAN CLAY</u> , medium, brown, trace fine sand	1054.2
	PA								6.0	<u>FAT CLAY</u> , very stiff, dark gray brown	
3	ST	24		5150	94	31.2	CH		10		
	PA								12.0	<u>FAT CLAY</u> , very stiff, gray brown, trace fine sand	1048.2
4	ST	24		5700	93	29.3	CH		15		
	PA								18.0	<u>SANDY SILT</u> , medium, fine grained, light brown	1042.2
5	ST	24		2020	97	26.2	ML		20		

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 5.0 feet W.D.

▽ 4.9 feet on 4/19/01

Installed 2-inch Piezometer

BORING STARTED	3-20-01
BORING COMPLETED	3-20-01
DRILL RIG	ATV-45
DRILLER	DD
APPROVED	JJZ
JOB NO.	2015102



LOG OF WELL NO. B-43

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park	
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas	
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	WELL LOG
	PA							[Dotted pattern]			[Dotted pattern]
6	ST	22	2230	94	30.3	ML		[Dotted pattern]	25.0	SANDY SILT , medium, fine grained, light brown	[Dotted pattern]
									25	BOTTOM OF BORING	[Cross-hatched pattern]

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽	5.0 feet W.D.
▽	4.9 feet on 4/19/01
Installed 2-inch Piezometer	

BORING STARTED		3-20-01	
BORING COMPLETED		3-20-01	
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-44

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 298,465.7 E - 1,687,653.6 DESCRIPTION									
										Surface Elevation: 1059.0									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA							▲▲▲▲▲	0.8	Topsoil, dark brown (9")									
1	ST	9		2040	90	27.1	CL	▨▨▨▨▨		LEAN CLAY , stiff, dark brown to gray brown, trace fine sand									
2	ST	24		3980	97	29.4	CL	▨▨▨▨▨	4.5										
	PA							▨▨▨▨▨	5	FAT CLAY , very stiff, gray brown									
3	ST	21		5390	94	30.4	CH	▨▨▨▨▨											
	PA							▨▨▨▨▨	11.0	LEAN TO FAT CLAY , very stiff, light gray brown, trace fine sand									
4	ST	17		5530	95	27.8	CL CH	▨▨▨▨▨	15.0										
										BOTTOM OF BORING									

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 5.0 feet W.D.	
▽ 2.8 feet @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 3-20-01	
BORING COMPLETED 3-20-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-45

OWNER/CLIENT										PROJECT NAME										
City of Manhattan, Kansas										Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER										LOCATION										
Schwab-Eaton, P.A.										Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
										Surface Elevation: 1057.8										
	PA								0.9	Topsoil, dark brown (11")										1056.9
1	ST	9		2040	91	26.0	CL		3.0	<u>LEAN CLAY</u> , stiff, dark gray brown, trace fine sand										1054.8
2	ST	12		4360	94	25.9	CL CH		5	<u>LEAN TO FAT CLAY</u> , very stiff, dark gray brown										▼
	PA								7.0											1050.8
3	ST	11		8530	98	25.3	CH		10	<u>FAT CLAY</u> , very stiff to hard, dark gray brown										
	PA								11.5											1046.3
4	ST	14		6650	100	23.9	CH		15	<u>FAT CLAY</u> , very stiff, light gray brown, trace fine sand										▽
									15.0	BOTTOM OF BORING										1042.8

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 14.5 feet W.D.	
▽ 4.7 feet @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED		3-20-01	
BORING COMPLETED		3-20-01	
DRILL RIG	ATV-45	DRILLER	DD
APPROVED	JJZ	JOB NO.	2015102



LOG OF BORING NO. B-46

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
	PA								0.8	Topsoil , dark brown (8")
1	ST	6		*3000	98	23.9	CL CH		3.0	FILL , lean to fat clay, stiff, brown, trace fine sand
2	ST	10		2850	98	24.9	CL		5.0	LEAN CLAY , stiff, reddish brown, trace fine sand
	PA								7.0	
3	ST	20		1430	101	25.2	CL ML		10.0	CLAYEY SILT , medium, light brown, trace fine sand
	PA								12.0	
4	ST	22		3530	101	26.7	CL		15.0	LEAN CLAY , stiff, brown, trace fine sand
									15.0	BOTTOM OF BORING

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	
▽ 8.0 feet W.D.	
▽ 9.1 feet @ 24 hrs. A.B.	
Backfilled @ Completion	

BORING STARTED 3-21-01	
BORING COMPLETED 3-21-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GeoSystems
ENGINEERING INC.

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/25/01

LOG OF WELL NO. B-47

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park			
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas			
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 297,620.1 E - 1,687,568.6 DESCRIPTION			WELL LOG
										Surface Elevation: 1059.7			
	PA								0.9	Topsoil, dark brown (11")			1058.8
1	ST	8		4080	94	30.1	CH			<u>FAT CLAY</u> , very stiff, brown			
2	ST	7		6330	99	24.4	CH		5				
	PA									▽			
									8.0				1051.7
3	SS	15	7			15.4	SM			<u>SILTY SAND</u> , loose, fine to medium grained, brown			
	PA								10				
4	SS	18	8			18.3	SM		15.0				1044.7
BOTTOM OF BORING										ATTERBERG LIMITS Sample 1, Depth 1-3 feet LL PL PI 58% 20% 38%			

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 3-21-01		
▽ 7.0 feet W.D.		BORING COMPLETED 3-21-01		
▼ 7.3 feet on 4/19/01		DRILL RIG ATV-45	DRILLER DD	
Installed 2-inch Piezometer		APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-48

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park	
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas	
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	
										Surface Elevation: 1056.5	
	PA							▲▲▲▲▲	0.8	Topsoil, dark brown (10")	
1	ST	20		3770	95	25.1	CL	//		LEAN CLAY , stiff to very stiff, dark gray brown to black, trace fine sand (Possible Fill)	
2	ST	9		4580	95	25.5	CL	//			
	PA							//	5		
								●●●●●	6.5	▼ 1050.0	
3	SS	16	13			17.8	SP	●●●●●		SAND , medium dense, fine to medium grained, poorly graded, brown	
	PA							●●●●●	10		
4	SS	18	12			18.0	SP	●●●●●			
								●●●●●	15	1041.5	
										BOTTOM OF BORING	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 6.5 feet W.D.
▼ 6.5 feet @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED 3-20-01	
BORING COMPLETED 3-20-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



LOG OF BORING NO. B-49

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 297,307.0 E - 1,687,538.7
										DESCRIPTION
	PA									Surface Elevation: 1062.0
									0.8	Topsoil , dark brown (10") 1061.2
1	ST	12		3610	101	17.3	CL		3.5	LEAN CLAY , stiff, dark gray brown, trace fine sand 1058.5
2	ST	20		6760	103	19.6	CL		5	LEAN CLAY , very stiff, light brown, trace fine sand 1056.0
	PA								6.0	FAT CLAY , brown 1053.5
3	SS	7	8			12.5	SM		10	SILTY SAND , loose, fine to medium grained, brown 1047.0
	PA									
4	SS	16	7			14.8	SM		15.0	BOTTOM OF BORING

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 3-21-01		
▽ 13.0 feet W.D.		BORING COMPLETED 3-21-01		
▽ 4.2 feet @ 24 hrs. A.B.		DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion		APPROVED JJZ	JOB NO. 2015102	

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-50

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park	
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas	
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 297,326.7 E - 1,688,020.4 DESCRIPTION Surface Elevation: 1054.6	
	PA						▲▲▲▲▲	0.8		Topsoil, dark brown (8") 1053.9	
1	ST	24		1810	105	21.9	CL	/ / / / /		<u>LEAN CLAY</u> , medium, brown, some fine sand	
2	ST	15		*2000	103	15.3	CL	/ / / / /	4.0		1050.6
						4.1	SM	5	<u>SILTY SAND</u> , loose, fine grained, brown	
	PA						7.0			1047.6
3	SS	16	20			6.3	SP	o o o o o	10	<u>SAND</u> , medium dense, fine to medium grained, poorly graded, brown to reddish brown	
	PA						o o o o o	12.5			1042.1
4	SS	17	9			9.9	SM	15.0	<u>SILTY SAND</u> , loose, fine grained, light brown 1039.6	
									15	BOTTOM OF BORING	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

☒ Dry W.D.

☒ Dry @ 24 hrs. A.B.

Backfilled @ Completion

BORING STARTED	3-20-01
BORING COMPLETED	3-20-01
DRILL RIG	ATV-45
DRILLER	DD
APPROVED	JJZ
JOB NO.	2015102



LOG OF BORING NO. B-51

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION										
										Surface Elevation: 1073.6										
	PA								1.0	Topsoil, dark brown (12")										
1	ST	21		8950	98	29.6	CH			FAT CLAY, very stiff to hard, gray brown to brown										
2	ST	7		9360	104	20.3	CH		4.5	1069.1										
	PA								5	SILTY SAND, fine grained, light brown										
									7.5	1066.1										
3	SS	10	8			4.5	SP		10	SAND, loose, fine to medium grained, poorly graded, light brown										
	PA								11.5	1062.1										
4	SS	18	16			17.5	SM		15.0	1058.6										
										BOTTOM OF BORING ATTERBERG LIMITS Sample 1, Depth 1-3 feet LL PL PI 59% 21% 38%										

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS			BORING STARTED 3-21-01		
▽ Dry W.D.			BORING COMPLETED 3-21-01		
▼ 14.5 feet @ 24 hrs. A.B.			DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion			APPROVED JJZ	JOB NO. 2015102	

GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-52

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park		
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas		
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
	PA									Surface Elevation: 1053.0
									0.8	Topsoil, dark brown (9")
										1052.2
1	ST	16		2000	100	18.5	CL		2.0	FILL, sandy lean clay, dark brown
				2980	101	22.1	CL CH			1051.0
2	ST	13		6210	105	20.9	CL CH			LEAN TO FAT CLAY , stiff to very stiff, brown, trace fine sand
	PA								5	
									7.0	1046.0
3	SS	18	11			4.4	SP			SAND , medium dense, fine to medium grained, poorly graded, light brown
	PA								10	
4	SS	16	21			6.4	SP		15.0	1038.0
										BOTTOM OF BORING

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ Dry W.D.
▽ Dry @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED	3-20-01
BORING COMPLETED	3-20-01
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



LOG OF BORING NO. B-53

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park				
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas				
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 296,290.9 E - 1,687,158.4				
										DESCRIPTION				
	PA									Surface Elevation: 1073.4				
									1.0	Topsoil, dark brown (12") 1072.4				
1	ST	9		9570	103	25.9			3.0	FAT CLAY, hard, gray brown 1070.4				
2	ST	16		5210	106	18.2			5.0	LEAN CLAY, very stiff, desiccated, light brown 1067.4				
	PA								6.0	SILTY SAND, loose to medium dense, fine to medium grained, poorly graded, light brown				
3	ST	13	11			9.6		10.0						
	PA													
4	SS	17	13			14.5		15.0		▼ 1058.4				
								15.0	BOTTOM OF BORING					

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 3-20-01		
▼ Dry W.D.		BORING COMPLETED 3-20-01		
▼ 14.5 feet @ 24 hrs. A.B.		DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion		APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-54

