FINAL REPORT

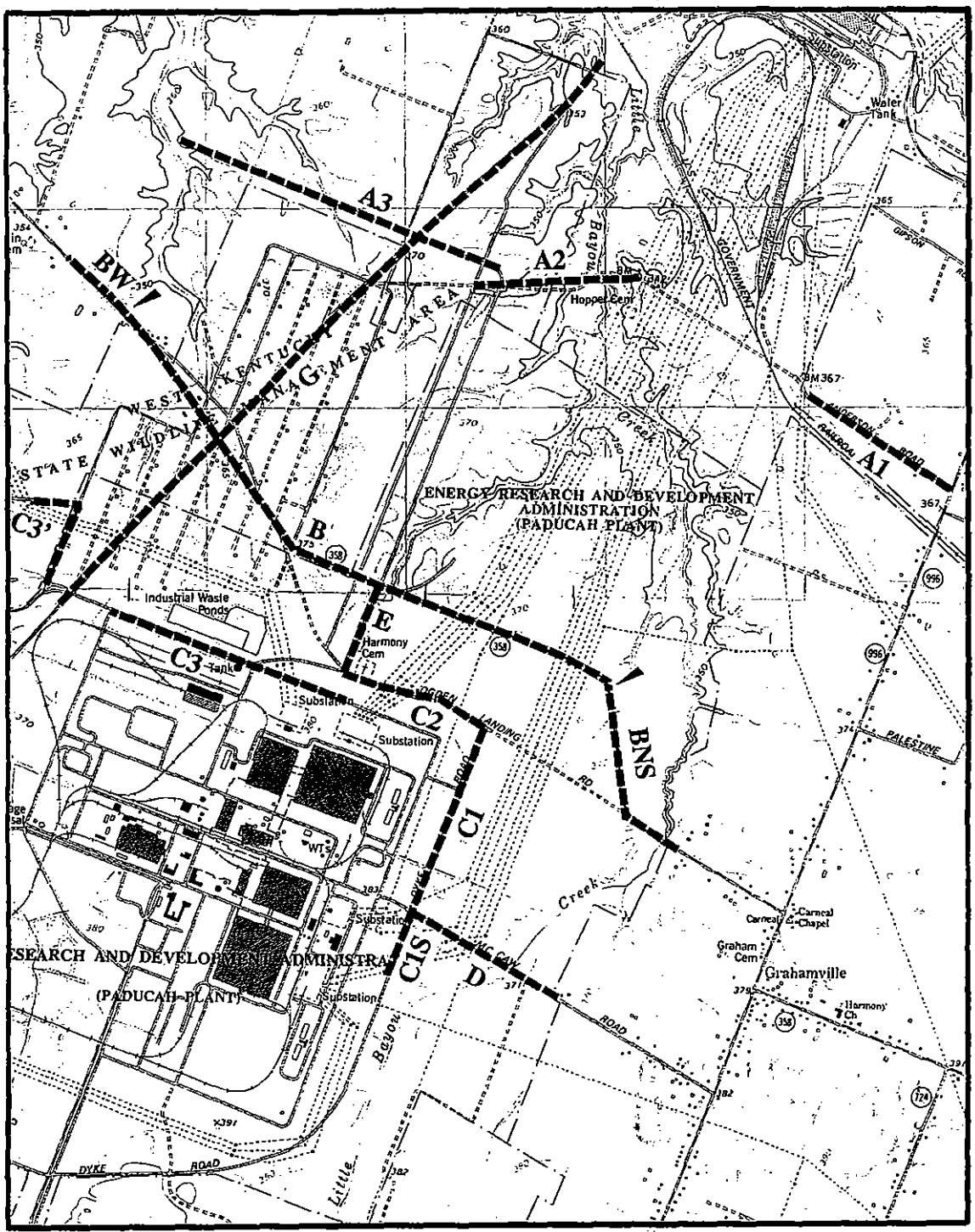
ACQUISITION OF SH–WAVE SEISMIC REFLECTION AND REFRACTION DATA IN THE AREA OF THE NORTHEASTWARD TRENDING CONTAMINANT PLUME AT THE PGDP

Christina Langston
Research Assistant

Ron Street
Principal Investigator
Department of Geological Sciences
University of Kentucky
Lexington, KY 40506

Telephone: (606) 257-4777
FAX: (606) 323-1938
email: geo151@ukcc.uky.edu

July 31, 1998


A3
A2
A1
BW
B
C3'
C3
C2
C1
BNS
E
F
D
C1S
KENTUCKY WEST WILDLIFE MANAGEMENT AREA
STATE
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
(PADUCAH PLANT)
Industrial Waste Ponds
Harmony Cem
Substation
Water Tank
Hoppe Cem
Graham Cem
Carneal Chapel
Grahamville
Harmony Ch
Bayou
Little
Creek
DYKE ROAD
PALESTINE
0
2
km

CONTENTS

1.0 INTRODUCTION

The Paducah Gaseous Diffusion Plant (PGDP), a Department of Energy (DOE) facility, is located in the Jackson Purchase area of western Kentucky (Fig. 1). Constructed in 1952, the plant produces uranium enriched in the uranium isotope ^{235}U for nuclear reactors. Procedures involved in everyday plant operations generate wastes and contaminants. Among these are TCE (tricholoroethylene) and Tc-99 (technetium-99 isotope). TCE is used at the PGDP as a cleaning agent, while Tc-99 is a byproduct of the reprocessing of nuclear power reactor tails (Clausen et al., 1992).

1.1 BACKGROUND

In 1988, TCE and Tc-99 were discovered in several private wells about 1 mile north of PGDP (Clausen et al., 1992). The source of these contaminants has been linked to the PGDP. These findings led to the initiation of numerous projects designed to characterize the site geology, hydrogeology, and groundwater flow characteristics near the PGDP. Tests showed that two contaminant plumes were emanating from within PGDP. The plumes were found to be traveling through the shallowest aquifer near the PGDP, the regional gravel aquifer (RGA), located at depths ranging from 9 to 25 m. Groundwater flow directions within the RGA are to the north, toward the Ohio River (Clausen et al., 1992). However, the plumes were found to be migrating to the northeast, suggesting that other factors may be involved in the plumes' direction of propagation. J. Drahovzal (pers.

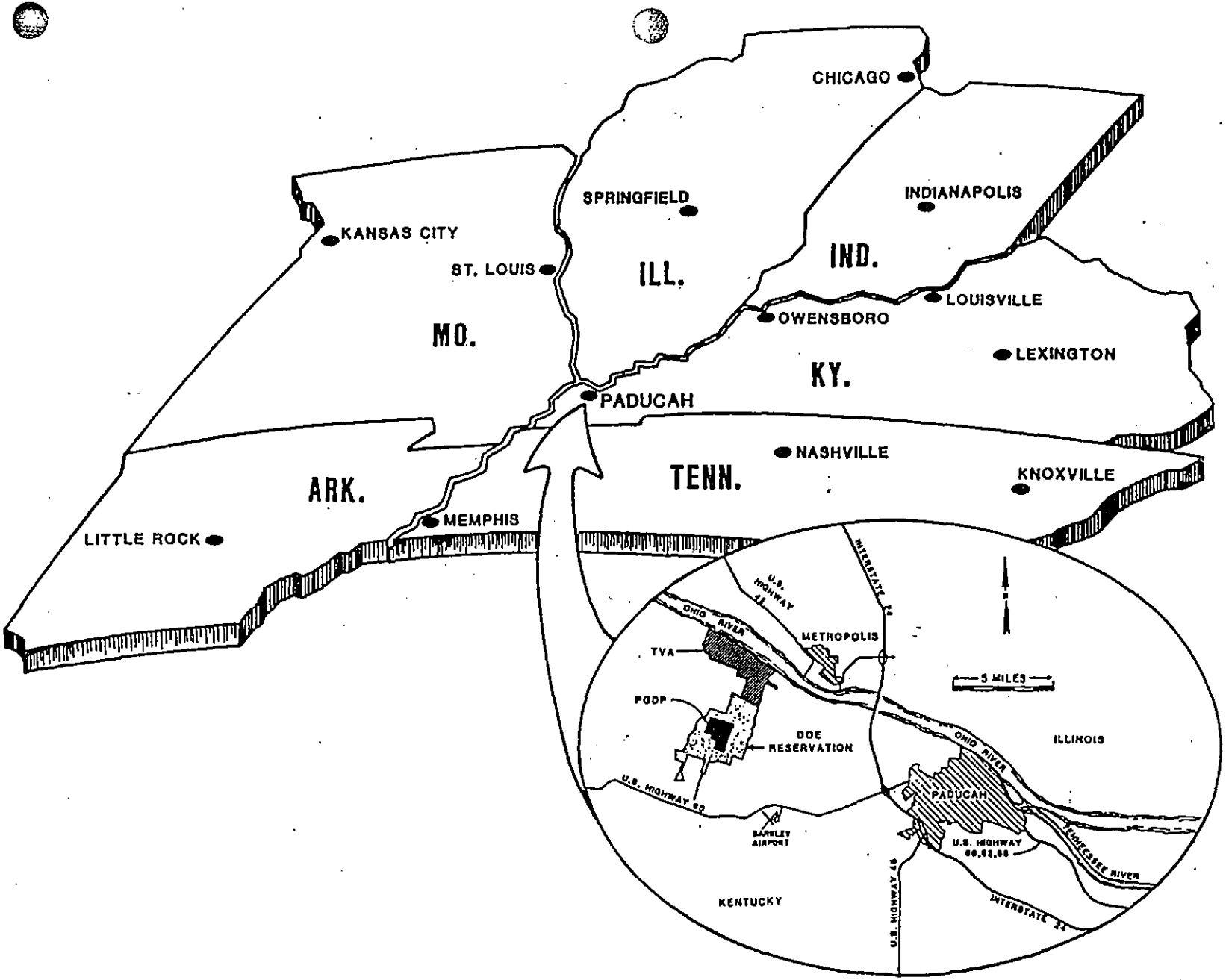


Figure 1. Regional map showing location of PGDP (from Clausen et al., 1992).

comm., 1997) proposed that the migration of the contaminant plumes might be controlled by local geologic structure. A pilot investigation was undertaken to determine data acquisition parameters to be used. Preliminary results indicated the presence of two fault zones near the northwest corner of the plant.

1.2 OBJECTIVES

There were two main objectives of the study. The first was to seismically image the RGA, the top of the Clayton and McNairy Formations, and the top of the limestone bedrock in the area of the contaminant plumes. The second objective was to find evidence of faulting or other aspects of the subsurface that could be controlling migration of the contaminant plumes. The presence of contaminants and their continuing migration indicates a strong need for specific knowledge of the shallow subsurface structure in the vicinity of the PGDP.

Based on Harris' (1992) study in the area surrounding PGDP, the need to use a nondestructive energy source in the wildlife area surrounding the PGDP, and field tests involving a weight drop for P–waves and a seismic hammer for SH–waves, it was decided that the best results could be achieved by acquiring high-resolution, SH–wave seismic CDP data using a seismic hammer. Results from the field tests were also used to determine the optimum acquisition geometry.

2.0 REGIONAL GEOLOGY

2.1 STRATIGRAPHY

The Jackson Purchase Region of Kentucky is located in the northernmost part of the Mississippi Embayment of the Gulf Coastal Plain Province and encompasses a 2,356-square-mile, eight-county area (Schwalb, 1969). The history of the embayment began in Cambrian time subsequent to the formation of the Reelfoot Rift to the south and the Rough Creek Graben to the east. Paleozoic rocks ranging from Cambrian to Mississippian in age are buried beneath Mesozoic and younger sediments, except on the eastern margin of the embayment, where Mississippian and Devonian strata crop out (Schwalb, 1969).

Cretaceous and younger rocks lie unconformably on this Paleozoic bedrock. A generalized stratigraphic column of the post-Paleozoic stratigraphy of the Jackson Purchase is shown in Figure 2. The oldest post-Paleozoic formation in the Jackson Purchase is the Upper Cretaceous Tuscaloosa Formation. A distinctive unit, this formation is composed of chert and well-rounded or broken chert gravel (Hansen, 1966). The Tuscaloosa is present over a relatively large area. In Kentucky, the formation is age-equivalent to rocks that overlie the Tuscaloosa of Alabama, indicating that the Tuscaloosa is a time-transgressive unit (Olive, 1980). This formation is very similar to another unit present locally, termed the"Little Bear Rubble". Both appear to be derived from similar material; angularity of clasts seems to be the only characteristic that can be

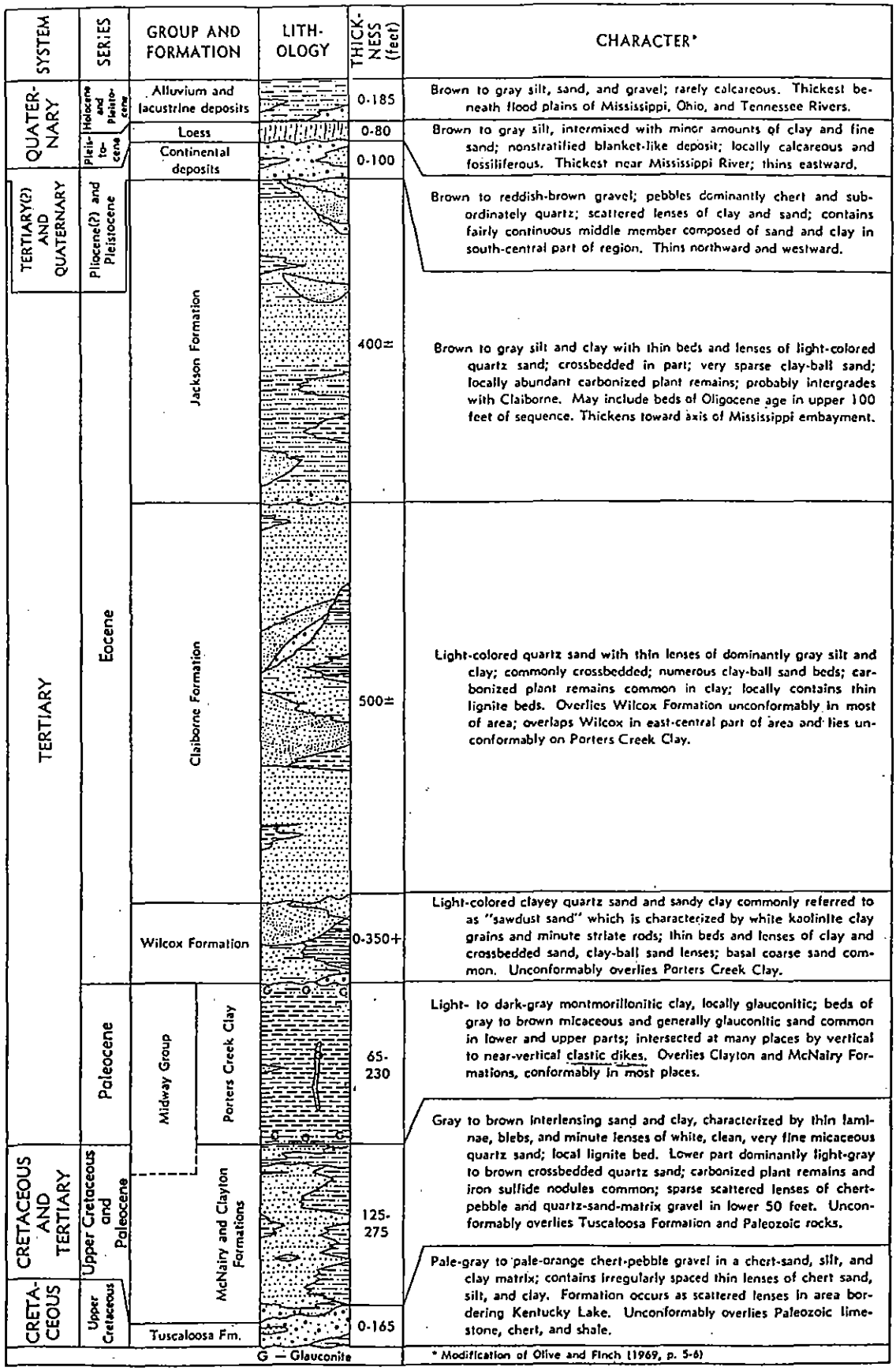


Figure 2. Stratigraphic column of the post-Paleozoic succession in the Jackson Purchase (from Olive, 1972).

used to distinguish the two units (Clausen et al., 1992). The Tuscaloosa Formation was encountered by drillhole at only one site in the vicinity of the PGDP, near the Shawnee Steam plant (Sykora and Davis, 1993).