OWNER/CLIENT City of Manhattan, Kansas	PROJECT NAME Manhattan Corporate Technology Park
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ARCHITECT/ENGINEER Schwab-Eaton, P.A.	LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas
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SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION
	PA									Surface Elevation: 1087.8
									1.0	Topsoil, dark brown (12") 1086.8
1	ST	14		4690	94	28.2	CH		3.0	FAT CLAY , very stiff, brown 1084.8
2	ST	11		3400	99	26.1	CL		5	LEAN CLAY , stiff, light brown, trace fine sand
	PA								7.0	1080.8
3	ST	12		2030	98	19.4	CL ML		10	CLAYEY SILT , stiff, reddish brown, trace fine sand
	PA									
4	ST	5		*3000	96	14.6	CL ML		15.0	1072.8
									15	BOTTOM OF BORING

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

Dry W.D.
 Dry @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED	3-20-01
BORING COMPLETED	3-20-01
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



LOG OF BORING NO. B-55

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park									
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas									
										N - 296,630.7 E - 1,686,770.5 <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: right;">Surface Elevation: 1089.0</p>									
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet										
	PA								1.0	Topsoil, dark brown (12")									
1	ST	14		3930	98	22.0	CH			FAT CLAY , stiff, brown									
2	ST	8		2980	96	25.4	CH		5.0										
	PA									SANDY LEAN CLAY , very stiff, brown to reddish									
3	ST	14		4120	103	17.0	CL SC		10										
	PA								12.0										
4	ST	6		2170	102	13.9	CL ML		15.0	CLAYEY SILT , stiff, brown to reddish brown, trace fine sand									
									15	BOTTOM OF BORING									

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS			BORING STARTED 3-21-01		
☐ Dry W.D.			BORING COMPLETED 3-21-01		
☑ Dry @ 24 hrs. A.B.			DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion			APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-56

OWNER/CLIENT City of Manhattan, Kansas							PROJECT NAME Manhattan Corporate Technology Park				
ARCHITECT/ENGINEER Schwab-Eaton, P.A.							LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas				
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	
										Surface Elevation: 1081.4	
	PA								0.8	Topsoil , dark brown (12")	1080.6
1	ST	10		7120	107	23.1	CL		3.0	LEAN CLAY , very stiff, brown, trace fine sand	1078.4
2	ST	7		8180	102	22.9	CH		5.0	FAT CLAY , very stiff to hard, brown	
	PA								7.0		1074.4
3	ST	7		5380	101	21.9	ML		10.0	SANDY SILT , very stiff, fine grained, brown to reddish brown, trace clay	
	PA								12.5		1068.9
4	ST	6		2370	108	19.2	CL ML		15.0	CLAYEY SILT , stiff, brown, trace fine sand	1066.4
									BOTTOM OF BORING		

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

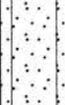
WATER LEVEL OBSERVATIONS

∇ Dry W.D.
 ▼ Dry @ 24 hrs. A.B.
 Backfilled @ Completion

BORING STARTED	3-21-01	
BORING COMPLETED	3-21-01	
DRILL RIG	ATV-45	DRILLER DD
APPROVED	JJZ	JOB NO. 2015102



LOG OF WELL NO. B-57

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park	
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas	
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	N - 297,125.7 E - 1,686,864.4 DESCRIPTION	
										Surface Elevation: 1075.8	
	PA								1.0	Topsoil, dark brown (12") 1074.8	
1	ST	8		6500	104	20.3	CH		3.5	FAT CLAY, very stiff, dark brown to brown 1072.3	
2	ST	17		3160	107	17.4	CL CH		5	LEAN TO FAT CLAY, stiff, brown, trace fine sand 1068.3	
	PA								7.5		
3	ST	22		1850	101	20.5	ML		10	SANDY SILT, medium, fine grained, light brown 1058.8	
	PA								15	▼ ▼	
4	ST	18		1460	104	24.9	ML		17.0	1058.8	
	PA								20	SILTY SAND, loose, fine grained, brown	
5	SS	12	8			15.6	SM				

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS		BORING STARTED 3-21-01	
▼ 15.0 feet W.D.		BORING COMPLETED 3-21-01	
▼ 14.2 feet on 4/19/01		DRILL RIG ATV-45	DRILLER DD
Installed 2-inch Piezometer		APPROVED JJZ	JOB NO. 2015102



LOG OF WELL NO. B-57

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park	
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas	
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	WELL LOG
	PA								25.0	SILTY SAND , loose, fine grained, brown	
6	SS	18	11			18.0	SM		1050.8		
										BOTTOM OF BORING	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 15.0 feet W.D.
▼ 14.2 feet on 4/19/01
Installed 2-inch Piezometer

BORING STARTED	3-21-01
BORING COMPLETED	3-21-01
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



LOG OF BORING NO. B-58

OWNER/CLIENT City of Manhattan, Kansas										PROJECT NAME Manhattan Corporate Technology Park										
ARCHITECT/ENGINEER Schwab-Eaton, P.A.										LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas										
										N - 296,864.0 E - 1,686,822.8 <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: right;">Surface Elevation: 1084.3</p>										
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet											
	PA							1.0	Topsoil, dark brown (12") 1083.3											
1	ST	5		6510	99	23.8	CL CH	5	LEAN TO FAT CLAY, very stiff, brown											
2	ST	7		2580	90	15.2	CL	6.0	1078.3											
	PA							10	CLAYEY SILT, medium, brown to reddish brown, trace fine sand											
3	ST	18		1560	97	14.6	CL ML	15	1069.3											
	PA																			
4	ST	7		*1500	95	11.1	CL ML		BOTTOM OF BORING											
										* Calibrated Penetrometer										

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS			BORING STARTED 3-21-01		
<input type="checkbox"/> Dry W.D.			BORING COMPLETED 3-21-01		
<input checked="" type="checkbox"/> Dry @ 24 hrs. A.B.			DRILL RIG ATV-45	DRILLER DD	
Backfilled @ Completion			APPROVED JJZ	JOB NO. 2015102	

LOG OF BORING NO. B-59

OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park			
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas			
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION	
										Surface Elevation: 1069.9	
	PA								0.8	Topsoil , dark brown (9")	1069.1
1	ST	6		*1500	100	13.0	SC			FILL , sandy clay, medium, brown	
2	ST	15			106	4.8	SP		4.0		1065.9
	PA								5	SAND , loose to medium dense, fine to medium grained, poorly graded, light brown	
										▼	
3	SS	18	11			4.3	SP		10		
	PA								12.0		1057.9
										SANDY SILT , very soft, fine grained, dark gray brown	▽
4	SS	18	2			23.1	ML		15.0		1054.9
									15	BOTTOM OF BORING	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS

▽ 13.0 feet W.D.
▼ 7.0 feet @ 24 hrs. A.B.
Backfilled @ Completion

BORING STARTED 3-21-01	
BORING COMPLETED 3-21-01	
DRILL RIG ATV-45	DRILLER DD
APPROVED JJZ	JOB NO. 2015102



GEOSYSTEMS LOG 2015102.GPJ GEOSYSTEM.GDT 4/20/01

LOG OF BORING NO. B-60

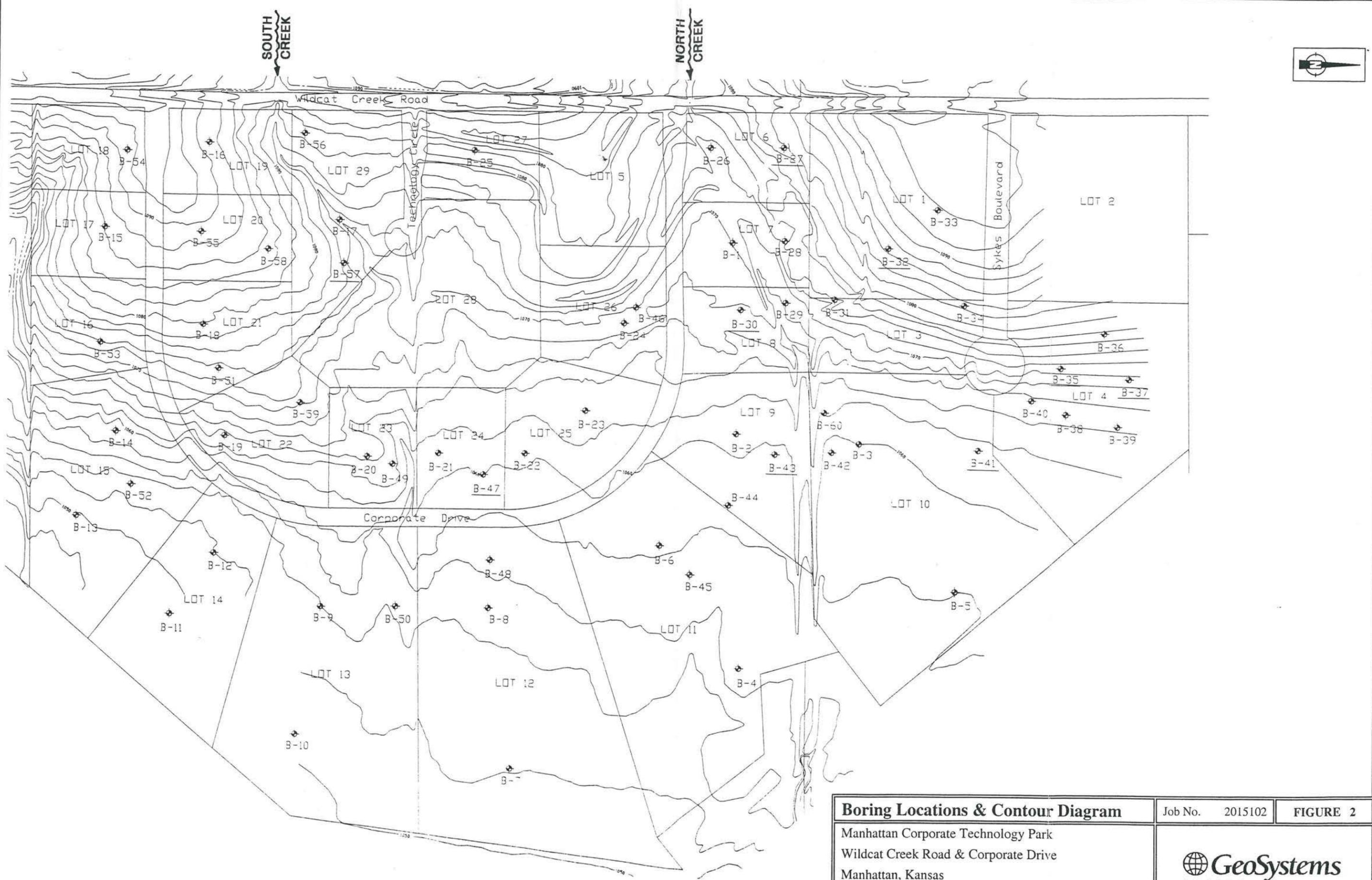
OWNER/CLIENT City of Manhattan, Kansas								PROJECT NAME Manhattan Corporate Technology Park								
ARCHITECT/ENGINEER Schwab-Eaton, P.A.								LOCATION Wildcat Creek Road & Technology Circle Manhattan, Kansas								
SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet	DESCRIPTION						
	PA									Surface Elevation: 1064.6						
									1.0	Topsoil , dark brown (12")						
1	ST	9		4130	96	26.9	CH		3.0	FILL , fat clay, stiff, dark brown						
2	ST	10		5610	91	31.2	CH		5	FAT CLAY , very stiff, brown						
	PA								6.0	FAT CLAY , very stiff, dark brown						
3	ST	8		5400	98	26.8	CH		10	FAT CLAY , very stiff, dark brown						
	PA								10.5	LEAN TO FAT CLAY , stiff, light brown, trace fine sand						
4	ST	13		3800	109	22.0	CL CH		15	LEAN TO FAT CLAY , stiff, light brown, trace fine sand						
									15.0	BOTTOM OF BORING						
<p style="text-align: center;">ATTERBERG LIMITS Sample 2, Depth 3-5 feet</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">LL</td> <td style="text-align: center;">PL</td> <td style="text-align: center;">PI</td> </tr> <tr> <td style="text-align: center;">65%</td> <td style="text-align: center;">22%</td> <td style="text-align: center;">43%</td> </tr> </table>											LL	PL	PI	65%	22%	43%
LL	PL	PI														
65%	22%	43%														

* Calibrated Penetrometer

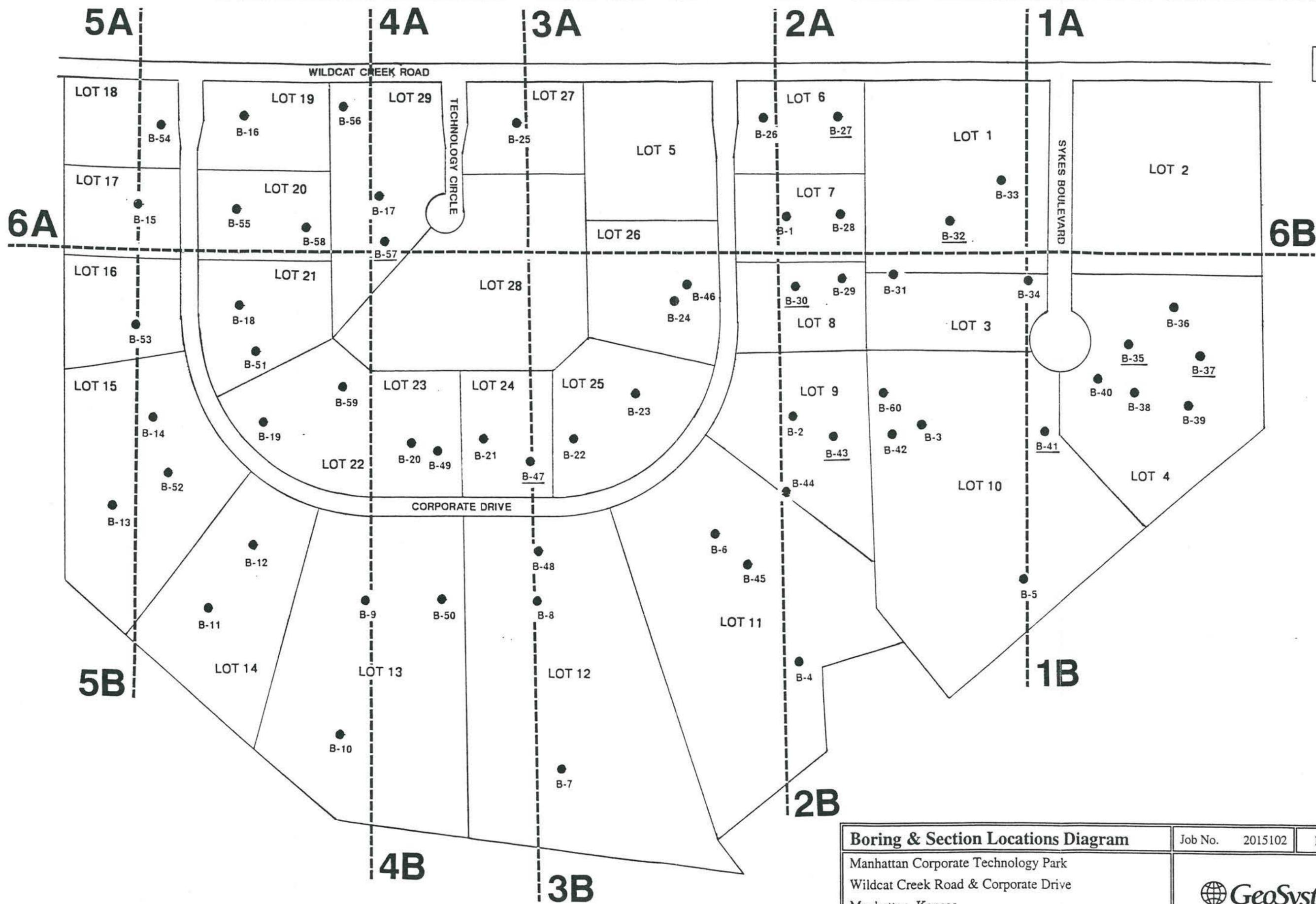
The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be gradual.

WATER LEVEL OBSERVATIONS	BORING STARTED 3-13-01	
	BORING COMPLETED 3-13-01	
	DRILL RIG ATV-45	DRILLER DD
	APPROVED JJZ	JOB NO. 2015102

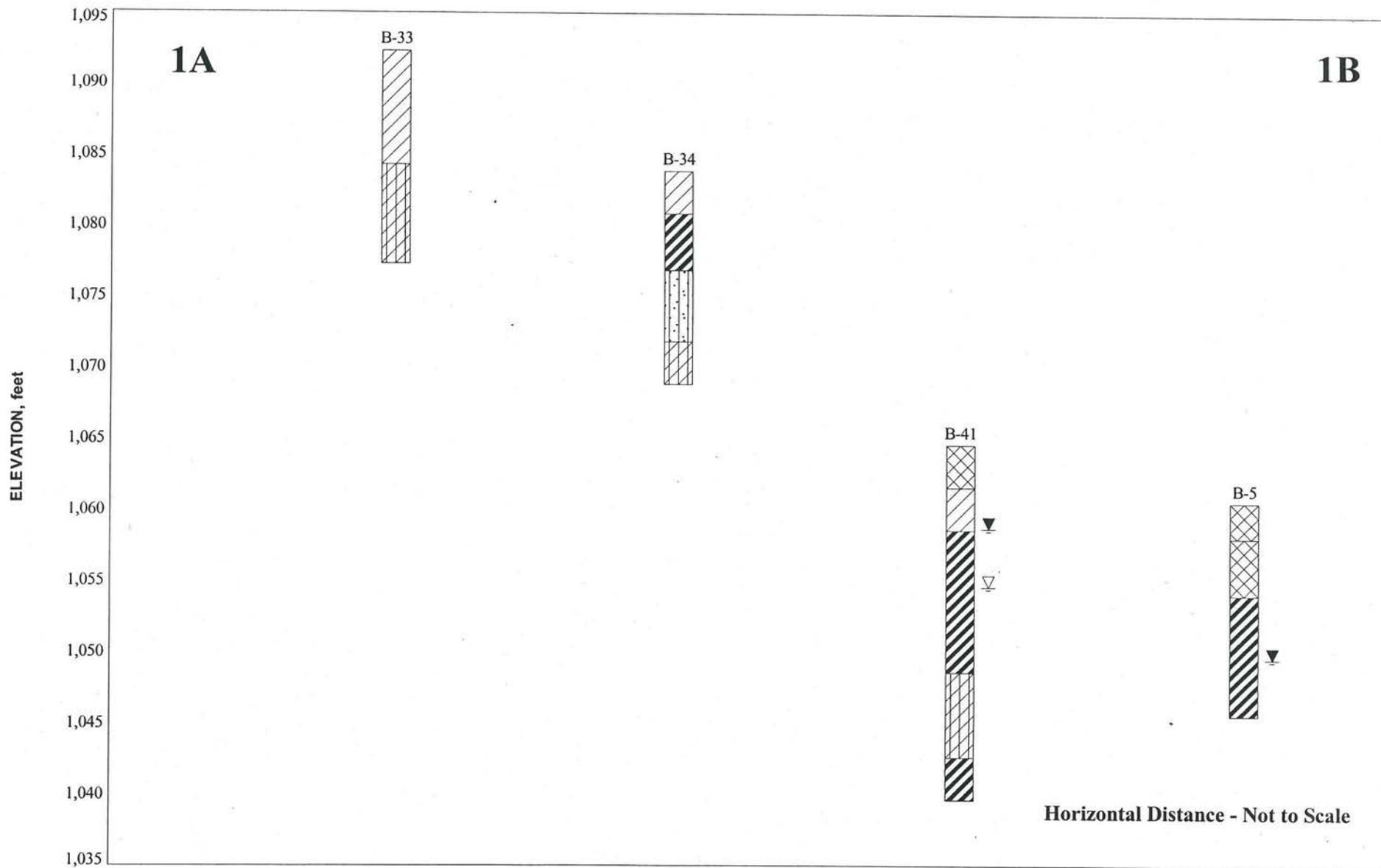




Boring Locations & Contour Diagram Manhattan Corporate Technology Park Wildcat Creek Road & Corporate Drive Manhattan, Kansas	Job No. 2015102	FIGURE 2
Scale: 1 inch = 300 feet (approx.)	Approved By: CM	



Boring & Section Locations Diagram	Job No. 2015102	FIGURE 3
Manhattan Corporate Technology Park Wildcat Creek Road & Corporate Drive Manhattan, Kansas		
Scale: 1 inch = 300 feet (approx.)	Approved By: CM	



GENERALIZED SUBSURFACE PROFILE

FIGURE 1

Manhattan Corporate Technology Park
 Wildcat Creek Road & Technology Circle
 Manhattan, Kansas