The sediments of the McNairy Formation overlie the Tuscaloosa Formation. First called the McNairy Sand after its type locality, the equivalent strata in the northern Purchase area is referred to as the McNairy Formation because in this location it is principally clay (Olive, 1980). Olive (1972) observed that both formations are lithologically similar and referred to the two formations collectively as the Clayton-McNairy Formation. Sykora and Davis (1993) determined that the elastic properties of the McNairy Formation are likewise similar to those of the Tertiary Clayton Formation in the northern part of the Jackson Purchase. This report will use the nomenclature established by Olive.

The Porters Creek Clay, perhaps the most distinguishable unit in the Tertiary strata, overlies the Clayton-McNairy Formation. Its composition, that of dark-gray montmorillonitic clay that is occasionally glauconitic, is consistent throughout the embayment. Its thickness fluctuates because of erosion preceding deposition of Eocene sediments (Hansen, 1966).

Eocene sediments overlie the Paleocene Porters Creek Clay south of PGDP. Three formations of Eocene age have been identified in the Jackson Purchase: the Wilcox, Claiborne, and Jackson Formations. The sediments of these units are usually distinguished

by means of palynological data (Olive, 1980). The sediments of each unit consist of interbedded and interlensing sand, silt, and clay (Olive, 1966).

During late Tertiary to Quaternary time, a gravel unit was deposited throughout the Jackson Purchase. Common names for this unit include the Lafayette Formation, Lafayette gravel, and Mounds gravel. For the purposes of this study, the unit will be referred to as continental deposits, following the nomenclature of Olive (1980). As indicated by some of the names for this unit, it is composed chiefly of gravel, but it also contains clay lenses, sand, and silty clay (Olive, 1980). The origin and age of these deposits are still controversial; some contend that the deposits are Pleistocene in age and derived from glacial outwash, while others maintain that the gravel is Pliocene-Pleistocene in age and that only the younger gravels of the unit were influenced by glaciation (Olive, 1980). In any case, a southeastern sediment source is likely, as is evidence by a southeastern increase in the altitude of the bedrock surface beneath the deposits, a southeastern increase in the minimum size of the coarsest grains, and a southeastern increase in the size of the modal class (Olive, 1980). The base of the continental deposits is an unconformity and exhibits steps or terraces (Clausen et al., 1992). The continental deposits are overlain by Quaternary loess, lacustrine deposits, and alluvium. Loess deposits are presumably derived from alluvium deposited by glacial meltwaters in the Mississippi and Ohio River valleys (Olive, 1980). Lacustrine sediments are from an ancient lake that once occupied eastern parts of the Purchase; these deposits occur at altitudes lower than 357 feet in areas bordering the Ohio and Tennessee Rivers, as is

suggested by the presence of gravel bars at this altitude (Olive, 1980). Most of the lacustrine sediments were derived from the area surrounding the lake. Pleistocene and Holocene alluvium are derived from the Jackson Purchase Region, although the alluvium of the major rivers bordering the Purchase was likely carried from more distant sources.

2.2 DEPOSITIONAL HISTORY

During the Cretaceous, the Purchase was an upland because of the presumed emergence of the Pascola Arch to the south. Scientists theorize that thermal events in the crust related to reactivation of the faults bounding the Reelfoot Rift contributed to this rise. Streams that flowed across the area emptied into a south-draining trunk stream (Olive, 1980). Eventually, the gradient of this stream was lowered sufficiently so that alluviation of its valley began; this alluviation is represented by the Tuscaloosa Formation (Olive, 1980).

Throughout this time, the Pascola Arch was being eroded and continued to subside. Ultimately, a sea was able to transgress into the northern part of the embayment. The transgression did not extend into the Jackson Purchase; absence of strata that are age-equivalent to those being deposited farther south during this time supports this interpretation (Stearns, 1957). This sea regressed during the Late Cretaceous. Olive (1980) noted that the sea was bordered by bays, lagoons, and saltwater marshes that mixed northward with freshwater swamps of distributaries from the northeast. Sediments

of the McNairy were deposited in this sea. McNairy sediments are thought to have come from an eastern source, as indicated by mineral assemblages (Pryor, 1960). The appearance of clay in the McNairy near PGDP, however, suggests that this area could have been located between two deltas: one to the southeast and one to the north (Olive, 1980).

The Clayton Formation of the Midway Group represents the first Tertiary deposition in the Jackson Purchase. Lithologically very similar to the McNairy Formation, the Clayton probably was deposited in much the same environment as was the McNairy. Interbedded sand and clay indicate that the marine sea, which was present to the south during deposition of the McNairy, may have influenced deposition of the Clayton Formation as well. Following deposition of the Clayton Formation, the Porters Creek Clay was laid down as the marine sea to the south transgressed to its fullest extent in the embayment (Stearns, 1957). Toward the end of the Paleocene, the sea began to regress; Porters Creek Clay continued to be deposited along the embayment axis.

During the Eocene, a sea advanced once more to occupy a large area of the embayment (Stearns, 1957). At this time, the strata of the Wilcox and possibly of the Claiborne Formations were deposited. Presumably, Eocene sediments continued to be deposited even as the sea began to regress. Evidence of this regression is shown by the presence of lignites in the Claiborne Formation (Olive, 1972). The last transgression in the embayment took place during the late Eocene; this advancement went as far north as southwestern

Tennessee (Stearns, 1957). Continued deposition of the Claiborne as well as of the Jackson Formation occurred during this time. The thickness of the combined Eocene section is substantial; some researchers theorize that this thickness is caused by structural movement that resulted in further subsidence of the embayment axis during Eocene time (Olive, 1980).

After deposition of the Jackson Formation, uplift and erosion is inferred to have occurred, based on geomorphic evidence (Clausen et al., 1992). A trunk stream existed on the margins of the Jackson Purchase, occupying roughly the same position of the present-day Tennessee, Ohio, and Mississippi Rivers (Olive, 1980). Along the eastern margin of the Purchase, the stream was confined to a valley bordered by Paleozoic rocks; farther to the west and northwest, the stream's gradient lessened as it passed over much less resistant Cretaceous and Eocene sediments. Olive (1980) theorizes that at this point the river was likely a braided or meandering stream. During the Pliocene, the trunk stream began to dump alluvium and coarser sediments (continental deposits) into the wide valley created. The load of the stream eventually increased so much that the stream could no longer transport sediments; consequently, it began to fill its course, and the alluvial fan that formed at the low-gradient portion of the stream increased in size. Eventually, the fan blanketed most of the Jackson Purchase (Olive, 1980).

In Pleistocene time, glaciation occurred. This caused many rivers throughout the Midcontinent to entrench in response to a lowering of sea level. The trunk stream and its

tributaries began to erode valleys into the alluvial fan deposits. Due to fluctuations in sea level, the streams flowing through the Jackson Purchase in turn alluviated and eroded their channels, so that the continental deposits were heavily reworked and redistributed during this period (Olive, 1980). During and between periods of glaciation, loess was deposited.

As the last stage of glaciation ended, tributaries draining from glaciated areas supplied large amounts of sediment into the ancestral Ohio and Mississippi Rivers. Streams throughout the Purchase area alluviated their valleys as the flood plains of the Ohio and Mississippi rose; however, the gradient of the ancestral Tennessee River was not great enough to keep the river from becoming blocked (Olive, 1980). Subsequently, a lake was formed that existed until the end of the Pleistocene. When it ruptured a northerly divide, the lake drained and caused the Ohio River to take on its present course (Olive, 1980). The sediments derived from this lake and from streams draining out of glaciated areas comprise latest Pleistocene and Holocene sediments.

2.3 STRUCTURAL FRAMEWORK

The main structural influence on the Jackson Purchase Region has been the ancient Reelfoot Rift-Rough Creek Graben rift structure. Despite the large amounts of knowledge gained about these two major intercontinental rift systems during the past 30 years, little is known about the role of the Jackson Purchase in relation to the rift

structures. It is apparent, however, that regional seismicity has affected the area in the past.

Evidence of seismic activity is found throughout the area. For example, the Porters Creek Clay is intersected by vertical to near-vertical clastic dikes in many places (Olive, 1972). Geologic mapping of the Purchase area and southern Illinois has revealed the existence of numerous faults that displace Paleozoic through Quaternary strata (Olive, 1972; Nelson et al., 1997). Other geophysical data, such as proprietary seismic reflection data and gravity and magnetic surveys, indicate that the area is structurally complex (Hildenbrand and Hendricks, 1995; Heigold and Kolata, 1993).

3.0 SEISMIC DATA ACQUISITION AND PROCESSING

Seventeen km of shallow, high-resolution SH-wave reflection and refraction data were acquired in the area of PGDP for this study. Figure 3 shows the locations of the seismic lines discussed in this report; Figures 4 through 8 illustrate the resulting seismic sections.

As previously stated, field tests using a seismic hammer to generate P– and SH–waves, and a vacuum-assisted weight drop to generate P–waves indicated that SH–waves generated by a seismic hammer resulted in the optimum signal-to-noise ratio for imaging the bedrock and unconsolidated sediments in the study area. The energy source used for generating the SH–waves consisted of a 5.4-kg sledgehammer striking a 12-kg section of

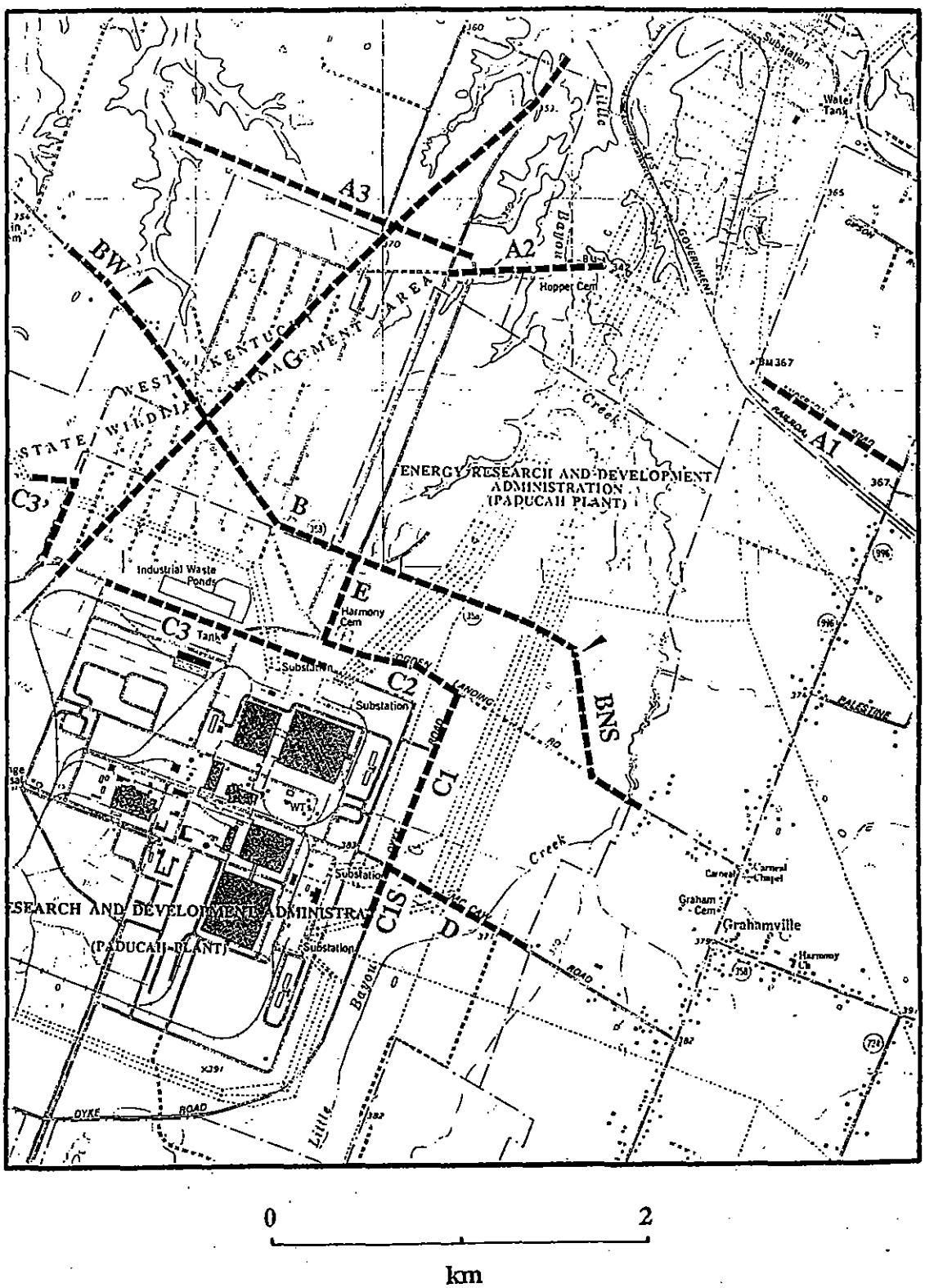


Figure 3. Map showing locations of seismic lines in the vicinity of the Paducah Gaseous Diffusion Plant.

I-beam perpendicular to the geophone spread. The hold-down weight of the I-beam consisted of the weight of the I-beam plus the hammer swinger for a total hold-down weight of approximately 85 kg. Coupling of the energy source to the ground was enhanced by embedding the I-beam against the edge of a blacktop road whenever possible; otherwise, the edge of the I-beam was embedded in a small slit trench. The degree of coupling attained on unpaved surfaces in the PGDP area probably affected the quality of data along certain lines, as is indicated in the discussions of lines A, C3, and G.

An in-line spread of 48, 30-Hz, horizontally polarized geophones spaced at 4 m intervals was used. A zero offset was used with the energy source, and records were generally stacked six times at each shotpoint. To ensure proper identification of SH-wave arrivals, data from each side of the I-beam energy source were recorded. Based on the acquisition parameters, twelve-fold common-depth point (CDP) data were obtainable.

The seismic data used in this study were collected with a 48-channel, 24- bit, IFP Geometrics Strataview RX engineering seismograph. Data were recorded at a sampling rate of 0.5 ms. Acquisition parameters included low-cut and high-cut bandpass filters of 10 and 250 Hz, respectively, and a notch filter of 60 Hz.