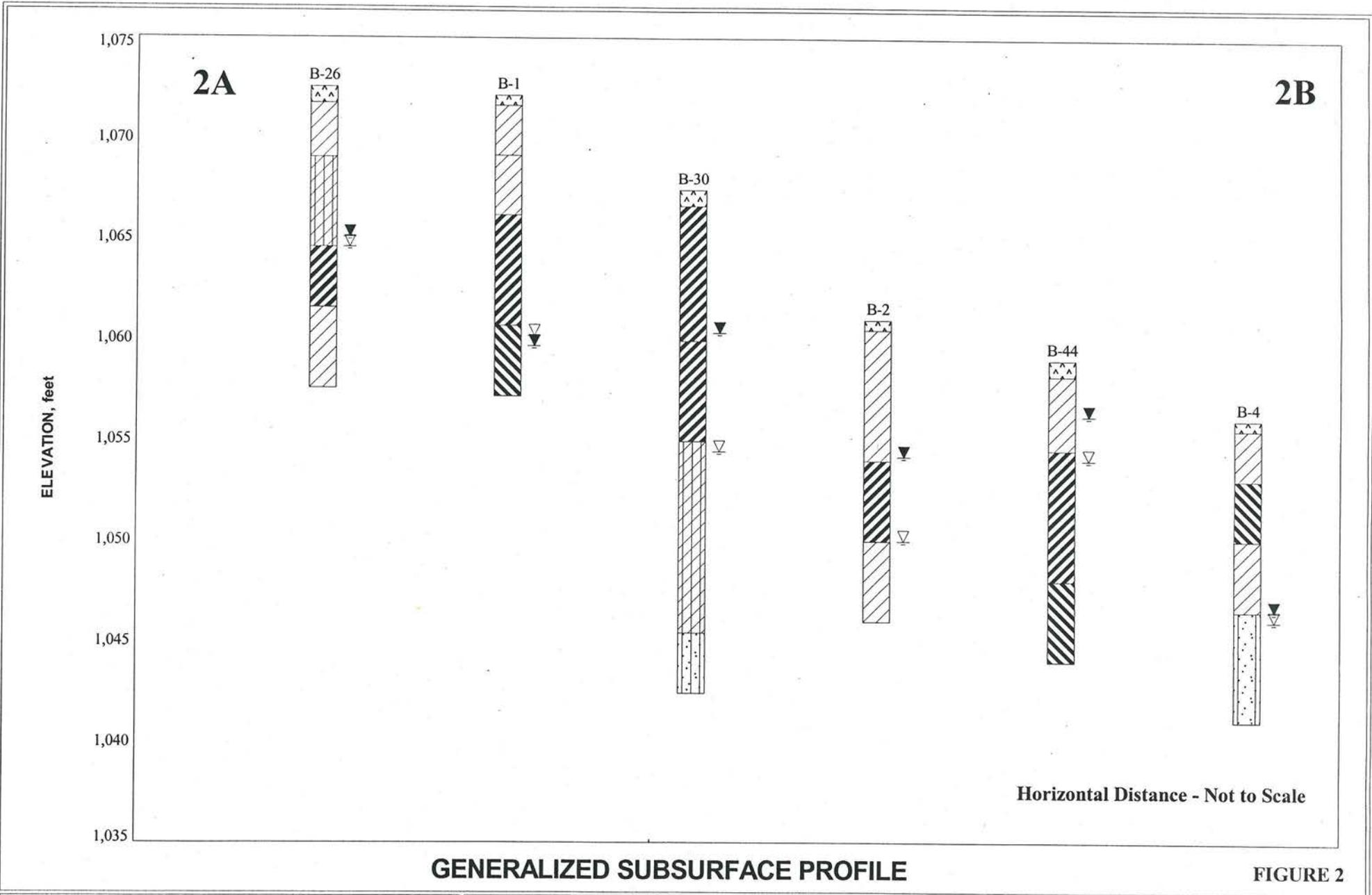
Approved By: JJZ

Job No.: 2015102

LEGEND

Topsoil	Lean Clay	Lean to Fat Clay	Sand
Silt	Fat Clay	Clayey Silt	Silty Sand
Fill	Sandy Silt	Sandy Clay	Gravel





Manhattan Corporate Technology Park
 Wildcat Creek Road & Technology Circle
 Manhattan, Kansas

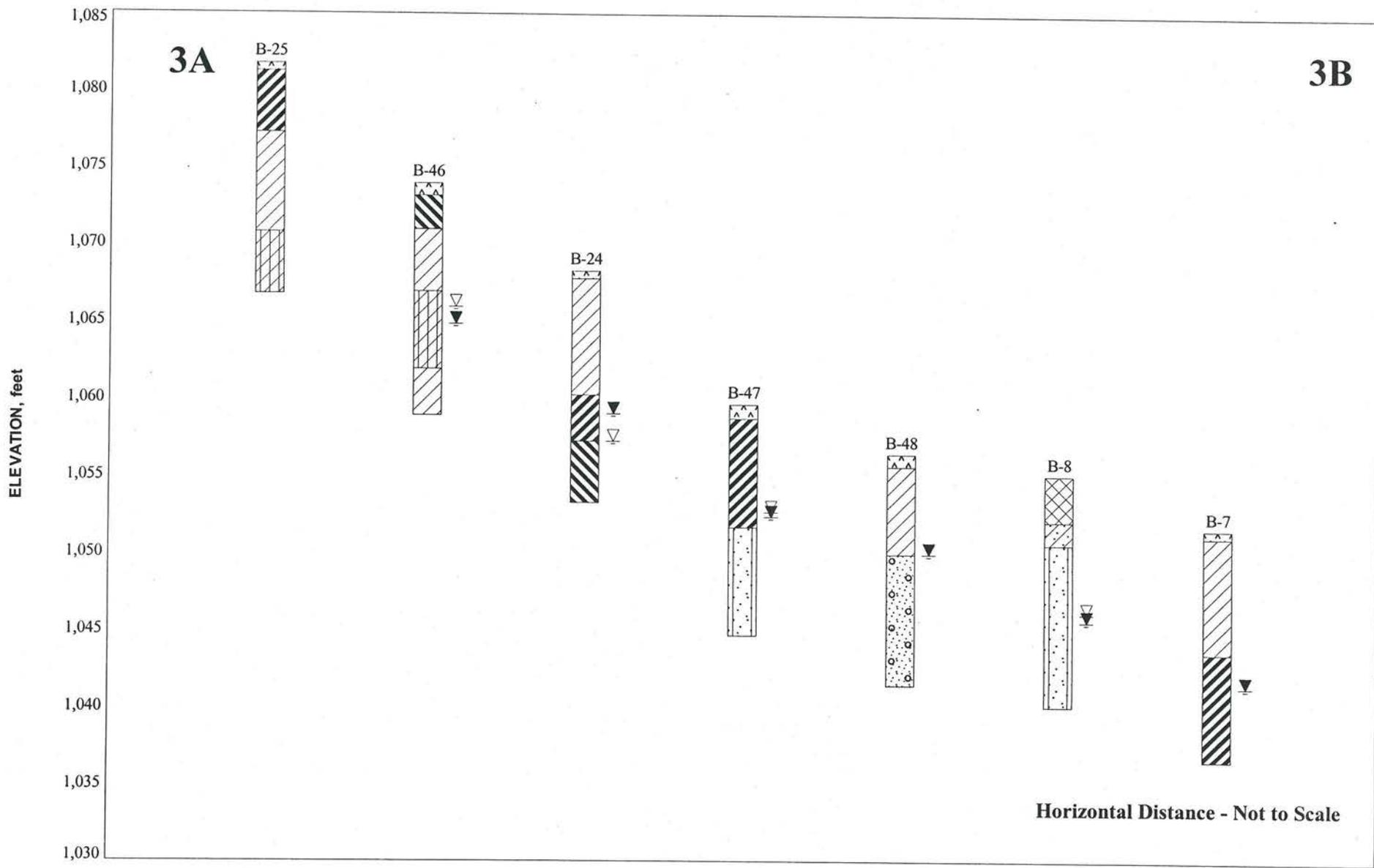
Approved By: JJZ

Job No.: 2015102

LEGEND

Topsoil	Lean Clay	Lean to Fat Clay	Sand
Silt	Fat Clay	Clayey Silt	Silty Sand
Fill	Sandy Silt	Sandy Clay	Gravel





GENERALIZED SUBSURFACE PROFILE

FIGURE 3

Manhattan Corporate Technology Park
 Wildcat Creek Road & Technology Circle
 Manhattan, Kansas

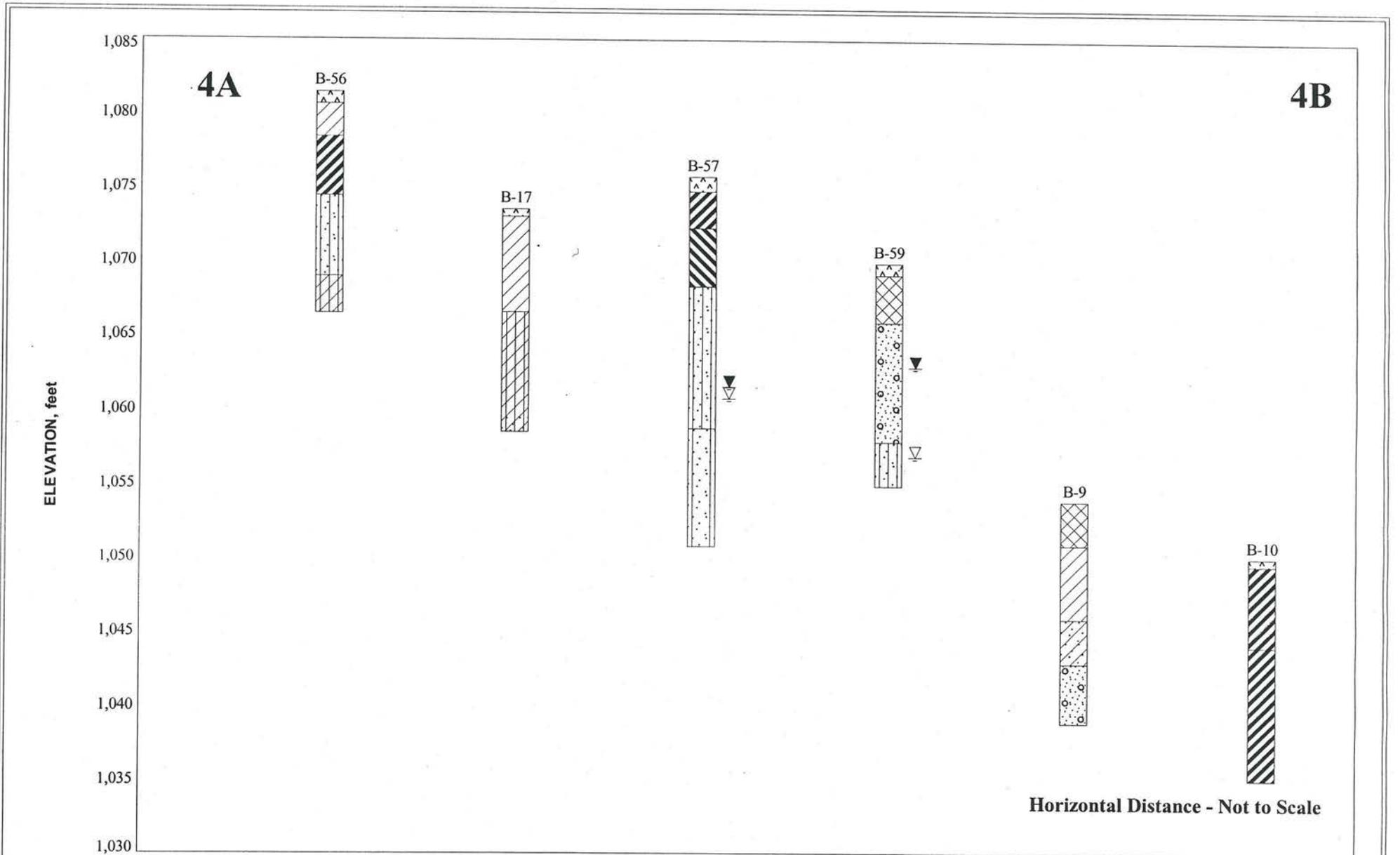
Approved By: JJZ

Job No.: 2015102

LEGEND

Topsoil	Lean Clay	Lean to Fat Clay	Sand
Silt	Fat Clay	Clayey Silt	Silty Sand
Fill	Sandy Silt	Sandy Clay	Gravel





GENERALIZED SUBSURFACE PROFILE

FIGURE 4

Manhattan Corporate Technology Park
 Wildcat Creek Road & Technology Circle
 Manhattan, Kansas

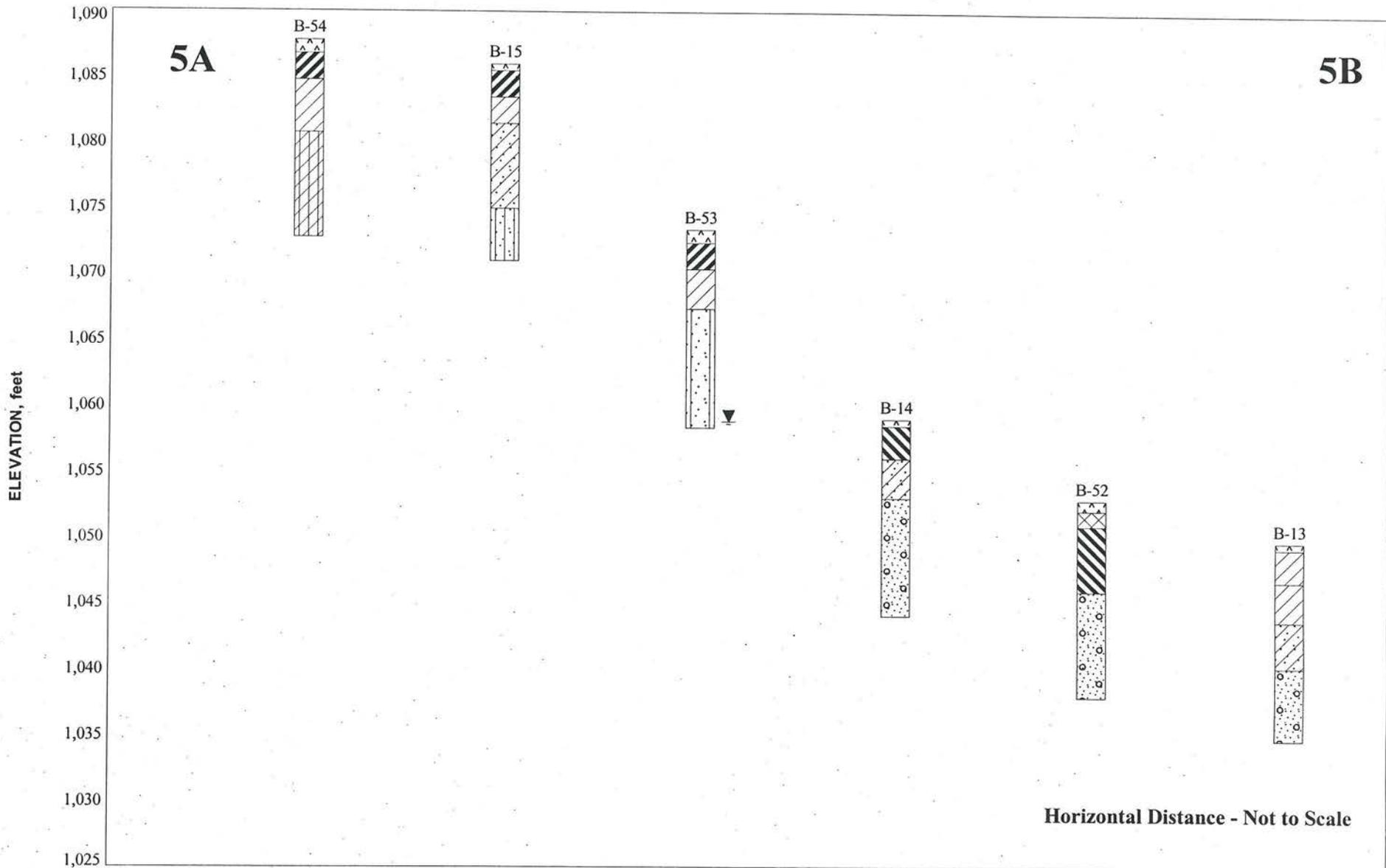
Approved By: JJZ

Job No.: 2015102

LEGEND

- | | | | |
|---------|------------|------------------|------------|
| Topsoil | Lean Clay | Lean to Fat Clay | Sand |
| Silt | Fat Clay | Clayey Silt | Silty Sand |
| Fill | Sandy Silt | Sandy Clay | Gravel |





GENERALIZED SUBSURFACE PROFILE

FIGURE 5

Manhattan Corporate Technology Park
 Wildcat Creek Road & Technology Circle
 Manhattan, Kansas

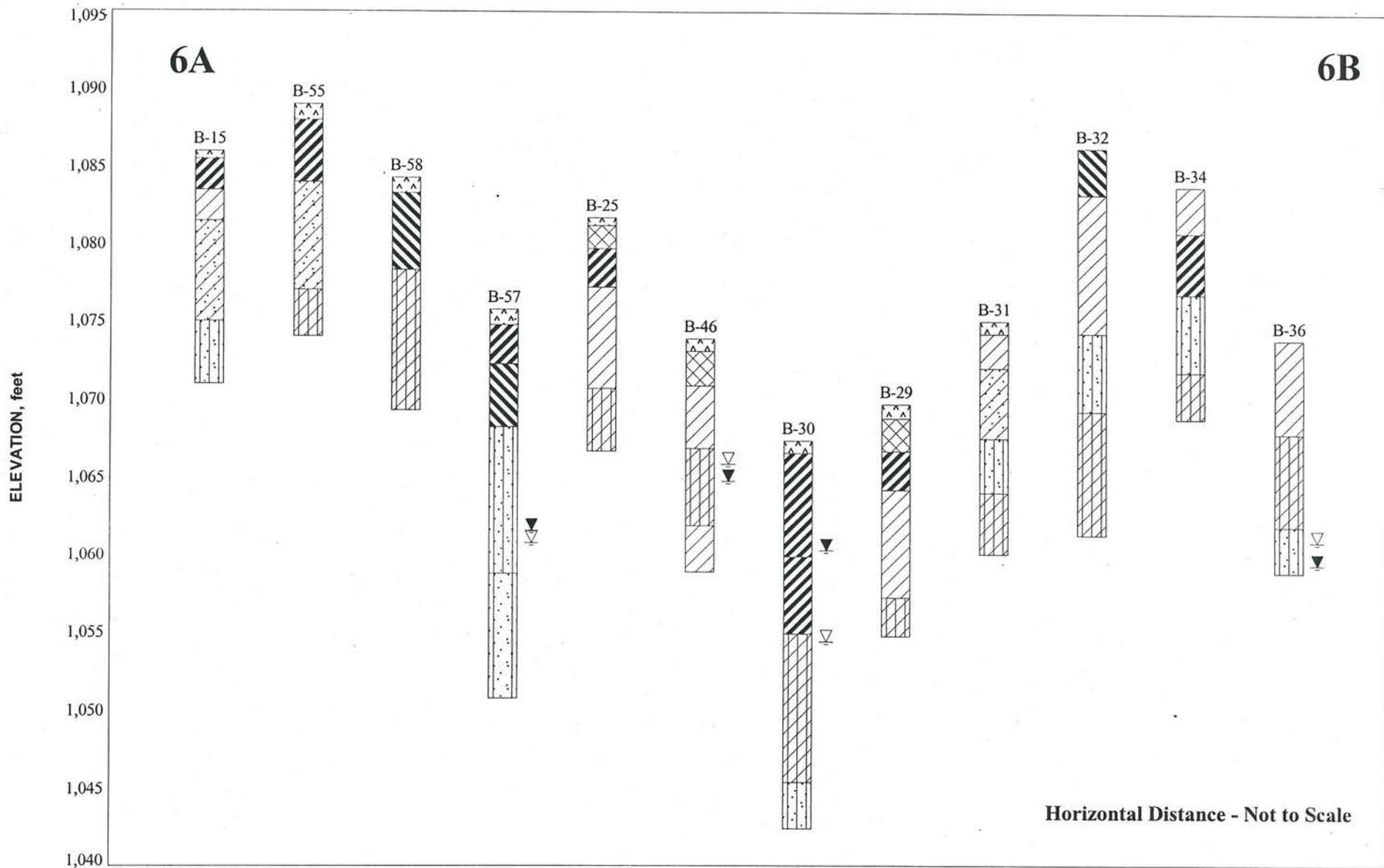
Approved By: JJZ

Job No.: 2015102

LEGEND

- | | | | |
|---------|------------|------------------|------------|
| Topsoil | Lean Clay | Lean to Fat Clay | Sand |
| Silt | Fat Clay | Clayey Silt | Silty Sand |
| Fill | Sandy Silt | Sandy Clay | Gravel |





GENERALIZED SUBSURFACE PROFILE

FIGURE 6

Manhattan Corporate Technology Park
 Wildcat Creek Road & Technology Circle
 Manhattan, Kansas

Approved By: JJZ

Job No.: 2015102

LEGEND

Topsoil	Lean Clay	Lean to Fat Clay	Sand
Silt	Fat Clay	Clayey Silt	Silty Sand
Fill	Sandy Silt	Sandy Clay	Gravel



WATER LEVEL MEASUREMENTS

Water levels indicated on the boring logs are levels measured in the borings at the times indicated. In permeable materials, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with only short-term observations.

WATER LEVEL OBSERVATION DESIGNATION

W.D.	While Drilling
A.B.	After Boring
B.C.R.	Before Casing Removal
A.C.R.	After Casing Removal
24 hr.	Water level taken approximately 24 hrs. after boring completion

DRILLING AND SAMPLING SYMBOLS

AS	Auger Sample
CS	Continuous Sampler
DB	Diamond Bit -NX unless otherwise noted
HA	Hand Auger
HS	Hollow Stem Auger
PA	Power Auger
RB	Rock Bit
SS*	Split-Barrel
ST	Shelby Tube - 2" (51mm) unless otherwise noted
WB	Wash Bore

*The Standard Penetration Test is conducted in conjunction with the split-barrel sampling procedure. The "N" value corresponds to the number of blows required to drive the last 1 foot (0.3m) of an 18 in. (0.46m) long, 2 in. (51mm) O.D. split-barrel sampler with a 140 lb. (63.5 kg) hammer falling a distance of 30 in. (0.76m). The Standard Penetration Test is carried out according to ASTM D-1586. (See "N" Value below.)

SOIL PROPERTIES & DESCRIPTIONS

TEXTURE

PARTICLE	SIZE	
Clay	< 0.002 mm	(< 0.002 mm)
Silt	< #200 Sieve	(0.075 mm)
Sand	#4 to #200 Sieve	(4.75 to 0.075 mm)
Gravel	3 in. to #4 Sieve	(75 mm to 4.75 mm)
Cobbles	12 in. to 3 in.	(300 mm to 75 mm)
Boulders	> 12 in.	(300 mm)

COMPOSITION

SAND & GRAVEL	
Description	% by Dry Weight
trace	< 15
with	15 - 29
modifier	> 30
FINES	
Description	% by Dry Weight
trace	< 5
with	5 - 12
modifier	> 12

Soil descriptions are based on the Unified Soil Classification System (USCS) as outlined in ASTM Designations D-2487 and D-2488. The USCS group symbol shown on the boring logs correspond to the group names listed below. The description includes soil constituents, consistency, relative density, color and other appropriate descriptive terms. Geologic description of bedrock, when encountered, also is shown in the description column.