Table 1 is a chronological list of the steps followed in processing data. Specific processing procedures for each line can be found in Appendix B. The seismic data were processed using the commercial software package VISTA 7.0 (Seismic Image Software,

Table 1. Data Processing Steps – (using VISTA 7.0)

1. **Preprocessing**
   a. **band-pass filtering (typically 25–60 Hz)**
   b. **AGC scaling (typically 250 ms)**
   c. **saving .dat files in SEG-Y format**
2. **Configuration of field geometry into headers**
   - elevation static corrections (where needed)
3. **Application of headers to SEG-Y files**
4. **Velocity Analysis**
   - derived stacking velocities from semblance plots
5. **Normal-Moveout Correction**
6. **CDP Sort**
7. **CDP Stack (6-fold)**
8. **Selective Post-Processing**
   a. **AGC scaling**
   b. **F-K filtering**
   c. **weighted 3-trace mixing**

1995). Preprocessing involved first changing the file format from .dat (Geometrics file format) to SEG-Y, a standard file format. Next, a band-pass filter was applied to data in order to reduce the amount of noise encountered during field operations. AGC scaling was also applied. This preprocessing step aided in viewing of data by normalizing data within a specified time window (usually 250 ms) according to the highest wave amplitude within that window. These files were then combined for processing purposes. Geophone spacing, shotpoint spacing, and any elevation corrections were next configured and applied to the combined file. A velocity analysis was subsequently performed on the combined file. Here, a group of traces was selected and a hyperbolic curve fitted to reflections visible in the group. A normal moveout (NMO) correction was applied to correct for differences in reflection travel-times due to source-receiver distance variations. Finally, the combined file was sorted and stacked to produce a profile like those in Appendix A. After preliminary processing with 12-fold data, it was determined that lateral discontinuities and frequency distortions due to wide-angle reflections were affecting the quality of the stacked traces; subsequently, 6-fold data were used for this study. Post-processing steps included additional AGC scaling as well as F–K filtering. This filtering procedure, like band-pass filtering, was used to remove noise. A 3-trace weighted mix was also used on many CDP sections; this procedure introduced an artificial increase in the horizontal coherence, thus making continuity of reflections more apparent (Dobrin and Savit, 1988). A glossary of geophysical terms relating to data processing procedures can be found in Appendix F. Definitions were taken from Sheriff (1973) and Sheriff and Geldart (1982).

As stated in the introduction, the limestone bedrock, the top of the Clayton and McNairy Formations, and the RGA were to be imaged. On all sections, the bedrock was visible at about 500 ms. Imaging the top of the Clayton and McNairy Formations, however, proved to be more difficult; this is due to the negligible velocity contrast between the Clayton-McNairy and the RGA. The top of the RGA was imaged by the refraction interface at roughly 100 ms. Using the method employed by Williams et al. (1995), the traces representing the RGA refraction were stacked and then corrected for linear moveout using the velocity of the refracted wave. The interpretation of the top of the RGA and bedrock was aided by lithologic logs from previous studies in the area (Northeast Plume Preliminary Characterization Summary Report, D.O.E., 1995; Results of the Site Investigation, Phase II at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, D.O.E., 1992).

A limiting factor in the quality of some of the seismic data acquired was the degree of coupling of the energy source to the ground. Data collected in fields or along gravel or dirt roads, were, in general, of poorer quality that collected along blacktop roads. The most noticeable effect in these instances was a decrease in impulsive amplitude of the seismic reflections. An attempt was made to compensate for this by digging the flanges of the steel beam into the ground, with limited success. Along blacktop roads, one edge of the I-beam was embedded into the shoulder of the road so that it butted up next to the edge of the blacktop. This method provided better coupling of the energy source to the ground.

The nature of deposition of the RGA is a limiting element in the interpretation of the location of the RGA refractor. As discussed before, near PGDP, the continental deposits of the RGA were subject to erosion and reworking by the ancestral Tennessee River during the Pleistocene. This led to the development of an erosional surface at approximately 85 m; this surface varies, however, between 75 m and 95 m. The depositional history of the RGA undoubtedly indicates that the thickness as well as the elevations of the top and bottom of the RGA will be irregular. This variance can be seen on virtually all of the seismic sections presented in this study.

Background noise was also a factor that could affect the quality of data gathered at PGDP. This included noise associated with plant operations, power lines, and automobiles. Pre- and post-processing frequency and F–K filtering was used to remove unwanted noise from the data where possible.

4.0 RESULTS

4.1 IDENTIFICATION OF REFLECTORS

Reflections and refractions were correlated with lithologic units by comparing velocity picks from offset panels to lithologic logs of available monitoring wells at PGDP. Velocity picks were obtained in VISTA 7.0 (Seismic Image Software, 1995) by entering a set of sorted and stacked traces corresponding to a common depth point (CDP). Next, a

semblance analysis was performed and the velocities and offset times were picked from the semblance output. From these parameters, depths to various horizons could be obtained using the formula

$$d = (V \times T)/2$$

where d is depth (m), V is velocity (m/s), and T is time (s). These depth values for individual reflectors and refractors were then compared with data from the lithologic logs closest to the line upon which the velocity analysis was performed. Appendix C gives a complete list of the velocity picks used for each line presented in Figure 3. Lithologic data referenced in this study are included in Appendix E.

In general, the limestone bedrock reflector was the most identifiable reflector on a velocity pick. The large velocity contrast between the Mississippian limestone and the overlying sediments was likely the reason for this easily observable reflection. Harder to interpret was the refraction for the top of the RGA. Often, this refraction was masked by the direct wave. Muting the top of the CDP section often resulted in erasing the RGA refractor. Depths obtained for the RGA refraction and bedrock reflection were compared to drill hole data (Northeast Plume Preliminary Characterization Summary Report, D.O.E., 1995; Results of the Site Investigation, Phase II at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, D.O.E., 1992). Other reflectors were picked in much the same way when possible.

The top of the Clayton-McNairy was able to be determined with confidence using the above procedure only along line C2. However, the reflector corresponding to the top of the Clayton-McNairy was generally not visible. This was likely because shear-wave velocity contrasts between the Continental Deposits and the Clayton-McNairy are negligible (Sykora and Davis, 1993).

4.2 GENERAL FEATURES

Several examples of stratigraphic units that have been affected by faulting are indicated on the seismic lines in Appendix A. Fault-related and erosional features are evident on most of the lines in the study area to varying degrees. Specific features will be discussed in greater detail for specific lines in the next section.

The most significant findings of the study are that faulting is observable in areas where edges of the contaminant plumes are located and that the strike of the faults correspond to the direction of migration of the contaminant plumes. This suggests structural control on plum migration. In many instances, the faults can be traced from the limestone bedrock to the top of the RGA, thereby suggesting Quaternary activity in an area where no Quaternary faulting had previously been observed. This finding is not unexpected in light of Nelson et al.'s (1997) study just across the Ohio River in southern Illinois.

4.3 SPECIFIC FEATURES

4.3.1 Line A1

Line A1 runs from the intersection of Anderson Road and Highway 996 to the U.S. government railroad lines (Fig. 4). Throughout much of the section, a prominent reflector, the limestone bedrock, is noticeable at 500 ms. A distinct break in this reflector occurs near shotpoint 36. Further breaks are seen near shotpoints 108 and 145. All of these features have been interpreted as faulting in the bedrock. The refractor imaged at roughly 100 ms is interpreted as the RGA. Here, faulting can be distinguished as well; in many cases, the faults within the RGA appear to be continuations of faults emanating from the bedrock.

The surfaces of both the RGA and the bedrock are noticeably undulatory along much of line A1, presumably because of weathering, which affected each unit subsequent to deposition. However, the depression between shotpoints 108 and 145, evident in both the bedrock and the RGA, is here interpreted as a downdropped area bounded by faulting.

Between shotpoints 1 and 36, the bedrock reflector drops to the east. The RGA refractor does not present a corresponding drop. This is thought to be primarily an erosional feature in the bedrock, or possibly basement faulting. There is no indication that these faults continue into the RGA.

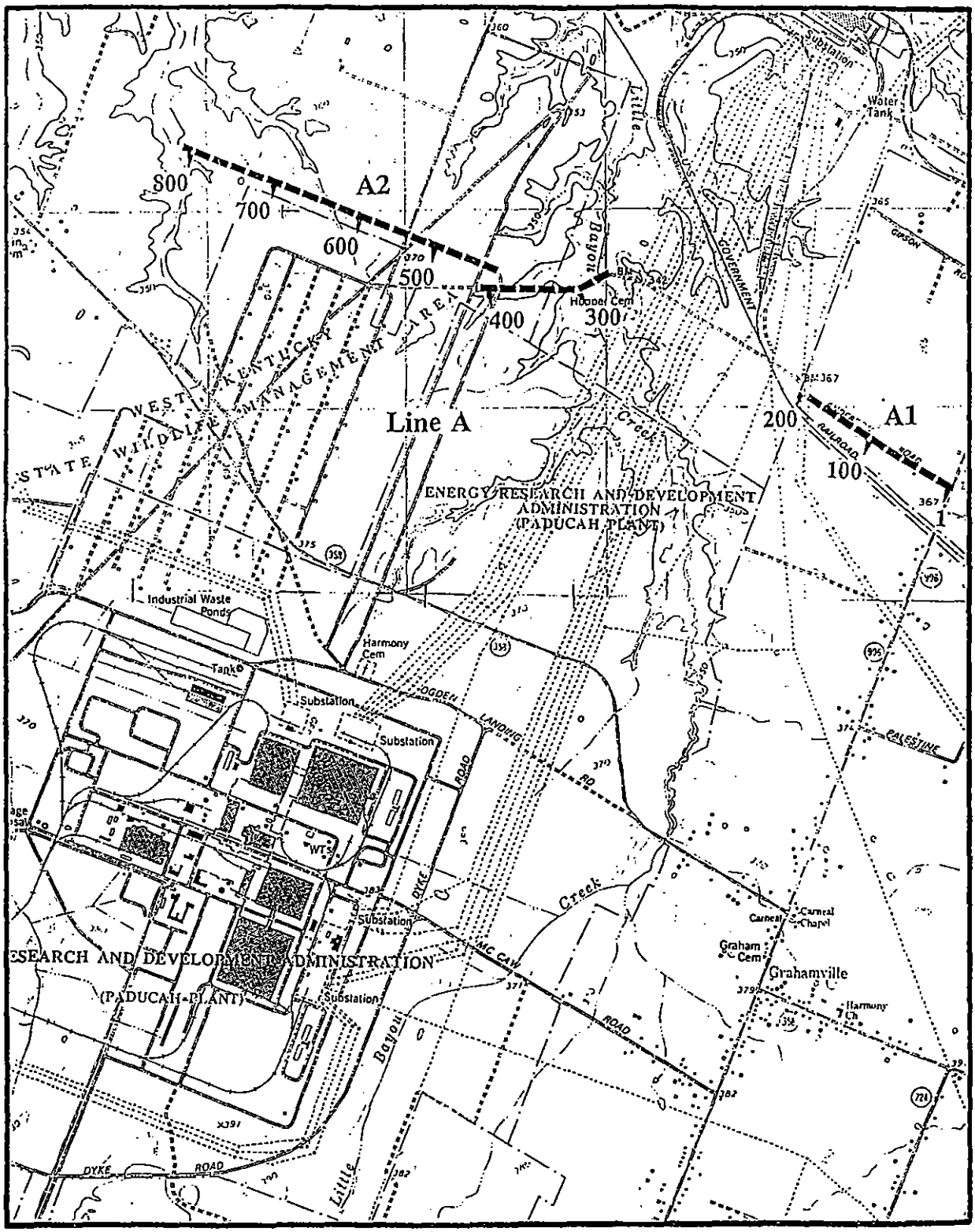


Figure 4. Shotpoint map, lines A1, A2, A3.

4.3.2 Line A2

Line A2 is an east-west section, located to the north of PGDP (Fig. 4). The reflector identified as the top of the bedrock is located at about 500 ms on the time section. However, in some places the bundles of energy are not as strong as in others, making interpretation difficult. The RGA refractor is present at roughly 100 ms on the section; it is noticeably undulatory. Data quality along A2 is average, likely due to differences in the degree of coupling. However, examples of faulting that are visible from the top of the bedrock through the top of the RGA are located near shotpoint 335, 350, and 370.

4.3.3 Line A3

Line A3 is an east–west profile between the Ohio River and the PGDP, paralleling the northern perimeter of PGDP (Fig. 4). The bedrock reflector is present at about 500 ms at the ends of this section. However, in the middle of the section, the bedrock reflections become weaker and occur deeper in the time section. Overlying reflectors within the Clayton-McNairy as well as the refractor identified as the top of RGA also exhibit this downdrop. This feature, located between shotpoints 434 and 745, is interpreted as a graben. Within the graben, the RGA refractor exhibits some topographic relief, attributable to weathering or to tectonism associated with graben formation, or to subsequent movement along faults within or bounding the graben. In any case, the feature is significant, since it affects the RGA, and could therefore exert some control over

migration of contaminants in the area. This feature is discussed in more detail in section 4.5. Faulting is evident in both the bedrock and the RGA reflectors on the bounding margins of the graben. Faults identified near shotpoints 525, 560, and 830 provide good examples of faulting that extends into the RGA refractor.

4.3.4 Line B

Line B runs east–west along Ogden Landing Road (Fig. 5). It is divided into three sections: BW, B, and BNS. Line B is key to the study, for the data gathered along this line serves as a correlator with data from other lines running parallel and perpendicular to it, thus enabling trends of features present in the subsurface to be established.

Line B begins in the western part of the study area. Here, the bedrock reflector, usually seen at 500 ms, is weak and appears to occur deeper in the time section. Near shotpoint 84, the bedrock reflector returns to 500 ms. This drop in the bedrock reflector west of shotpoint 84 is interpreted to be the eastern margin of the graben previously identified on line A3. Other reflectors and the RGA refractor above the graben tend to be disturbed in this location as well. Toward the western end of line B (indicated as BW on Fig. 4), the RGA refractor, located near 150 ms, is noticeably disturbed.