GROUP SYMBOL	GROUP NAME	GROUP SYMBOL	GROUP NAME
GW	Well Graded Gravel	CL	Lean Clay
GP	Poorly Graded Gravel	ML	Silt
GM	Silty Gravel	OL	Organic Clay or Silt
GC	Clayey Gravel	CH	Fat Clay
SW	Well Graded Sand	MH	Elastic Silt
SP	Poorly Graded Sand	OH	Organic Clay or Silt
SM	Silty Sand	PT	Peat
SC	Clayey Sand	CL-CH	Lean to Fat Clay

COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (Qu)		PLASTICITY
	(psf)	(kPa)	
Very Soft	< 500	(< 24)	Description
Soft	500 - 1000	(24 - 48)	Lean
Medium	1001 - 2000	(48 - 96)	Lean to Fat
Stiff	2001 - 4000	(96 - 192)	Fat
Very Stiff	4001 - 8000	(192 - 383)	Liquid Limit (%)
Hard	> 8001	(> 383)	< 45%
			45 to 49%
			≥ 50%

COHESIONLESS SOILS

RELATIVE DENSITY	"N" VALUE*
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	≥ 50

BEDROCK PROPERTIES & DESCRIPTIONS

ROCK QUALITY DESIGNATION (RQD)**

DESCRIPTION OF ROCK QUALITY	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

**RQD is defined as the total length of sound core pieces, 4 inches (102mm) or greater in length, expressed as a percentage of the total length cored. RQD provides an indication of the integrity of the rock mass and relative extent of seams and bedding planes.

HARDNESS & DEGREE OF CEMENTATION

LIMESTONE	
Hard	Difficult to scratch with knife.
Moderately Hard	Can scratch with knife but not with fingernail.
Soft	Can be scratched with fingernail.
SHALE	
Hard	Can scratch with knife but not with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be molded easily with fingers.
SANDSTONE	
Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers.

BEDDING CHARACTERISTICS

TERM	THICKNESS (inches)	THICKNESS (mm)
Very Thick Bedded	> 36	> 915
Thick Bedded	12 - 36	305 - 915
Medium Bedded	4 - 12	102 - 305
Thin Bedded	1 - 4	25 - 102
Very Thin Bedded	0.4 - 1	10 - 25
Laminated	0.1 - 0.4	2.5 - 10
Thinly Laminated	< 0.1	< 2.5

Bedding Planes	Planes dividing the individual layers, beds or strata of rocks.
Joint	Fracture in rock, generally more or less vertical or transverse to the bedding.
Seam	Applies to bedding plane with an unspecified degree of weathering.

DEGREE OF WEATHERING

Slightly Weathered	Slight decomposition of parent material in joints and seams.
Weathered	Well-developed and decomposed joints and seams.
Highly Weathered	Rock highly decomposed, may be extremely broken.

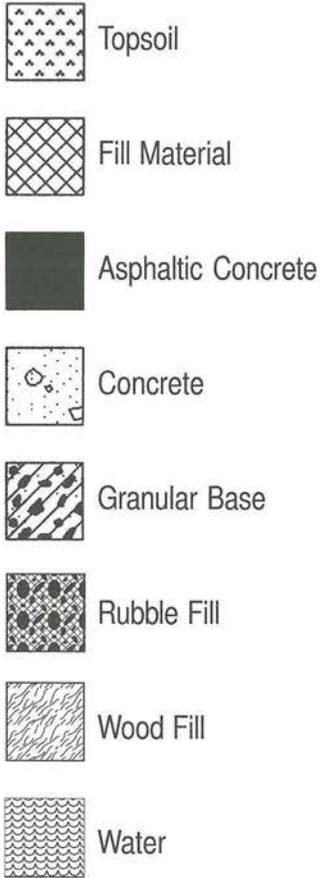
SOLUTION AND VOID CONDITIONS

Solid	Contains no voids.
Vuggy	Containing small pits or cavities < 1/2" (13mm).
Porous	Containing numerous voids which may be interconnected.
Cavernous	Containing cavities, sometimes quite large.

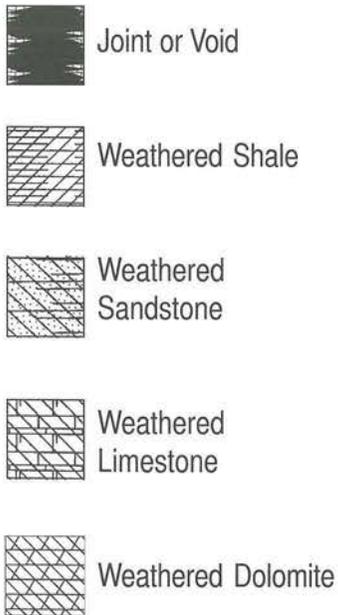
When classification of rock materials has been estimated from disturbed samples, core samples and petrographic analysis may reveal other rock types.

BORING LOG SYMBOLS

SURFACE MATERIALS



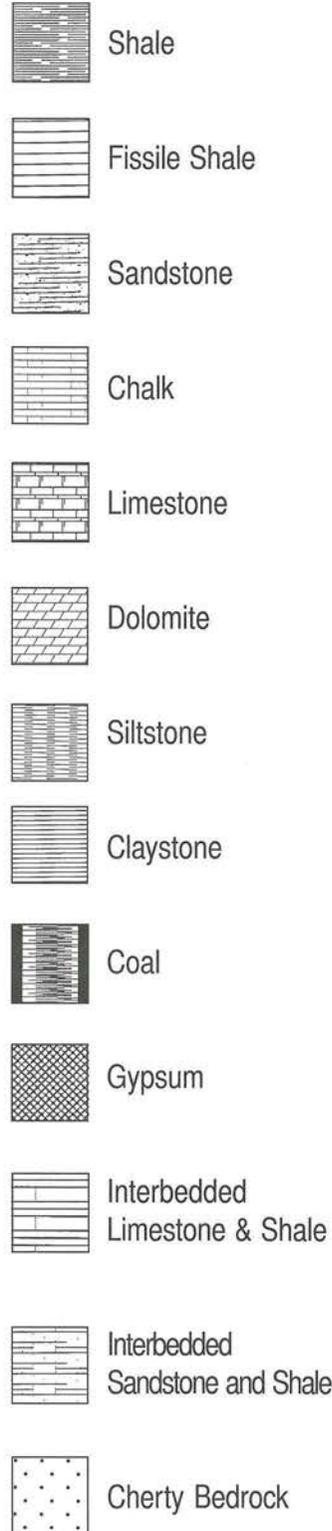
WEATHERED BEDROCK



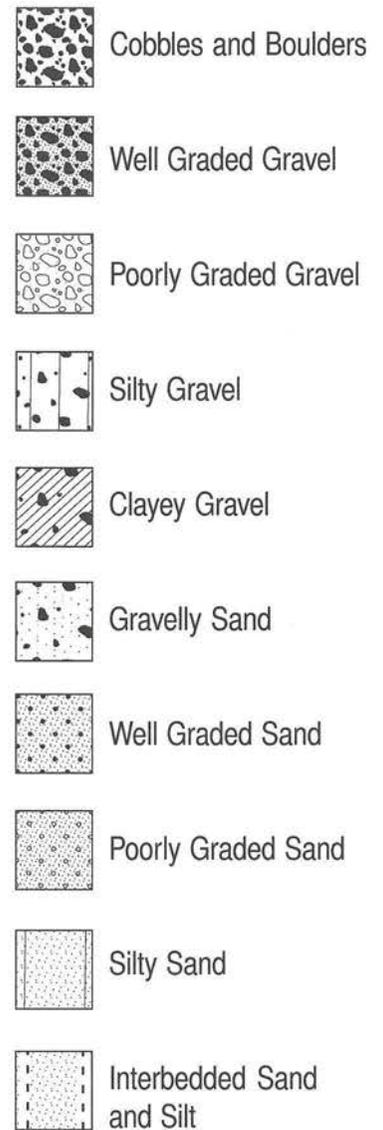
FINE-GRAINED SOILS



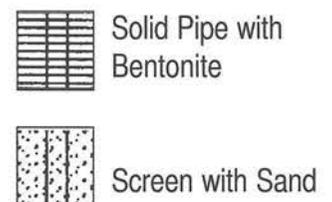
BEDROCK UNITS



COARSE-GRAINED SOILS

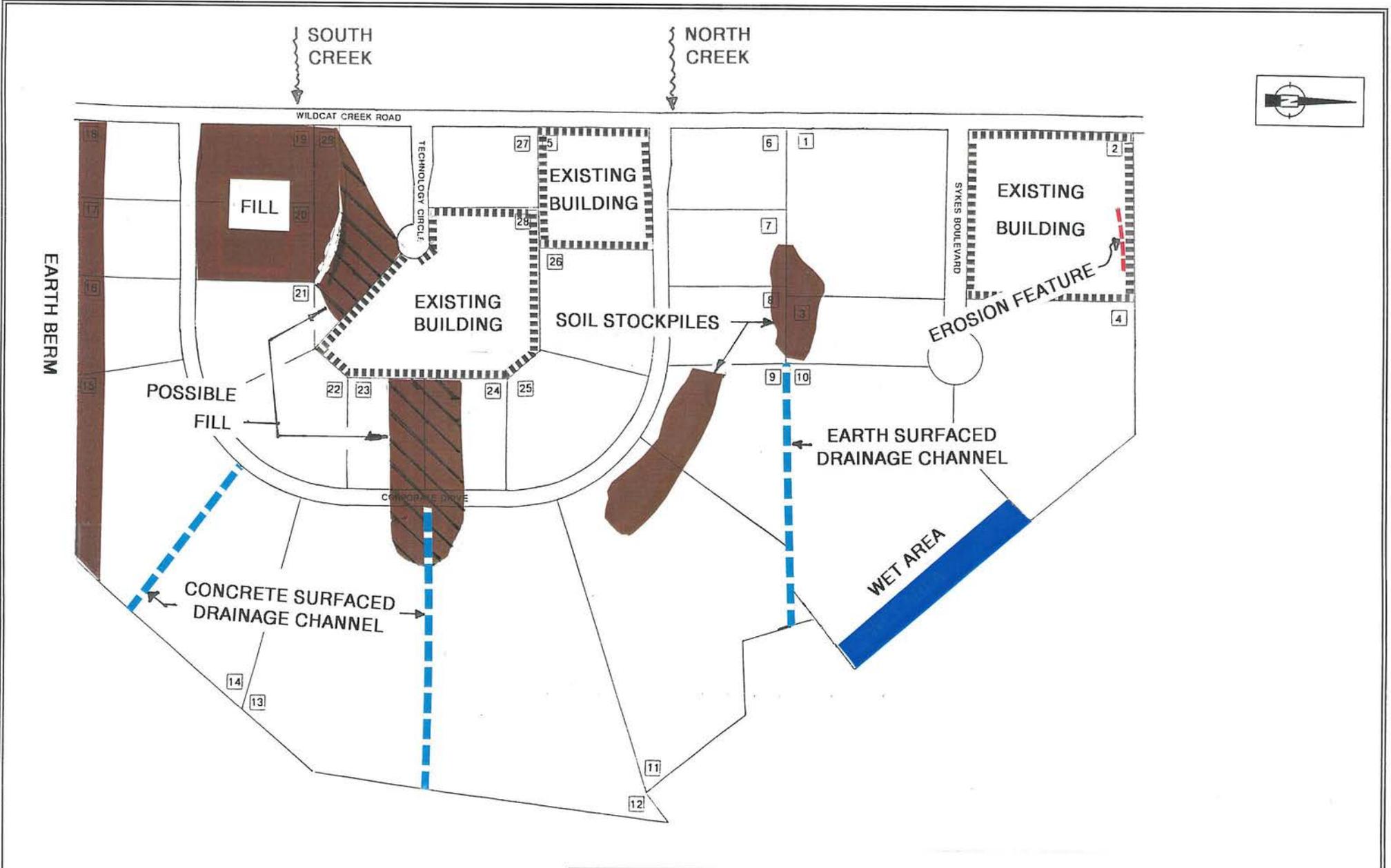


WELL SYMBOLS

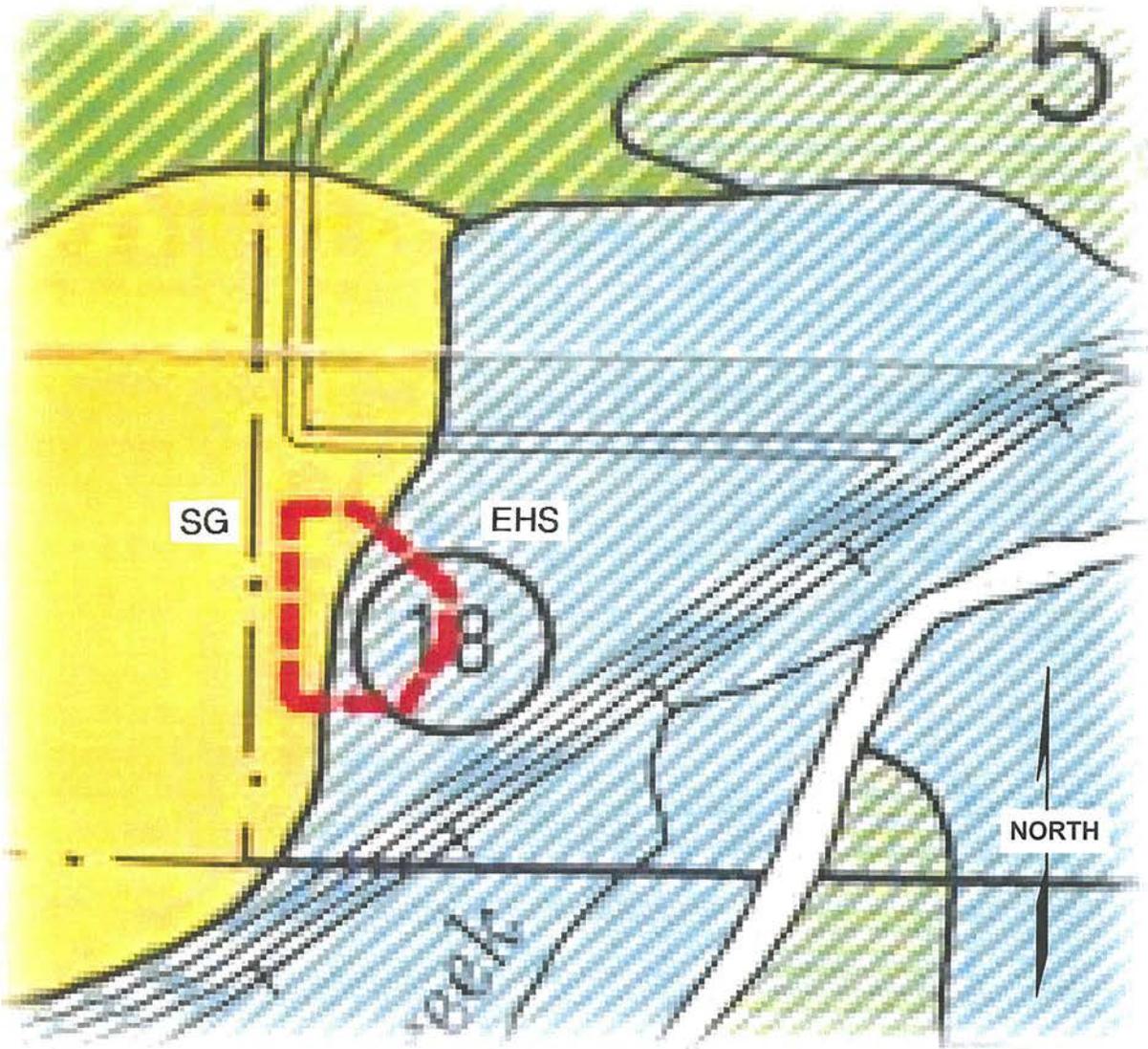




Appendix C

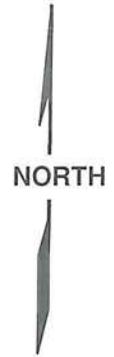
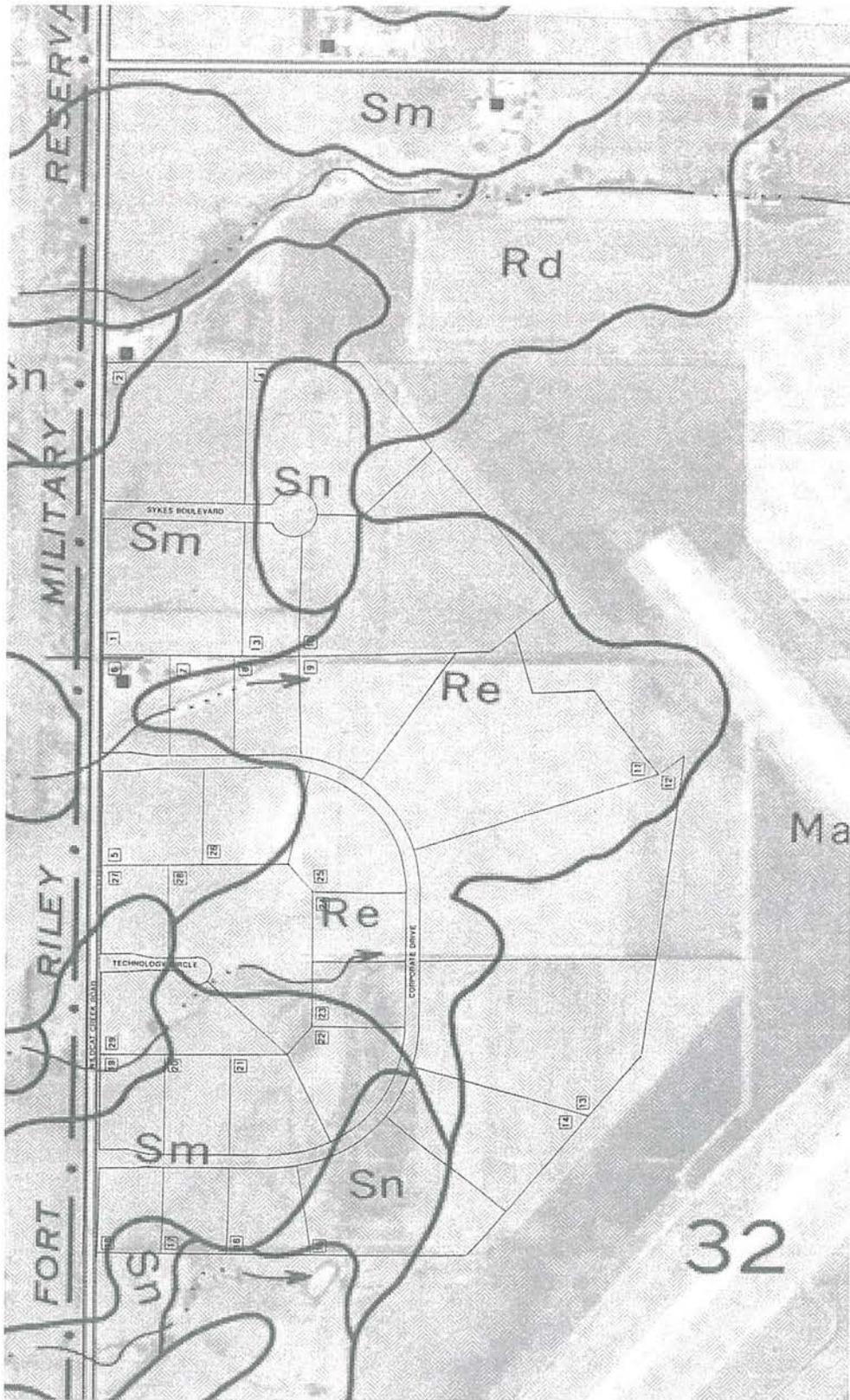


Apparent Surface Features Diagram		Job No. 2015102	Figure 11
Manhattan Corporate Technology Park Wildcat Creek Road & Corporate Avenue Manhattan, Kansas			
Scale: 1 inch = 500 feet (approx.)	Approved by: CM		