East of shotpoint 84, strong reflections from the bedrock are exhibited. The refraction from the top of the RGA is also seen clearly here at around 100 ms. Between shotpoints

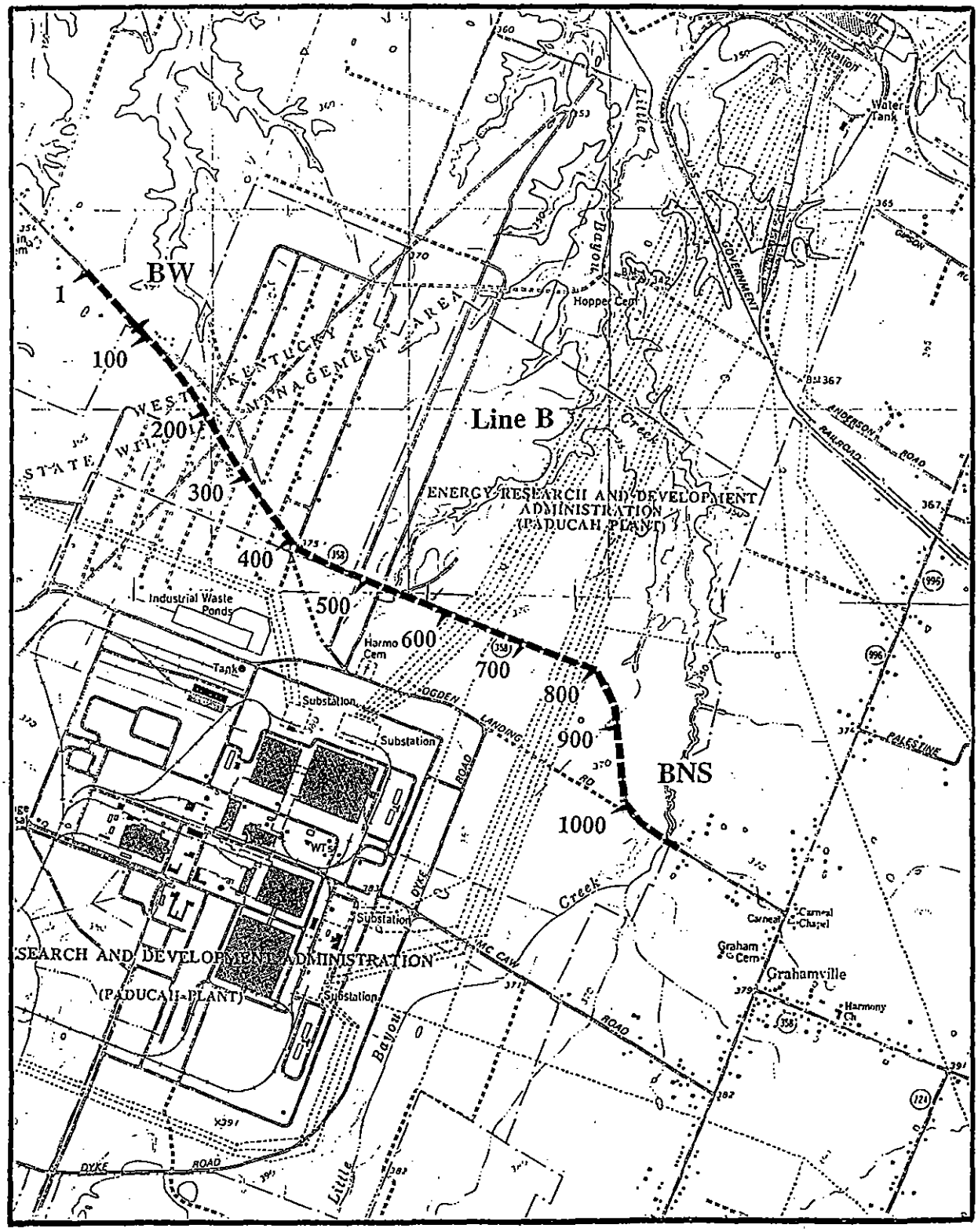


Figure 5. Shotpoint map, line B.

97 and 265, small but distinct breaks are seen in both units, providing further examples of faulting that has penetrated the top of the RGA. Some of these faults are part of a fault zone detected in a pilot study of the PGDP area (Street, personal comm., 1997). Between shotpoints 265 and 337, another zone of faulting is interpreted to intersect the top of the RGA; this group of faults is interpreted to be part of a second zone of faulting also detected in the pilot study.

Between shotpoints 241 and 301, a large dome-like feature is present below the limestone bedrock reflector. This feature appears again farther to the east on line B and on several other lines in the study. The dome-like feature could represent parts of the bedrock that were less resistant to weathering. Correlations to this feature can be found in Hunter et al. (1984).

Past shotpoint 301 and continuing until near shotpoint 505, small breaks occur in the refractor representing the top of the RGA as well as in the bedrock reflector. Notable displacements are located near shotpoints 330 and 460. Near shotpoint 505, both reflectors drop down to the east, returning to their usual locations in the section near shotpoint 575. Just before shotpoint 553, line B intersects line E. In an attempt to correlate features across these two lines, an optimum offset technique was used in the lab with data from lines B, E, and C3. The results obtained through the use of this method will be presented in section 4.4.

Dome-like features are evident in the bedrock again between shotpoints 600 and 649, indicating that these parts of the bedrock were likely less resistant to erosion. A small down-to-the-east displacement is also present in the RGA and bedrock reflectors at this location. After shotpoint 700, the RGA refractor dips down to the east, while the bedrock reflector exhibits and opposing trend. Past this point, no other significant features are observable on line B (shotpoints 1 through 864).

4.3.5 Line BNS

Line BNS is discussed separately because it trends in a different direction than the main part of line B. Reflector and refractor locations are as noted in the earlier discussion of Line B. Line BNS begins at shotpoint 865 of line B.

The most obvious displacement occurring in both reflectors is located near shotpoint 877, where both the RGA and the bedrock reflectors are downdropped to the east. The east-bounding fault that accompanies this feature is located near shotpoint 913, indicating that this could be interpreted as a small graben. Another down-to-the-east drop in both reflectors occurs near the intersection of Line BNS with Old Ogden Landing Road. Here, near shotpoint 1000, the RGA refractor and bedrock reflector show evidence of displacement. Line BNS becomes an east–west profile as it intersects Old Ogden Landing Road near shotpoint 1022. The bedrock reflection becomes very weak at this point, and the RGA reflection becomes hard to follow with certainty. This could indicate the

presence of structure; likewise, the change in data quality might be related to other factors such as background noise. Line BNS ends at the bridge that crosses Little Bayou Creek.

4.3.6 Line C1

Line C1 runs from the intersection of Old Ogden Landing Road and Dyke Road to the intersection of Dyke Road and McCaw Road (Fig. 6). Line C1 is punctuated by at least seven monitoring wells along its length; therefore, good depth control of the RGA and the Clayton-McNairy Formation was maintained along this line.

Quality of data along Line C1 is variable. Extensive processing was necessary in order to image the top of the RGA. A solid image of the top of the limestone bedrock was likewise attained only through the use of considerable filtering. Background noise from PGDP probably affected data quality along line C1.

Examples of interpreted faulting are shown in the interpreted C1 section in Appendix A. Throughout the section, the surfaces of both the RGA and the bedrock undulate significantly; due to data quality constraints, it is not possible to say with certainty where faulting has played a role in the disruption of these units. Near shotpoint 12, the bedrock reflector bends noticeably; however, this is not seen in the top of the RGA at this location. This indicates that the downdip in the bedrock could be representative of weathering. Alternatively, faulting could occur here that simply does not penetrate the RGA. A

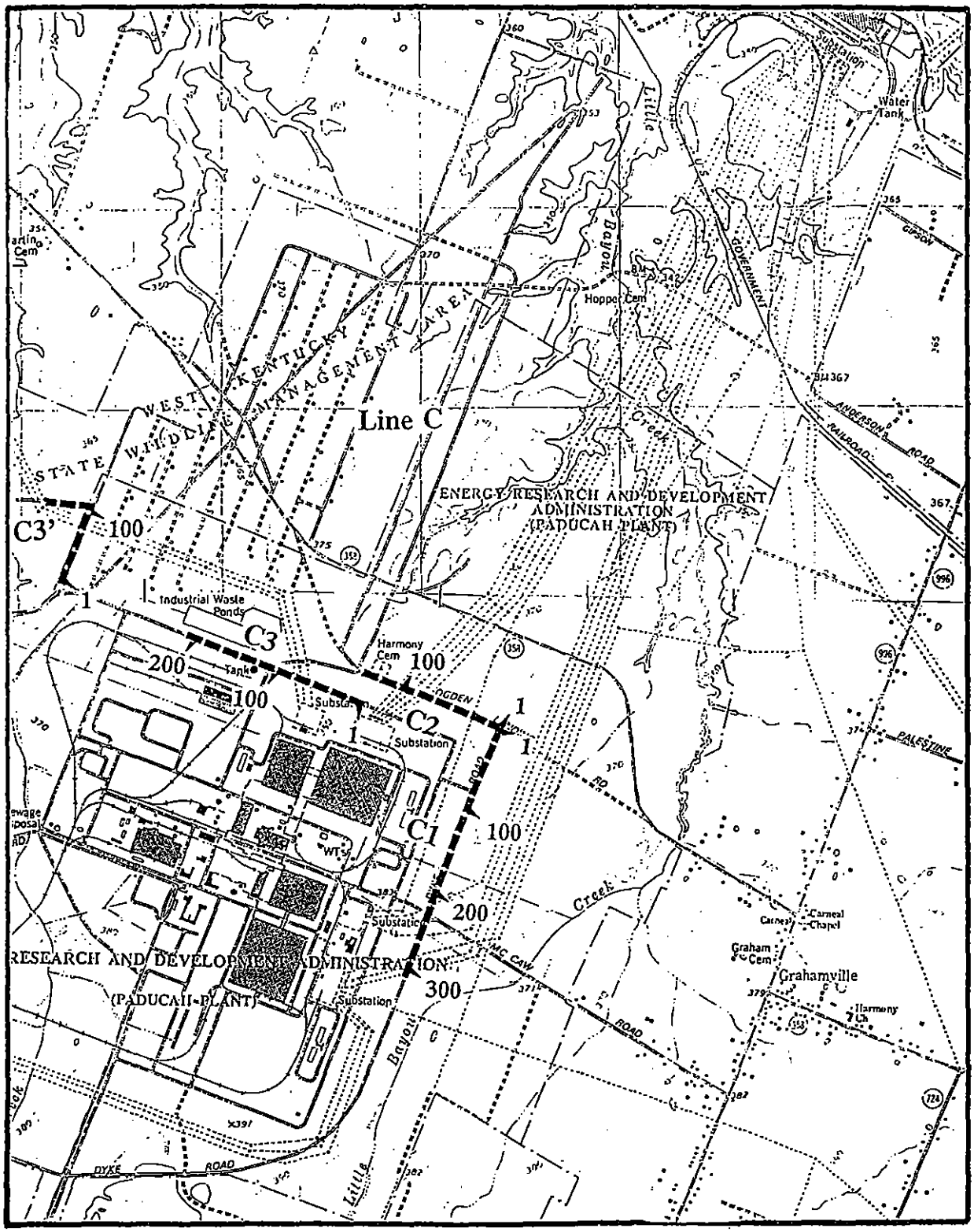


Figure 6. Shotpoint map, lines C1, C2, C3, C3'.

distinct break occurs in an unidentified reflector below the interpreted top of the RGA just past shotpoint 36. This is accompanied by a drop in the bedrock reflector as well, indicating that this displacement is fault-related. Another break occurs in the identified top of the RGA at shotpoint 120, although this displacement is not clearly seen in the reflectors beneath. A likely candidate for faulting is located between shotpoints 136 and 144. Here, the RGA reflector is displaced, as is the somewhat weaker bedrock reflection at about 550 ms.

4.3.7 Line C1S

Although not indicated as such on the shotpoint map, Line C1S is the section of Line C1 that runs south along Dyke Road from the intersection of Dyke Road and McCaw Road. A monitoring well at this intersection provides only approximate control on the extent of the RGA. The depth to the RGA determined from velocity picks closely correlates with the lithologic data in this area.

As is seen in both the uninterpreted and interpreted sections in Appendix A, the surfaces of the RGA and the limestone bedrock are highly variable. Between shotpoints 264 and 276, the RGA surface slopes down to the south and is broken. At this location, the top of the bedrock appears to be displaced, as do other unidentified reflectors in the 200 to 400 ms range. At shotpoint 300, both the RGA refractor and the bedrock reflector are noticeably downdropped, outlining a small graben. The other bounding fault to this

structure occurs near shotpoint 324. This feature, as well as the one between shotpoints 264 and 288, is located in the general vicinity of the lower boundary of the northeast-trending contaminant plume.

Line C1S does not cross the terrace feature present to the south of PGDP. Well data to the west and southwest of C1S show that the terrace is located to the south of the terminus of C1S.

4.3.8 Line C2

Line C2 runs from the intersection of Old Ogden Landing Road and Dyke Road west along Old Ogden Landing Road. It ends at the southern terminus of line E (Fig. 6). At its western end, C2 nears the upper boundary of the northeast- trending contaminant plume, making it potentially important for determination of fault-related control.

Line C2 is one of the few lines in the study area along which the Clayton-McNairy has been identified. Appendix C lists the velocity picks made for this line. The prominent refractor at 100 ms is identified as the top of the RGA; the somewhat fainter reflector at roughly 200 to 235 ms is distinguished as the top of the Clayton-McNairy; and the reflector at 500 ms is labeled as top of bedrock. As noted in descriptions of other sections, the surfaces of the RGA and the bedrock are undulatory and broken in many places. Specific displacements in the RGA can be seen near shotpoints 25, 30, and 55.

Accompanying breaks in the Clayton-McNairy are not as apparent; however, these displacements can be traced down into the bedrock reflector. Dome-like structures are also apparent within the bedrock along this line. A significant feature along line C2 occurs between shotpoints 145 and 150. Here, all three units are displaced in what is interpreted as a zone of faulting.

4.3.9 Line C3

Line C3 runs from a point just east of the guard gate on the northern periphery of the plant west for 812 meters. The RGA and bedrock reflectors have been identified at 120 ms and 550 ms, respectively. Only one monitoring well, P4-F08, provided control on velocity picks made during processing.

In general, the data quality of line C3 can be considered to be of lower quality. This is attributable to several factors, especially background plant noise. In general, plant noise registers at a variety of frequencies and in order to filter it out completely, desirable reflections would have to be deleted. Another factor involves the quality of coupling attained along line C3. Line C3 was shot entirely along an unpaved surface, so data quality was not as good along line C3 as along lines B or D.

Faint reflections are discernible along line C3. The RGA refractor and limestone bedrock reflector again appear at around 100 ms and 500 ms, respectively. The most noticeable

displacements within the reflector representing the top of the RGA occur near shotpoints 30 and 50. Here, the bedrock is downdropped. However, because of the weak bedrock reflector, these distinct displacements cannot be traced with certainty into the 500 ms reflector. The optimum offset method was used with data from line C3; this technique delivered clearer data than CDP data for line C3 and helped in correlating features among lines.

4.3.10 Line C3'

Line C3' runs south-to-north along a road northwest of the plant. An extension of the line runs east-to-west along a road roughly perpendicular to line C3' (Fig. 6). On this line, the top of the RGA and the limestone bedrock can be distinguished with varying degrees of certainty. The quality of data here could also be affected by plant noise, since PGDP facilities are nearby.

The top of the RGA and the bedrock are identified at 100 and 500 ms, respectively. Although the bedrock reflector is not as strong as it is on other lines, the quality of data obtained along line C3' is still somewhat better than that acquired along line C3. An irregular bedrock surface is apparent; breaks in the bedrock reflector and RGA refractor occur near shotpoint 100. Other parts of this section display irregularity of both surfaces; it is not possible to say with certainty that these irregularities are fault-related.

Data quality for the east–west extension of line C3' is fair. The bedrock reflector is somewhat distinguishable at around 500 ms, and the top of the RGA is discernible at about 100 ms. Two distinct breaks can be observed in the RGA reflector near shotpoints 25 and 30. These displacements can tentatively be traced down into the bedrock, as indicated on the interpreted version of the extension of line C3'.

4.3.11 Line D

Line D runs west-to-east along McCaw Road, beginning at the intersection of McCaw Road and Dyke Road and extending for a length of 480 meters (Fig. 7). The tops of the RGA and the bedrock are identified at roughly 100 and 500 ms, respectively. The top of the Clayton-McNairy cannot be detected on the line D section.

Data quality along line D is very good, with a virtually continuous refraction from the top of the RGA. Although not as well defined, the surface of the bedrock still yields sufficient information from which to make interpretations. Breaks in the RGA refractor are apparent near shotpoints 12, 36, 60, and 84. The two breaks near 12 and 60 define a downdropped area visible within the RGA as well as the bedrock, indicating that fault-related movement has occurred. This downdropped area occurs near the bottom edge of the northeast-trending contaminant plume, suggesting that this zone of displacement may also be affecting the migration of the plume.

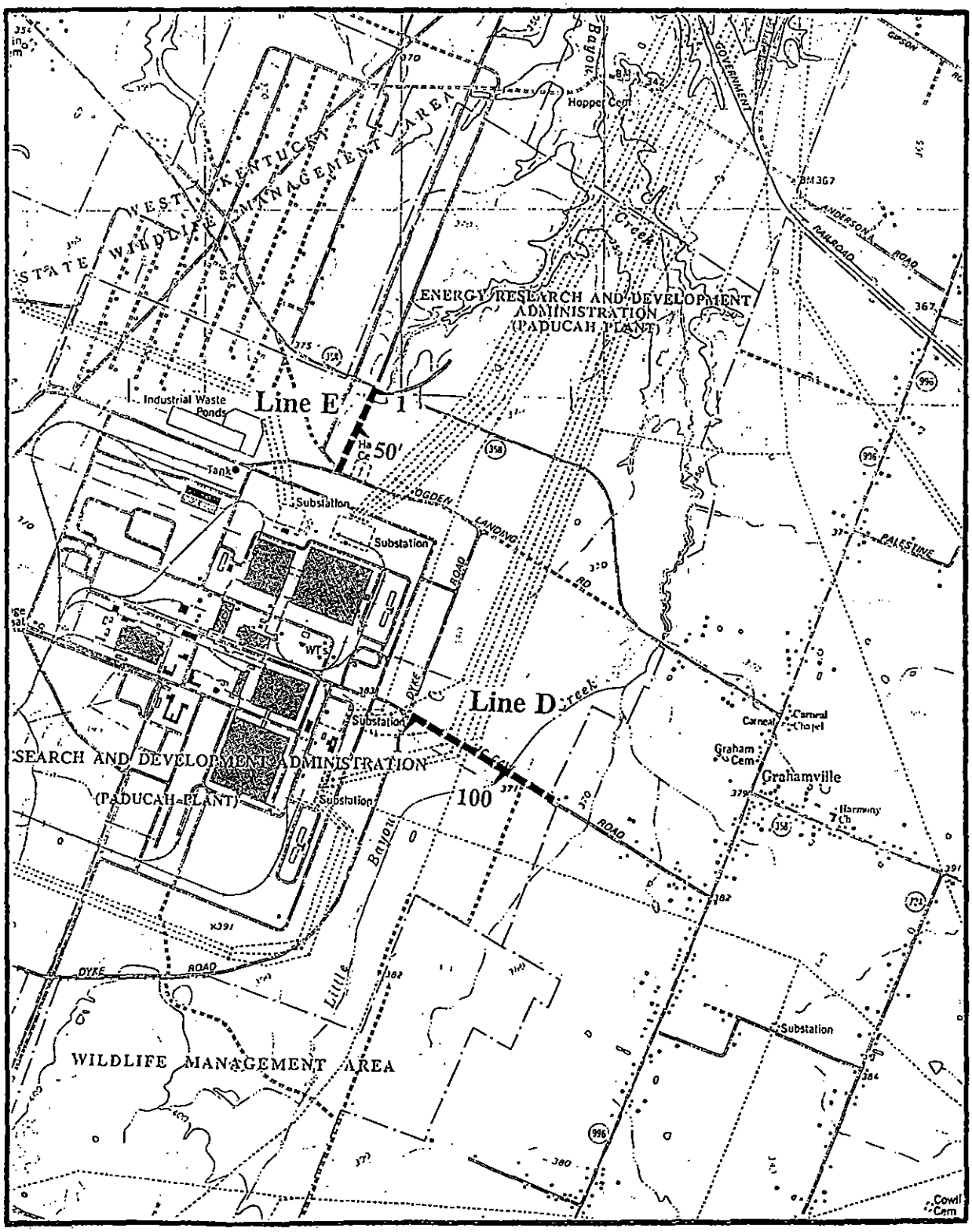


Figure 7. Shotpoint map, lines D, E.

4.3.12 Line E

Line E is located along New Harmony Road, running north-to-south from the intersection of Ogden Landing Road to the intersection of New Harmony Road with Old Ogden Landing Road (Fig. 7). Along this line, the bedrock has been identified at about 500 ms. However, the top of the RGA cannot be located with certainty. The only monitoring well near line E, well P4-F08, indicates the top of the RGA is at 44 feet and the bottom is at 92 feet; the velocity pick used along line E indicated a depth of approximately 71 feet at a time of 180 ms on the time section. No other significant reflections were visible at times between 0 and 180 ms or in the interval shortly after 180 ms. This reflector may be the top of the Clayton-McNairy, and the reflector representing the top of the RGA may simply have not been visible during processing. In any case, all prominent shallow reflectors in the CDP sections in Appendix A show displacement in areas that would allow features to be correlated through the reflectors (see interpreted section, line E).

Sharp displacements are evident in the 100, 180, and 500 ms reflectors on line E. These occur near shotpoints 24, 48, 60, and 72. The break near shotpoint 60 displaces the reflectors present at 100 and 180 ms in a down-to-the-north sense, suggesting that this break represents a fault. A similar drop is present in the bedrock, although it is not as pronounced. The displacement present near shotpoint 48 is also indicative of faulting. This zone of faulting could also be important in determining whether structure present in

the subsurface has any control on contaminant migration. The optimum offset method was used on line E, with favorable results.

4.3.13 Line G

Line G is a northeast–southwest profile along an access road that begins south of the Shawnee Steam Plant (Fig. 8). It is over 3800 meters long and ends near the northwest corner of PGDP. On this line, only the refractor representing the top of the RGA and the limestone bedrock reflector can be distinguished with certainty. They occur at about 100 and 500 ms, respectively, which is typical of other lines shot for this study.

From the beginning of line G in the northeast until roughly shotpoint 250, the graben that has been identified on lines A3 and B is observable within the bedrock reflector. Near shotpoint 125, the RGA refractor begins to show obvious displacement and ultimately dips down to the north to about 200 ms on the time section. Throughout the record until shotpoint 250, the bedrock surface within the graben is uneven and discontinuous. Near shotpoint 125, the RGA refractor is clearly broken, indicating that faulting likely related to graben formation or reactivation has penetrated the RGA. Just past the intersection of lines G and B, from shotpoints 673 to 697, the bedrock surface is lower than it was before the road crossing. There are slight undulations in the RGA reflector, but no obvious indicator of faulting. This lowered reflector could simply represent a weathered part of the bedrock surface. From this point on, the bedrock reflector is significantly weaker; the

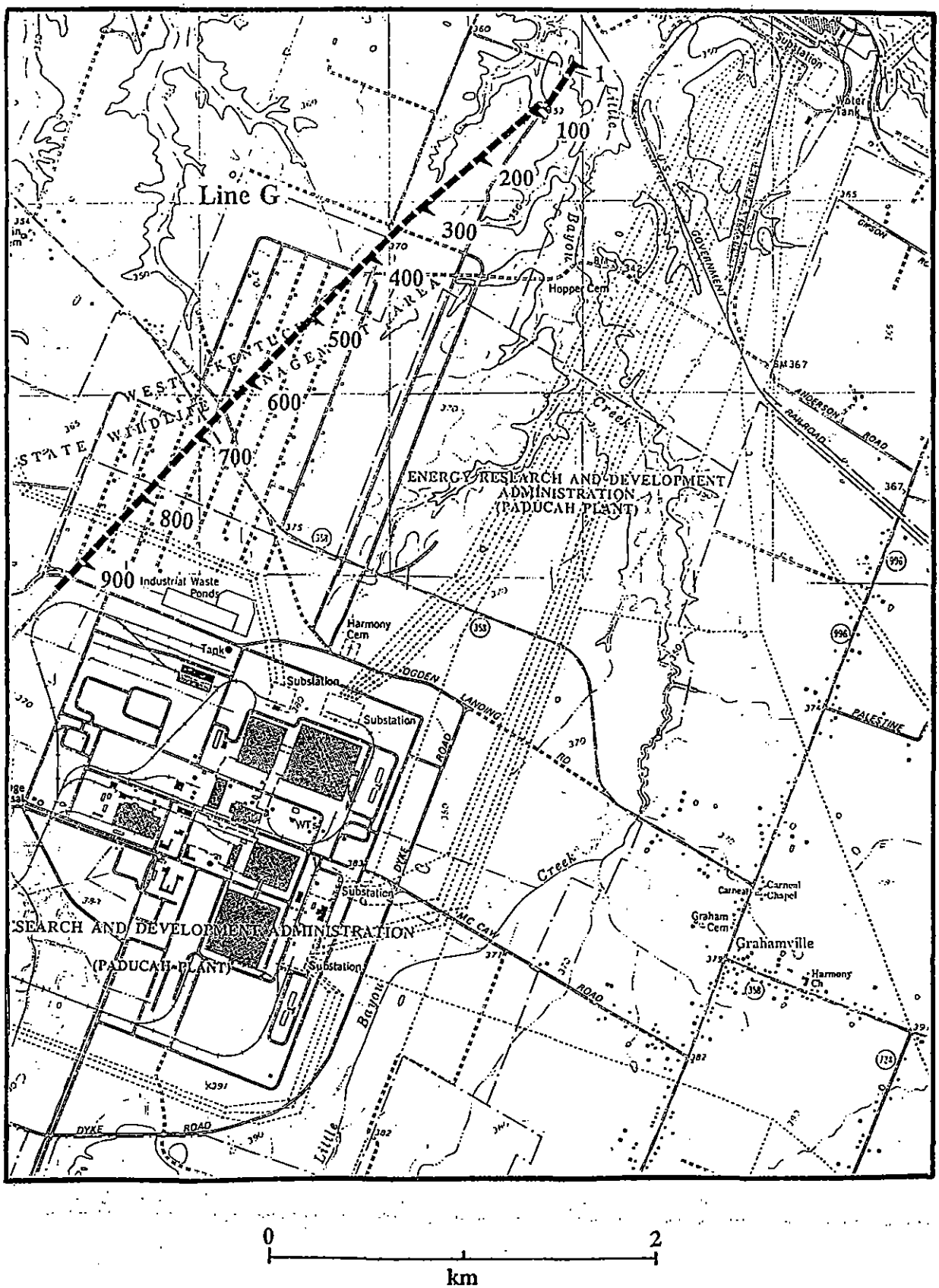


Figure 8. Shotpoint map, line G.

reason for this is unclear. No apparent breaks in either reflector occur until about shotpoint 877, when both reflectors drop down to the southwest.

4.4 CORRELATION OF OBSERVED FEATURES

Figure 9 is an area map of PGDP that presents the locations of the seismic profiles in the study as well as numbered faults that could be significant to the direction of contaminant plume migration. The map also shows the location of the two contaminant plumes in relation to these faults.

Based on the similarity of features from line to line, as well as the approximate locations of the two contaminant plumes, it is reasonable to conclude that the contaminant plumes are being structurally controlled to some extent. Perhaps the strongest evidence for this comes from faults observed across lines C1 and D. This fault zone is labeled '1' on both Figure 9 and on the interpreted seismic sections of both lines in Appendix A. As indicated in Figure 9, the fault zone is coincident with the lower boundary of the northeast plume and has the same strike as the edge of the plume. Additionally, the southern end of BNS could be part of this trend; however, data quality prohibits a definitive correlation of features at this point.

Other evidence for structural control of the northeast plume comes from data obtained using the optimum offset method. This technique was applied to lines C3, E, and a section

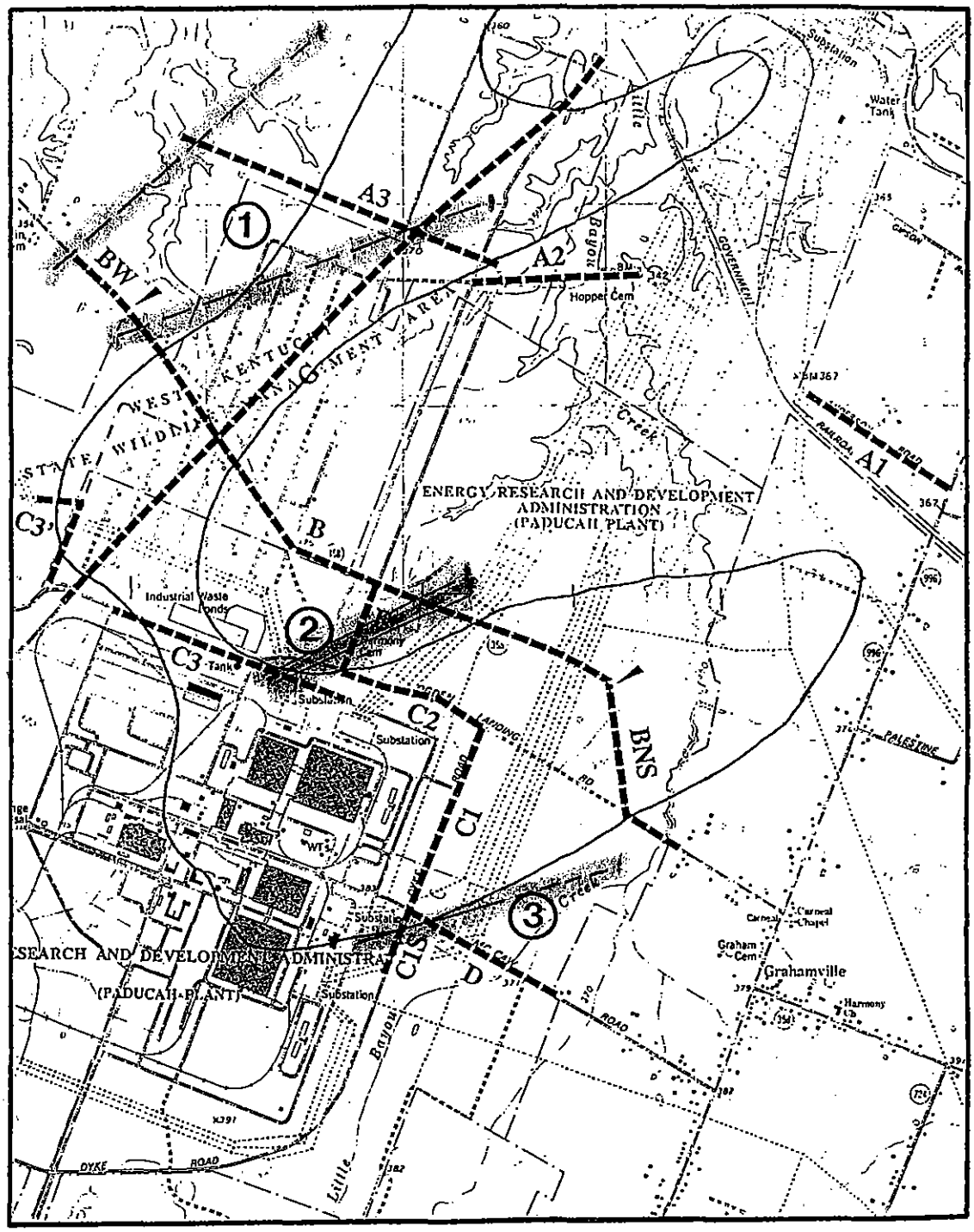


Figure 9. Map showing locations of fault zones in relation to locations of seismic lines and contaminant plumes.

of line B (corresponding to an area between shotpoints 505 and 672). The results are shown in Appendix D. Here, continuous subsurface coverage is obtained by taking data from single but successive traces within a desired area (Burger, 1992). When data from each line is oriented according to the actual positions of each line, a northeast-trending zone of displacement is apparent; the intersection of E and B is marked by a low point in the reflector at 200 ms; line C3 also exhibits a low point in the reflector past shotpoint 52. This zone of faulting coincides with the upper boundary of the northeast-trending contaminant plume. This area is indicated in Figure 9 as zone '2'; it is also indicated on the interpreted seismic sections in Appendix A.