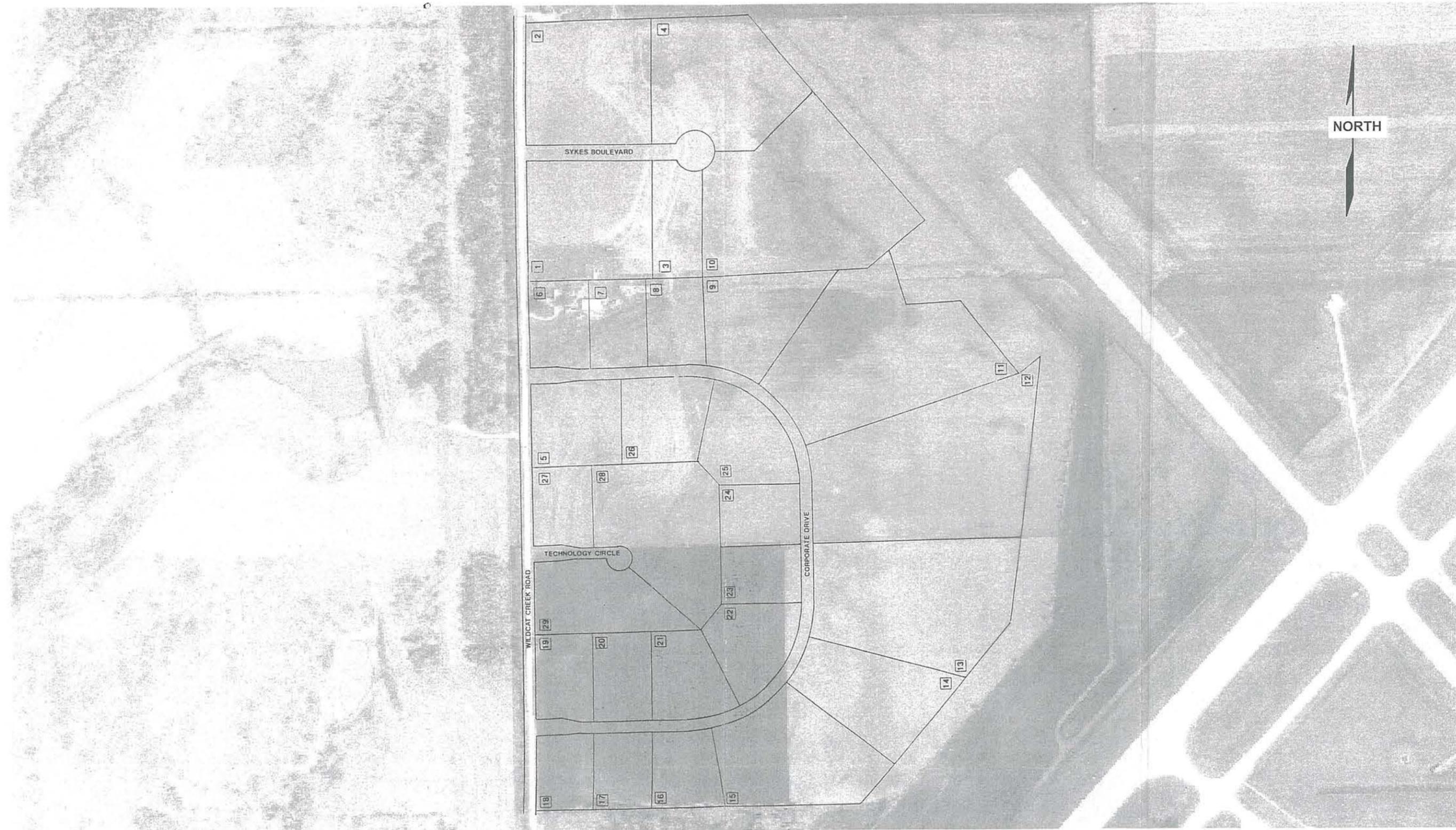


SG = SMOLAN-GEARY ASSOCIATION
 EHS = EUDORA-HAYNIE-SARPY ASSOCIATION

Soil Associations	Job No: 2015102	FIGURE 12
Manhattan Corporate Technology Park Wildcat Creek Road & Corporate Avenue Manhattan, Kansas		
Scale: NTS		



Soil Type Boundaries		Job No: 2015102	FIGURE 13
Manhattan Corporate Technology Park Wildcat Creek Road & Corporate Avenue Manhattan, Kansas			
Scale: NTS	Approved: CM		



Historical Aerial Photo 1995

Manhattan Corporate Technology Park
 Wildcat Creek Road & Corporate Drive
 Manhattan, Kansas

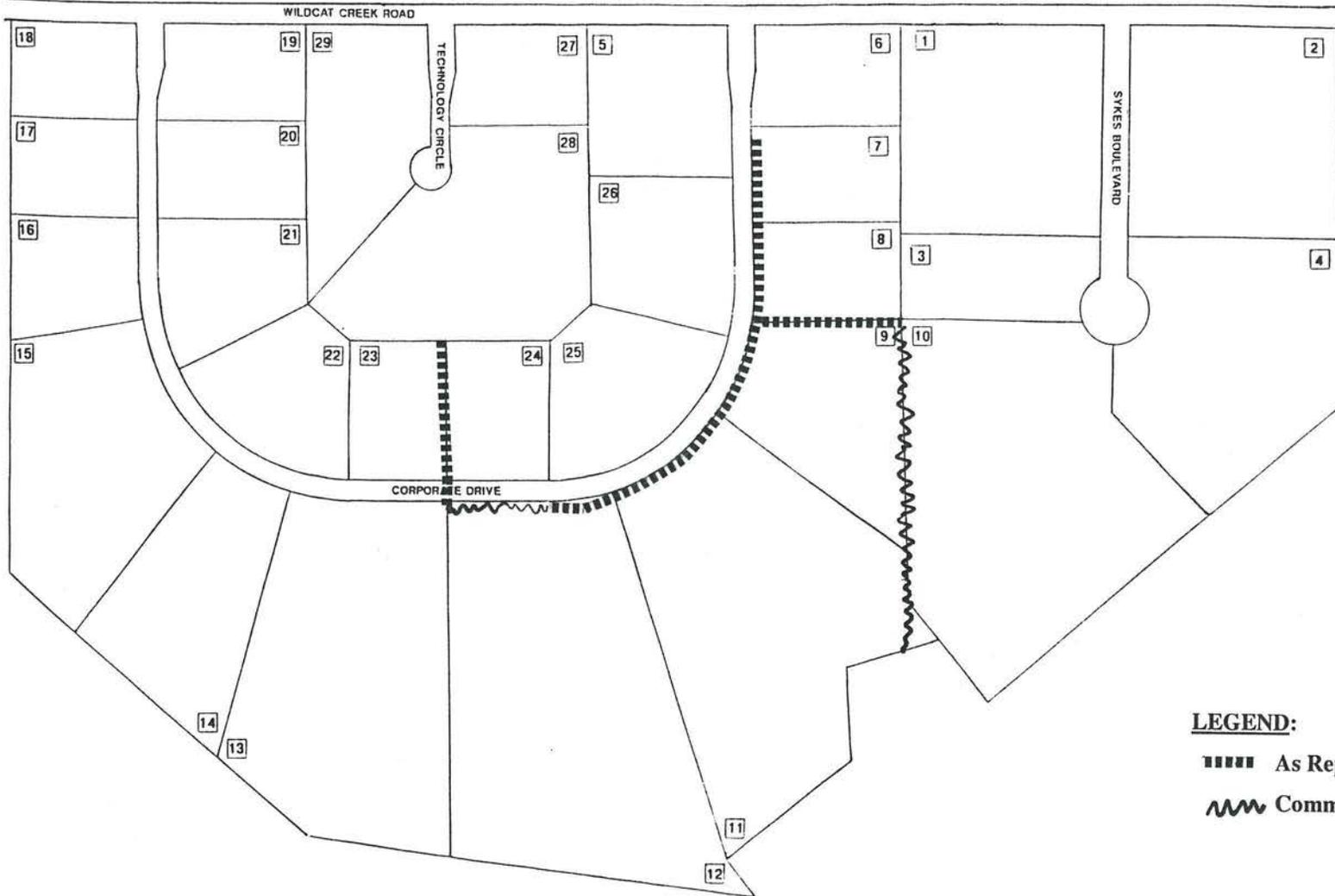
Scale: 1 inch = 500 feet (approx.)

Approved By: CM

Job No. 2015102

FIGURE 14

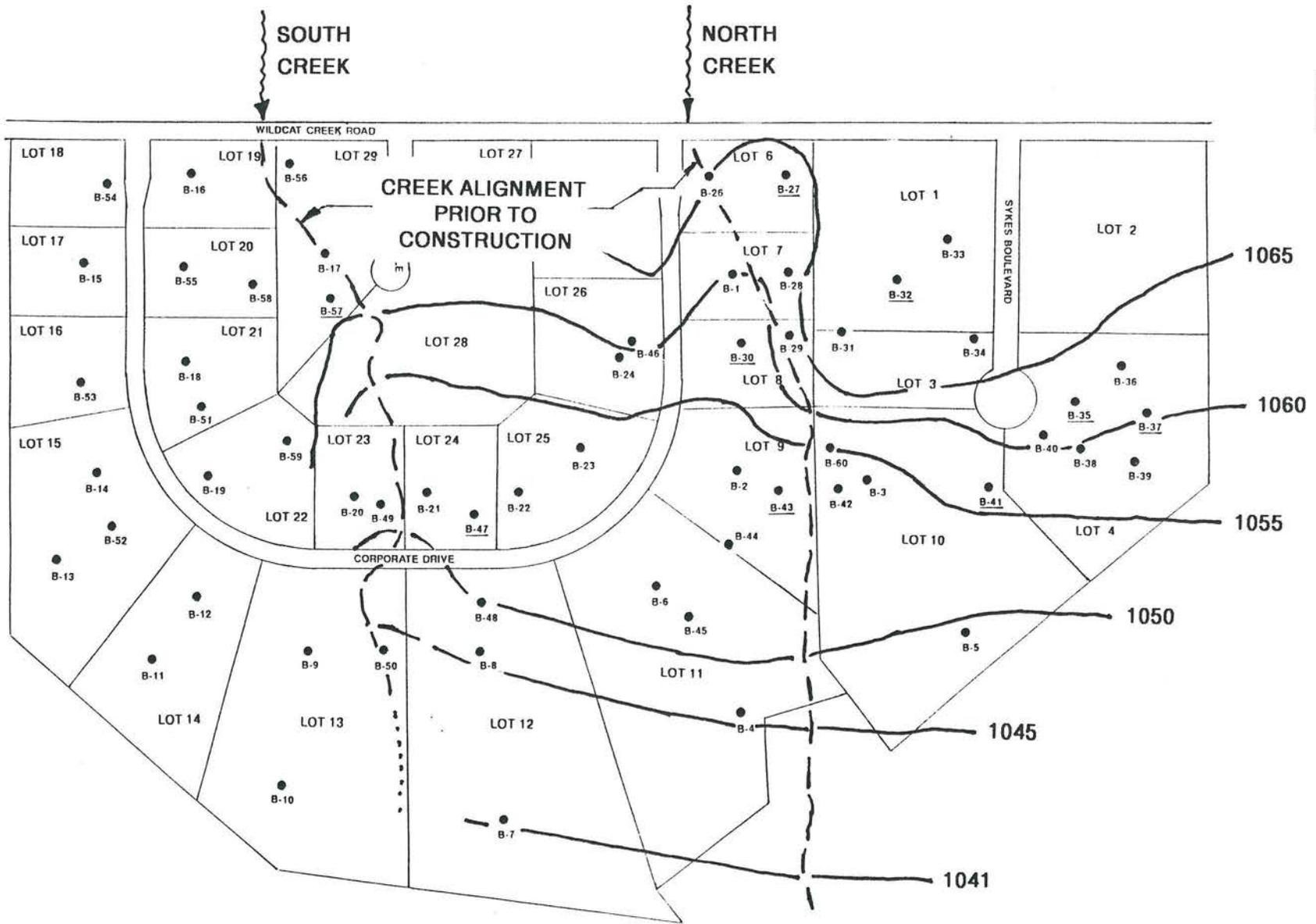




LEGEND:

- As Reported by City of Manhattan
- ~~~~~ Communication with Contractor

Extent of Previously Reported Groundwater Problems		Job No. 2015102	Figure 15
Manhattan Corporate Technology Park Wildcat Creek Road & Corporate Avenue Manhattan, Kansas			
Scale: 1 inch = 500 feet (approx.)	Approved by: CM		



Inferred Groundwater Contour Plan

Job No. 2015102

Figure 16

Manhattan Corporate Technology Park
 Wildcat Creek Road & Corporate Avenue
 Manhattan, Kansas



Scale: 1 inch = 500 feet (approx.)

Approved by: CM