4.5 OTHER FEATURES

As mentioned in the discussion of lines A3, G, and B, a large graben was found in the northwest corner of the study area. The graben is illustrated in Figure 9 as fault zone '3'. The strike of the graben is roughly N50°E to N60°E, which agrees with the general strikes of faults belonging to the Fluorspar Area Fault Complex that have beeen recently mapped in southern Illinois by Nelson et al. (1997). Nelson et al (1997) present evidence of movement along the Lusk Creek Fault Zone, Hobbs Creek Fault Zone, and Barnes Creek Fault Zone, indicating that faults have displaced Quaternary strata.

The existence of this graben is an indication that significant faulting and zones of faulting might also be present in the western Kentucky area, but have not been identified because

of the thick sedimentary cover of Cretaceous and younger sediments. Further work needs to be done in order to ascertain the extent of faulting of all ages in the area.

5.0 SUMMARY

Seventeen km of SH-wave seismic reflection and refraction data were collected in the vicinity of the Paducah Gaseous Diffusion Plant to test the hypothesis that faulting in Paleozoic bedrock and post-Paleozoic sediments could be controlling the migration of the contaminant plumes emanating from the PGDP facility.

Faulting in the bedrock and overlying sediments was found on all of the seismic lines shot for this study. Two major zones of faulting have been identified in the northeastern part of the DOE reservation and are coincidental with the direction of migration and edges of the northeast contaminant plume. In the northwestern quadrant of the study area, a large northeast-trending graben was imaged. The graben and faulting imaged by seismic data in this study are probably related to similar features being investigated by Nelson et al. (1997) in southernmost Illinois. The trend of the faults, and the fact that many of these faults appear to propagate from the bedrock into the RGA, strongly suggests that faulting is controlling the migration of the contaminant plumes associated with the PGDP.

References

Burger, H. R., 1992, Exploration Geophysics of the Shallow Subsurface: Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 489 p.

Clausen, J. L., Douthitt, J. W., Davis, K. R., and Phillips, B. E., 1992, Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation Phase III: KY/E–150, Martin Marietta Energy Systems, Inc., Paducah Gaseous Diffusion Plant.

Dobrin, M. B., and Savit, C. H., 1988, Introduction to Geophysical Prospecting: McGraw-Hill, Inc., 867 p.

Hansen, A. J., Jr., 1966, Availability of Ground Water in the Kentucky Parts of the Joppa and Metropolis Quadrangles, Jackson Purchase Region, Kentucky: Hydrologic Investigations Atlas HA-171, U. S. Department of the Interior, U. S. Geological Survey.

Harris, J. B., 1992, Site Amplification of Seismic Ground Motions in the Paducah, Kentucky Area: Ph.D. Dissertation, University of Kentucky, Lexington, Kentucky.

Heigold, P. C., and Kolata, D. R., 1993, Proterozoic Crustal Boundary in the Southern Part of the Illinois Basin: Tectonophysics, 217, p. 307-319.

Hildenbrand, T. G., and Hendricks, J. D., 1995, Geophysical Setting of the Reelfoot Rift and Relations Between Rift Structures and the New Madrid Seismic Zone: U. S. Geological Survey, Professional Paper 1538-E, 30 p.

Hunter, J. A., Pullan, S. E., Burns, R. A., Gagne, R. M., and Good, R. L., 1984, Shallow Seismic Reflection Mapping of the Overburden-Bedrock Interface with the Engineering Seismograph--Some Simple Techniques: Geophysics, v. 49, p. 1381-1385.

Nelson, W. J., Denny, F. B., Devera, J. A., Follmer, L. R., and Masters, J. M., 1997, Tertiary and Quaternary Tectonic Faulting in Southernmost Illinois: Engineering Geology, v. 46, p. 235-258.

Northeast Plume Preliminary Characterization Summary Report, Department of Energy, 1995.

Olive, W. W., 1966, Lake Paducah, of Late Pleistocene Age, in Western Kentucky and Southern Illinois: U. S., Geological Survey Professional Paper 550-D, p. D87-D88.

Olive, W. W., 1972, Geology of the Jackson Purchase Region, Kentucky: Geological Society of Kentucky Spring Field Conference, 11 p.

Olive, W. W., 1980, Geologic Maps of the Jackson Purchase Region, Kentucky: U. S. Geological Survey, Map I-1217.

Pryor, W. A., 1960, Cretaceous Sedimentation in Upper Mississippi Embayment: American Association of Petroleum Geologists Bulletin, v. 44, no. 9, p. 1473-1504.

Results of Site Investigation Phase II at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Department of Energy, 1992.

Schwalb, H. R., 1969, Paleozoic Geology of the Jackson Purchase Region, Kentucky, with Reference to Petroleum Possibilities: Kentucky Geological Survey, Ser. 10, Rept. Inv. 10, 40 p.

Seismic Image Software, Ltd., 1995, Vista 7.1 Notes, 261 p.

Sheriff, R. E., 1973, Encyclopedic Dictionary of Exploration Geophysics: Tulsa, Society of Exploration Geophysicists.

Sheriff, R. E., and Geldart, L. P., 1982, Exploration Seismology; Volume 1: History, Theory, and Data Acquisition: Cambridge, Cambridge University Press, 253 p.

Sykora, D. W., and Davis, J. J., 1993, Site-Specific Earthquake Response Analysis for Paducah Gaseous Diffusion Plant, Paducah, Kentucky: U. S. Army Corps of Engineers Miscellaneous Paper GL-93-14, 118 p.

Williams, R. A., Odum, J. K., Pratt, T. L., Shedlock, K. M., and Stephenson, W. J., 1995, Seismic Surveys Assess Earthquake Hazard in the New Madrid Area: The Leading Edge, v. 14, no. 1, p. 30-34.

Appendix A

UNINTERPRETED AND INTERPRETED SEISMIC SECTIONS

Appendix B

PROCESSING PROCEDURES, LINES A1–G

Line A1

files 1-120:

1. Preprocessing
   - -band-pass filtering (25 35 50 55)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3-trace mixing (25 50 25 weights)

files 97-240:

1. Preprocessing
   - -band-pass filtering (25 35 50 55)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack

Line A2

1. Preprocessing
   - -band-pass filtering (25 35 50 55)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
   - -elevation static corrections
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. post-stack F–K filtering
9. 250 AGC post-stack scaling
10. post-stack 3 trace mixing (25 50 25 weights)

Line A3

1. Preprocessing
   - -band-pass filtering (15 25 50 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
   - -elevation static corrections
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

Line B

BW:

1. Preprocessing
   - -band-pass filtering (25 35 50 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. post-stack F–K filtering
9. 250 AGC post-stack scaling
10. post-stack 3-trace mixing (25 50 25 weights)

files 1–216:

1. Preprocessing
   - -band-pass filtering (25 35 50 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 193–384:

1. Preprocessing
   - -band-pass filtering (25 35 50 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 361–720:

1. Preprocessing
    - -band-pass filtering (25 35 50 60)Hz
    - -200 AGC scaling
    - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 697–816:

1. Preprocessing
    - -band-pass filtering (25 35 50 60)Hz
    - -200 AGC scaling
    - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. post-stack F-K filtering
9. 250 AGC post-stack scaling
10. post-stack 3 trace mixing (25 50 25 weights)

files 793–1008:

1. Preprocessing
    - -band-pass filtering (25 35 50 60)Hz
    - -200 AGC scaling
    - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. post-stack F-K filtering
9. 250 AGC post-stack scaling
10. post-stack 3 trace mixing (25 50 25 weights)

files 985–1090:

1. Preprocessing
    - -band-pass filtering (25 35 50 60)Hz
    - -200 AGC scaling
    - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. post-stack F-K filtering
9. 250 AGC post-stack scaling
10. post-stack 3 trace mixing (25 50 25 weights)

Line C1

1. Preprocessing
    -band-pass filtering (25 35 55 60)Hz
    -200 AGC scaling
    -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 500 AGC post-stack scaling
9. post-stack F-K filtering
10. post-stack 3 trace mixing (25 50 25 weights)

Line C1S

1. Preprocessing
    -band-pass filtering (25 35 55 60)Hz
    -200 AGC scaling
    -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. post-stack F-K filtering
9. 500 AGC post-stack scaling
10. post-stack 3 trace mixing (25 50 25 weights)

Line C2

1. Preprocessing
   - -band-pass filtering (25 35 55 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. post-stack 3 trace mix (25 50 25 weights)

Line C3

1. Preprocessing
    -band-pass filtering (25 35 55 60)Hz
    -300 AGC scaling
    -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

Line C3'

1. Preprocessing
    -band-pass filtering (25 35 55 60)Hz
    -200 AGC scaling
    -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack

Line C3' extended

1. Preprocessing
    -band-pass filtering (25 35 55 60)Hz
    -200 AGC scaling
    -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

Line D

1. Preprocessing
   - -band-pass filtering (5 10 45 50)Hz
   - -500 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. post-stack F-K filtering
9. 500 AGC post-stack scaling
10. post-stack 3 trace mixing (25 50 25 weights)

Line E

1. Preprocessing
   - -band-pass filtering (15 25 50 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 200 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

Line G

files 1-216:

1. Preprocessing
   - -band-pass filtering (25 35 50 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
   - -elevation static corrections
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 193-408:

1. Preprocessing
   - -band-pass filtering (25 35 50 60) Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 385-552:

1. Preprocessing
   - -band-pass filtering (25 35 50 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 529-696:

1. Preprocessing
    -band-pass filtering (25 35 50 60)Hz
    -200 AGC scaling
    -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 673-768:

1. Preprocessing
    -band-pass filtering (25 35 50 60)Hz
    -200 AGC scaling
    -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 745-864:

1. Preprocessing
    -band-pass filtering (25 35 50 60)
    -200 AGC scaling
    -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

files 841-960:

1. Preprocessing
   - -band-pass filtering (25 35 50 60)Hz
   - -200 AGC scaling
   - -reformatting of data to SEG-Y format
2. Configuration of field geometry into headers
3. Application of headers to SEG-Y files
4. Velocity Analysis
5. Normal-Moveout Correction
6. CDP Sort
7. CDP Stack
8. 250 AGC post-stack scaling
9. post-stack 3 trace mixing (25 50 25 weights)

Appendix C

VELOCITY PICKS, LINES A1–G

Line A1

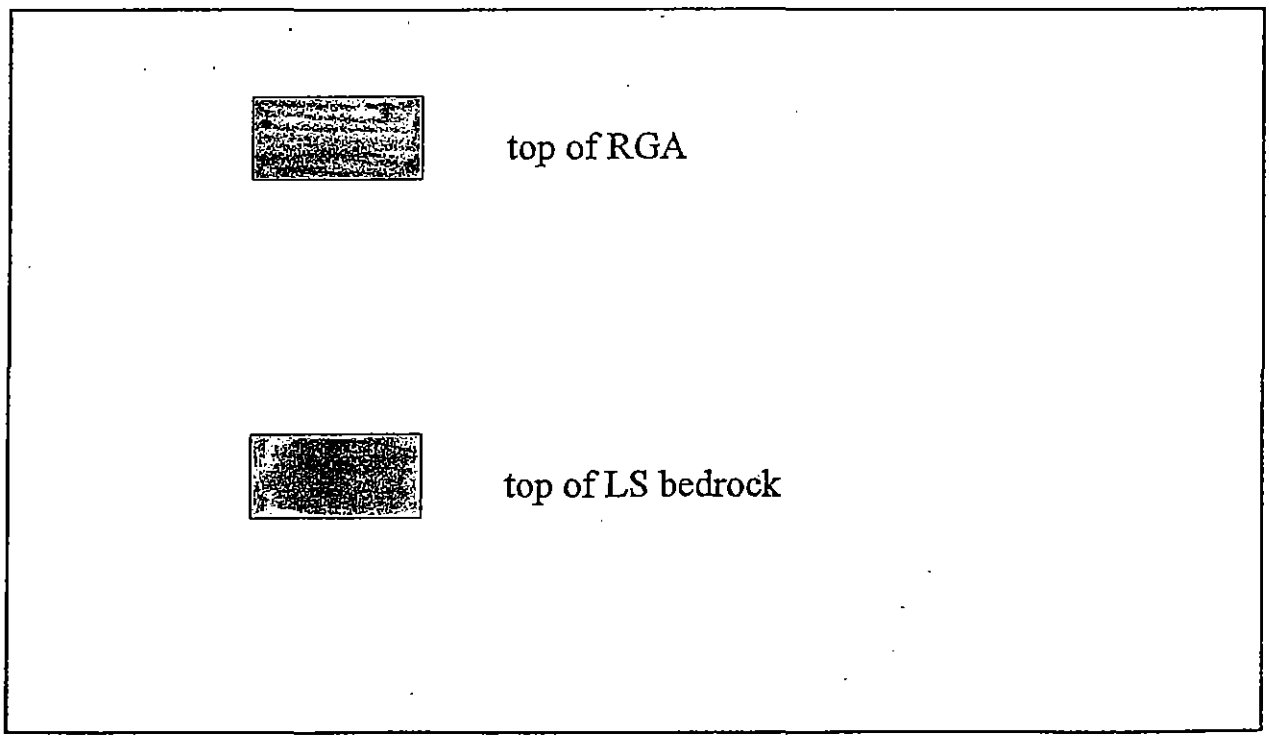
Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
175	210	18.4
325	225	36.6
555	370	102.7
675	490	165.4
820	570	233.7

Existing well data for Line A1:

MW-133	P4-A2	P4-A3
RGA top: 20.2 m	RGA top: 14 m	RGA top: 14 m
	TKcm top: 29.6 m	TKcm top: 31.8 m

* TKcm denotes Clayton-McNairy interval



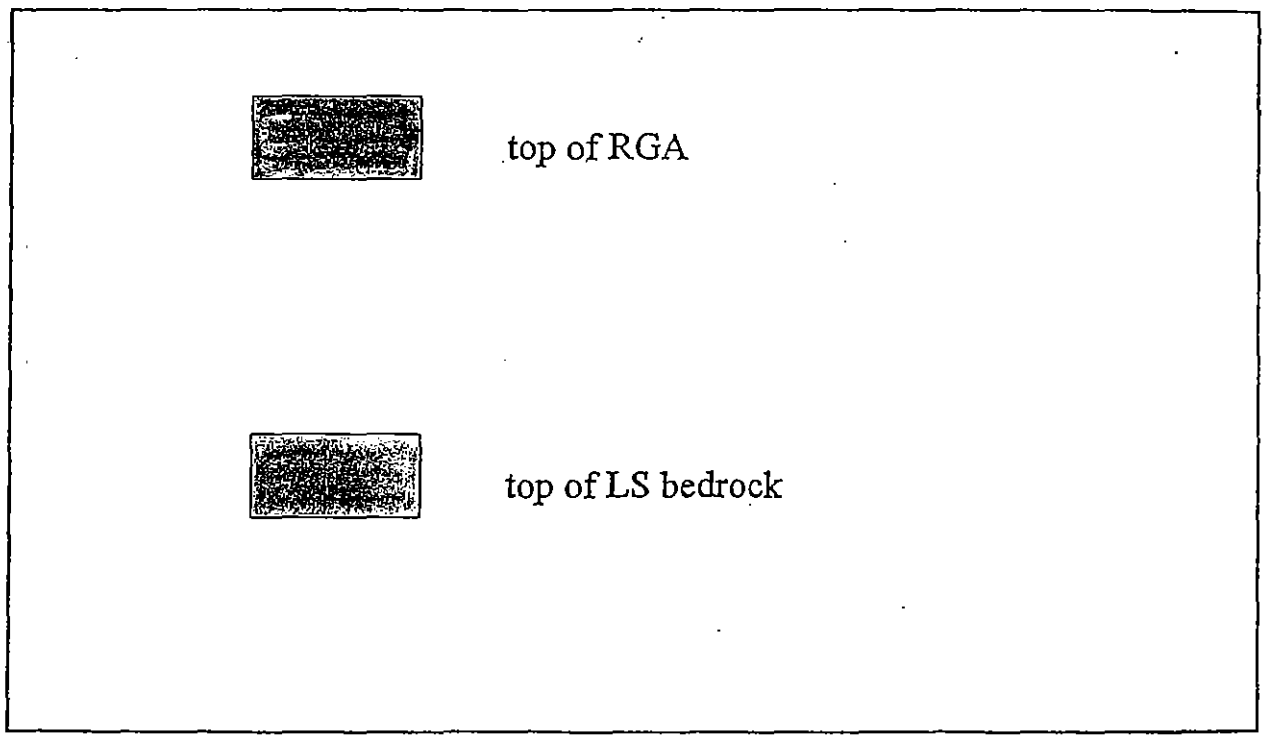
Line A2

Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
145	205	14.9
250	245	30.6
500	420	105
700	500	175
800	575	230

Existing well data for Line A2:

MW-133
RGA top: 20.2 m (approx.)



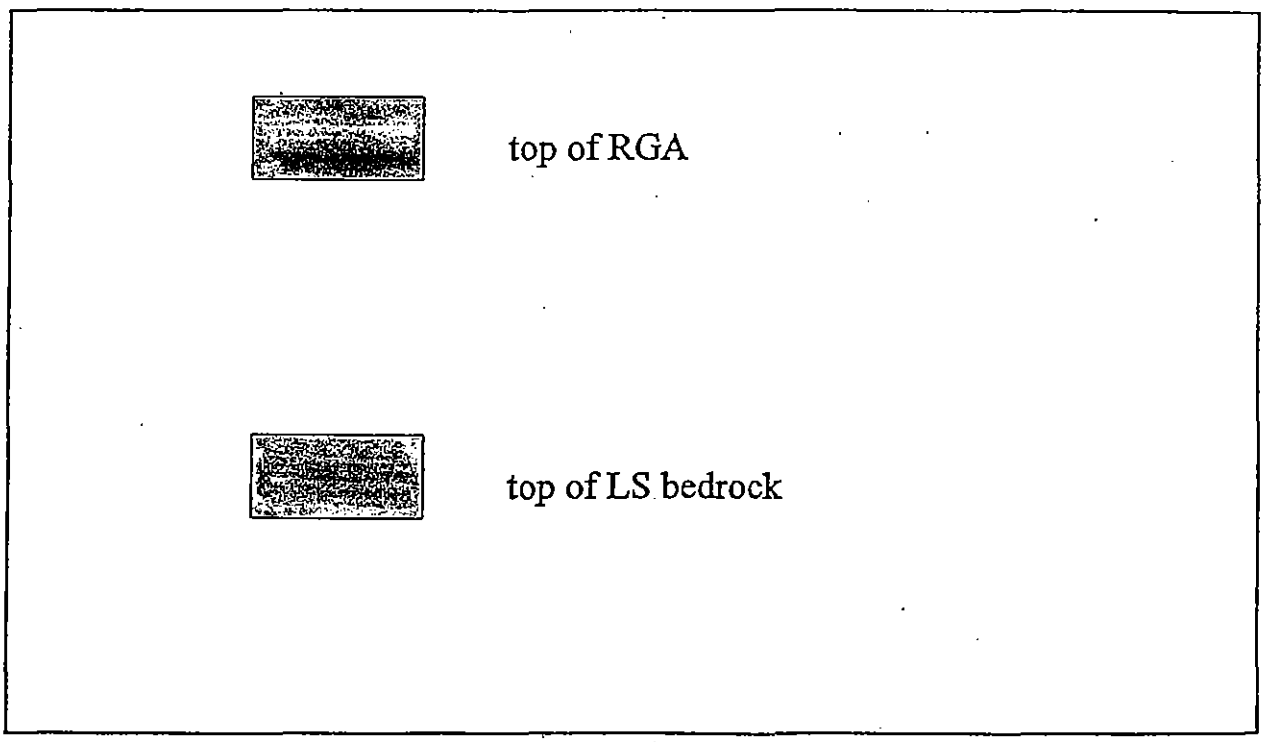
Line A3

Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
100	285	14.3
160	290	23.2
275	305	41.9
565	350	98.9
835	455	189
960	570	273.6

Existing well data for Line A3:

MW-202
RGA top: 21.9 m (approx.)



Line B (BW, B, BNS)

Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
80	295	11.8
230	345	39.7
380	385	73.2
505	440	111.1
560	460	128.8
610	490	149.4

Existing well data for line B:

P4-C2
RGA top: 16.8 m
TKcm top: 27.1 m

P4-C4
RGA top: 17.1 m
TKcm top: 30.8 m

P4-C5
RGA top: 16.2 m
TKcm top: 32.9 m

P4-C7
RGA top: 18.3 m
TKcm top: 32.6 m

P4-C9
RGA top: 17.2 m
TKcm top: 34.4 m

P4-C10
RGA top: 18.6 m
TKcm top: 36 m

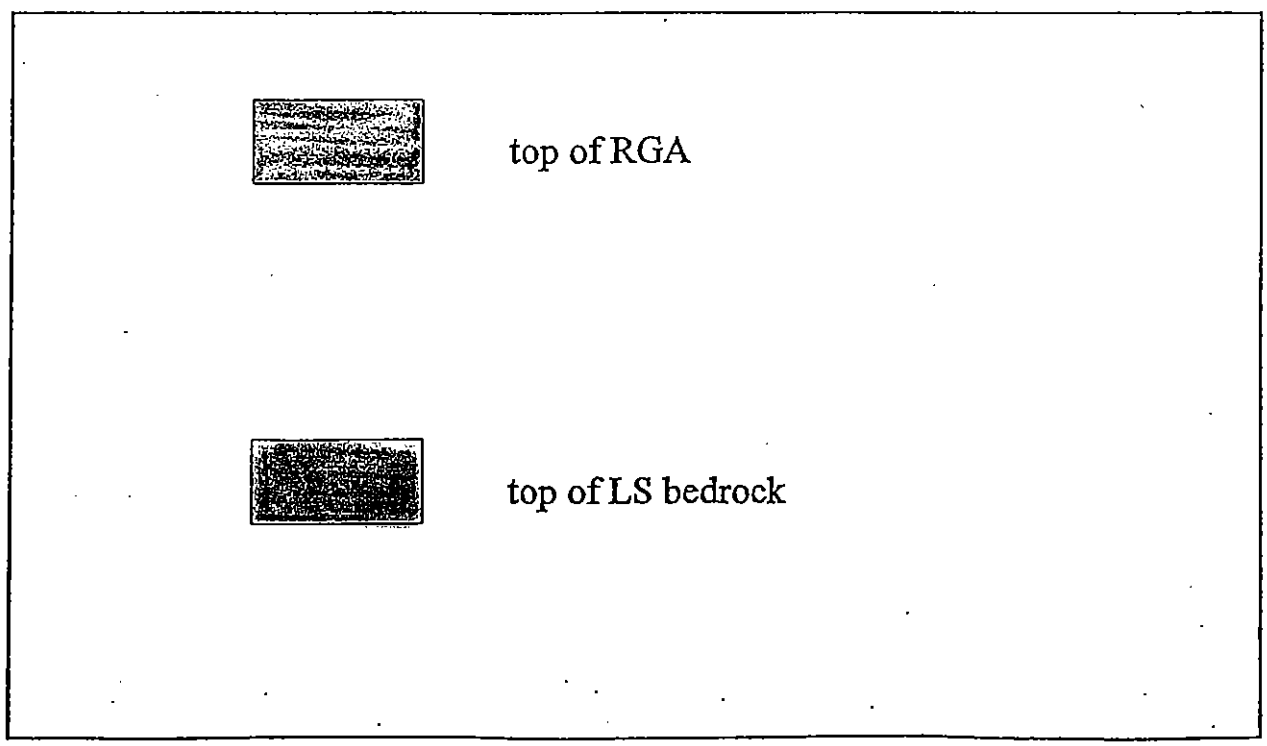
MW-181
RGA top: 17.4 m

MW-193
RGA top: 20.7 m

MW-122
RGA top: 18.9 m

MW-140
RGA top: 17.7 m

* TKcm denotes Clayton-McNairy interval



Line C1, C1S

Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
110	345	19
540	370	99.9

Existing well data for Line C1, C1S:

MW-144
RGA top: 21.6 m

P4-D6
RGA top: 15.9 m
TKcm top: 104.6 m

P4-D7
RGA top: 18.3 m
TKcm top: 50.6 m

P4-D8
RGA top: 17.3 m
TKcm top: 31.4 m

P4-D9
RGA top: 19.5 m
TKcm top: 32 m

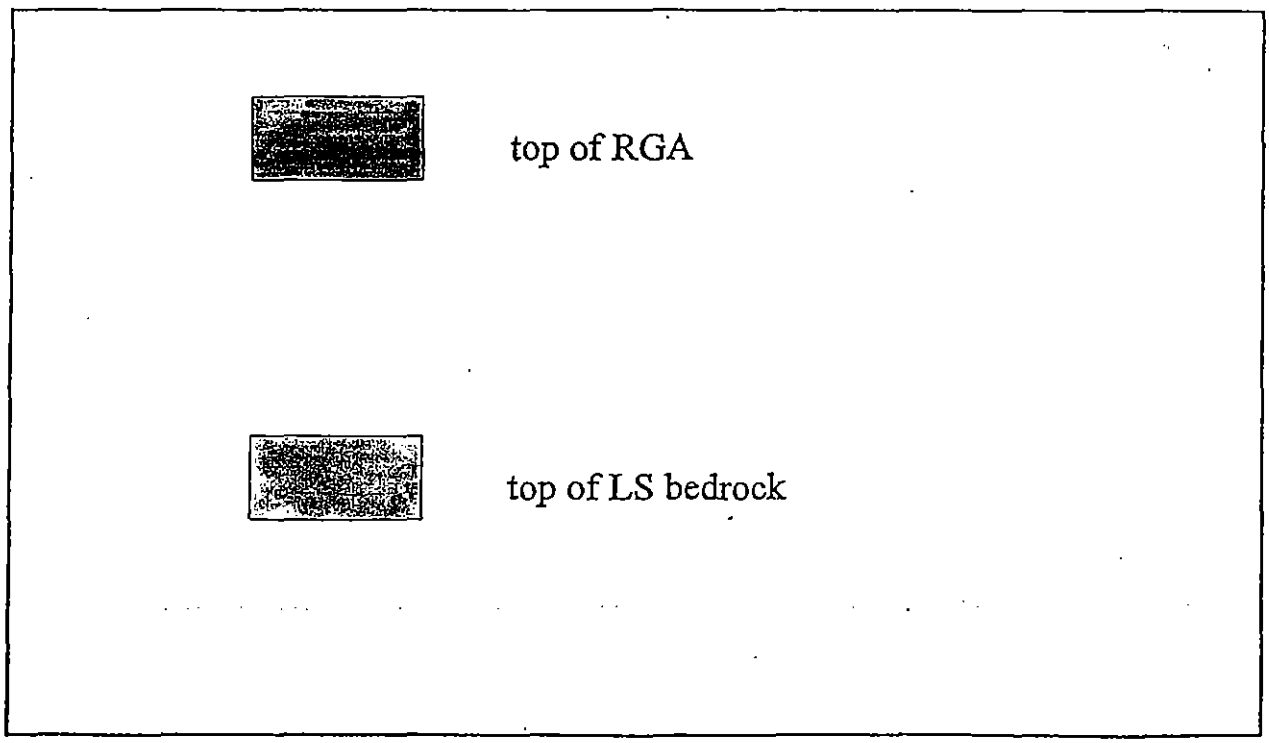
P4-D10
RGA top: 18.6 m
TKcm top: 32.4 m

P4-D12
RGA top: 18.8 m
TKcm top: 33.2 m

P4-D12A
RGA top: 19.1 m
TKcm top: 32.2 m

P4-D11
RGA top: 18.3 m
TKcm top: 34.3 m

* TKcm denotes Clayton-McNairy interval



Line C2

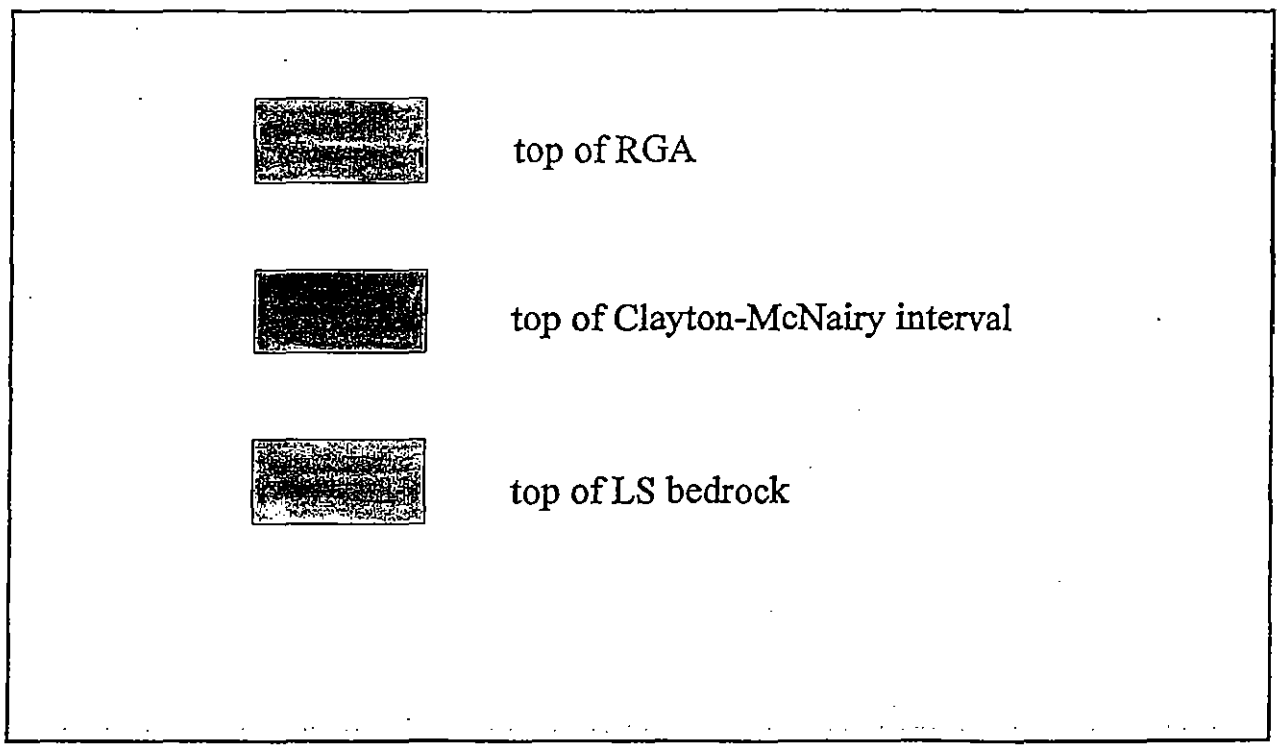
Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
110	235	12.9
235	240	28.2
340	265	45.1
530	385	102

Existing well data for Line C2:

P4-D4	P4-D5
RGA top: 16.4 m	RGA top: 16.3 m
TKcm top: 31.1 m	TKcm top: 31.2 m

* TKcm denotes Clayton-McNairy interval



Line C3

Velocity Analysis

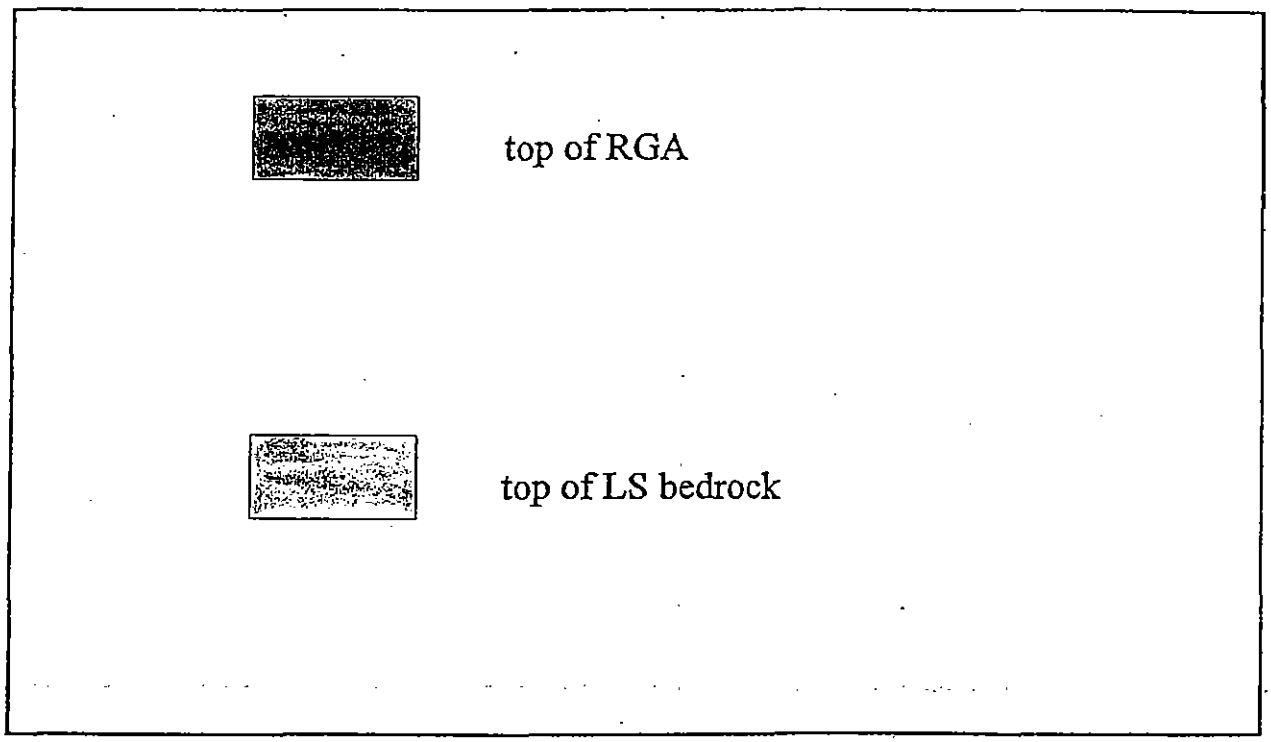
time (ms)	velocity (m/s)	depth (m)
120	210	12.6
335	225	37.7
550	380	104.5
625	415	129.7
860	545	234.4
960	575	276

Existing well data for Line C3:

P4-F8
RGA top: 13.4 m
TKcm top: 27.5 m
LS top: 105.2 m

MW-66
RGA top: 17.1 m

*TKcm denotes Clayton-McNairy interval
LS denotes Mississippian bedrock



Line C3', C3' extended

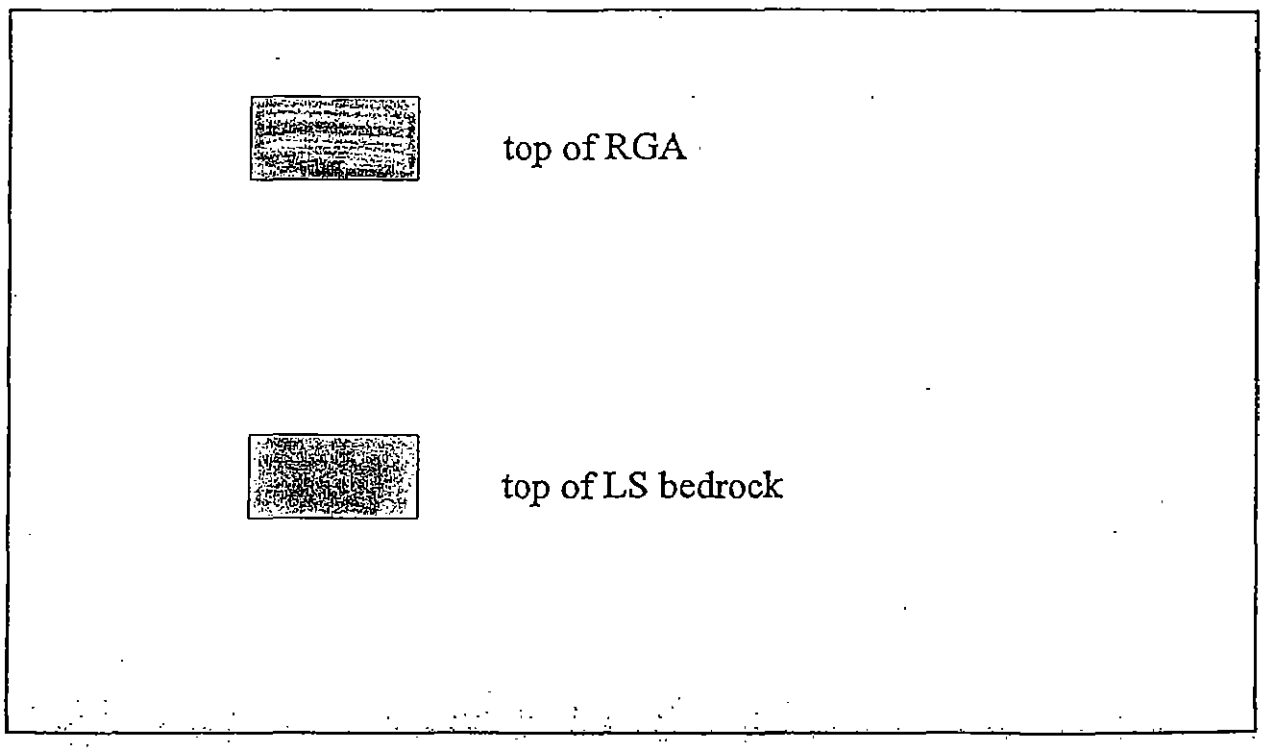
Velocity Analysis

C3'			C3' extended		
time (ms)	velocity (m/s)	depth (m)	time (ms)	velocity (m/s)	depth (m)
95	270	12.8	95	240	11.4
290	280	40.6	300	250	37.5
360	285	51.3	475	445	105.7
485	435	105	580	560	162.4
515	435	112			

Existing well data for C3', C3' extended:

MW-106
RGA top: 16.6 m

MW-194
RGA top: 19.3 m



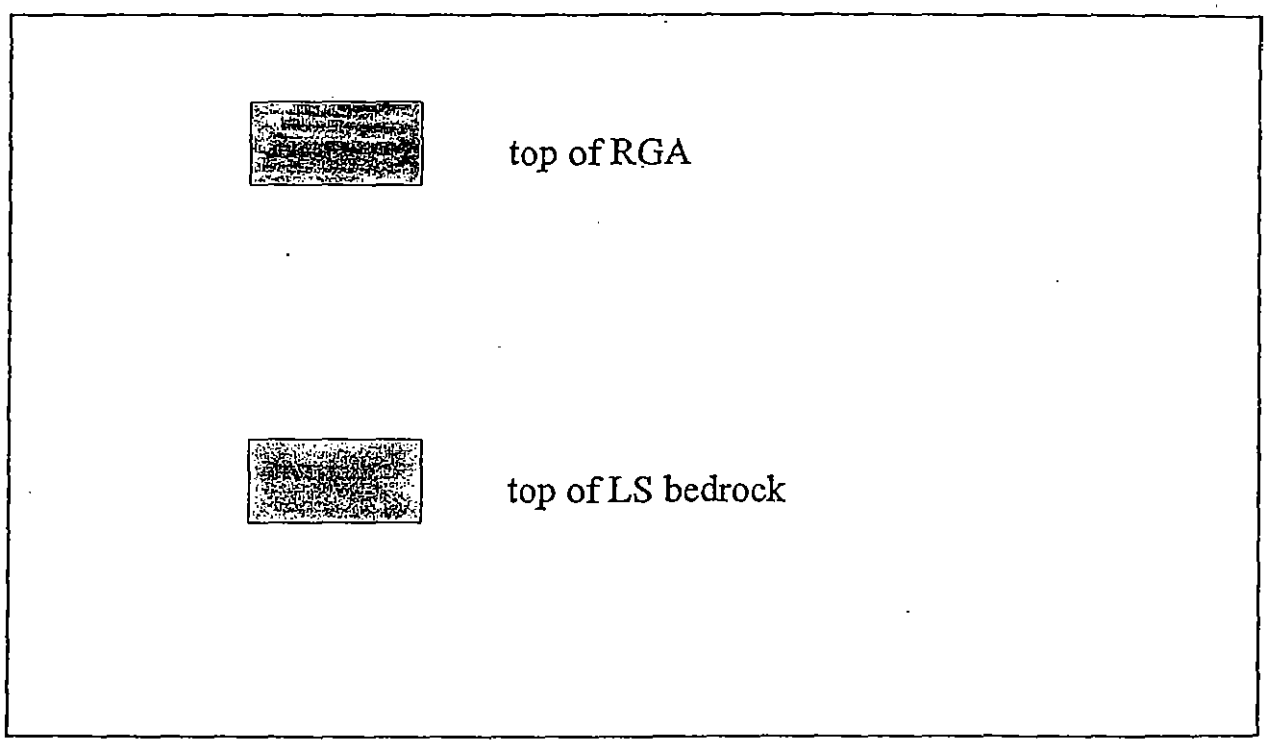
Line D

Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
110	345	18.9
540	370	99.9

Existing well data for Line D:

P4-D11	P4-D12	P4-D12A	P4-D10
RGA top: 18.3 m	RGA top: 18.9 m	RGA top: 18.6 m	RGA top: 18.8 m



Line E

Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
190	255	24
265	255	33.8
540	375	101.3

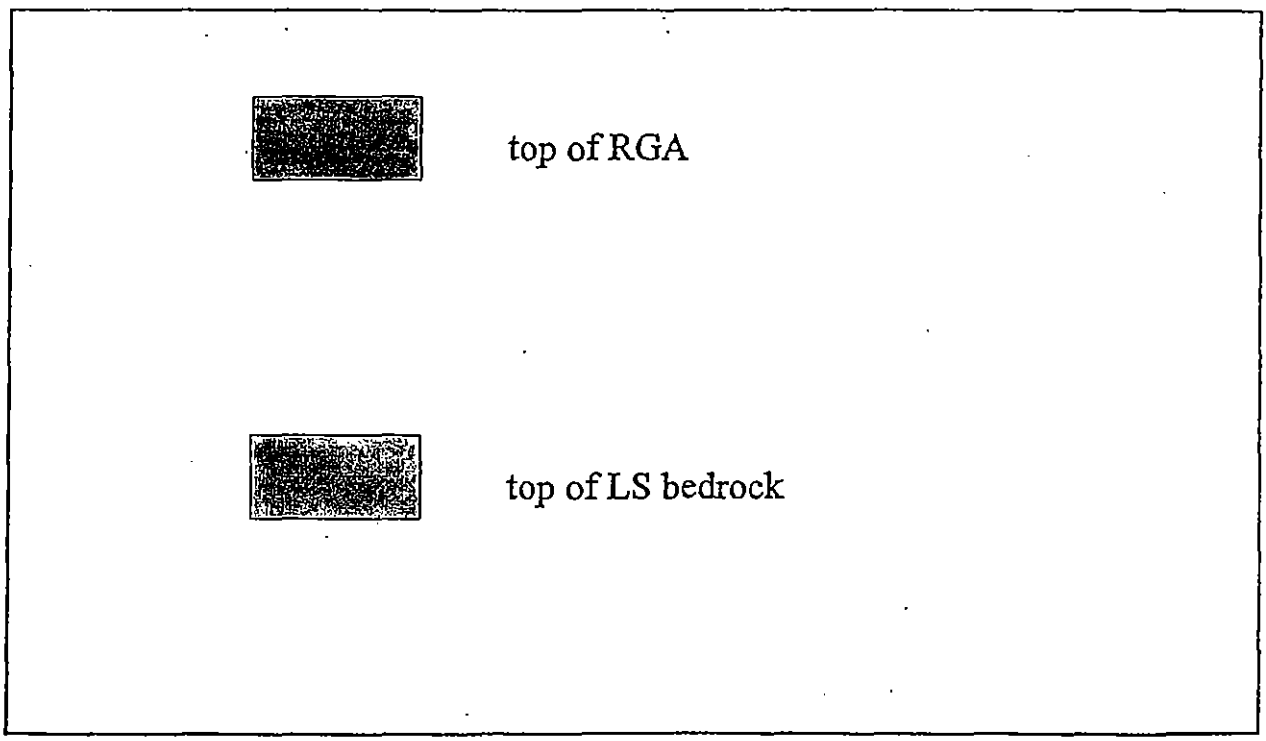
Existing well data for Line E:

P4-F8
RGA top: 13.4 m
TKcm top: 27.5 m
LS top: 105.2 m

P4-D4
RGA top: 16.5 m
TKcm top: 31.1 m

MW-181
RGA top: 16.8 m

* TKcm denotes Clayton-McNairy interval
LS denotes Mississippian bedrock



Line G

Velocity Analysis

time (ms)	velocity (m/s)	depth (m)
100	250	12.5
250	290	50.8
555	370	102.7

Existing well data for Line G:

MW-Z12
RGA top: 28.6 m
TKcm top: 39.3 m
LS top: 111.8 m

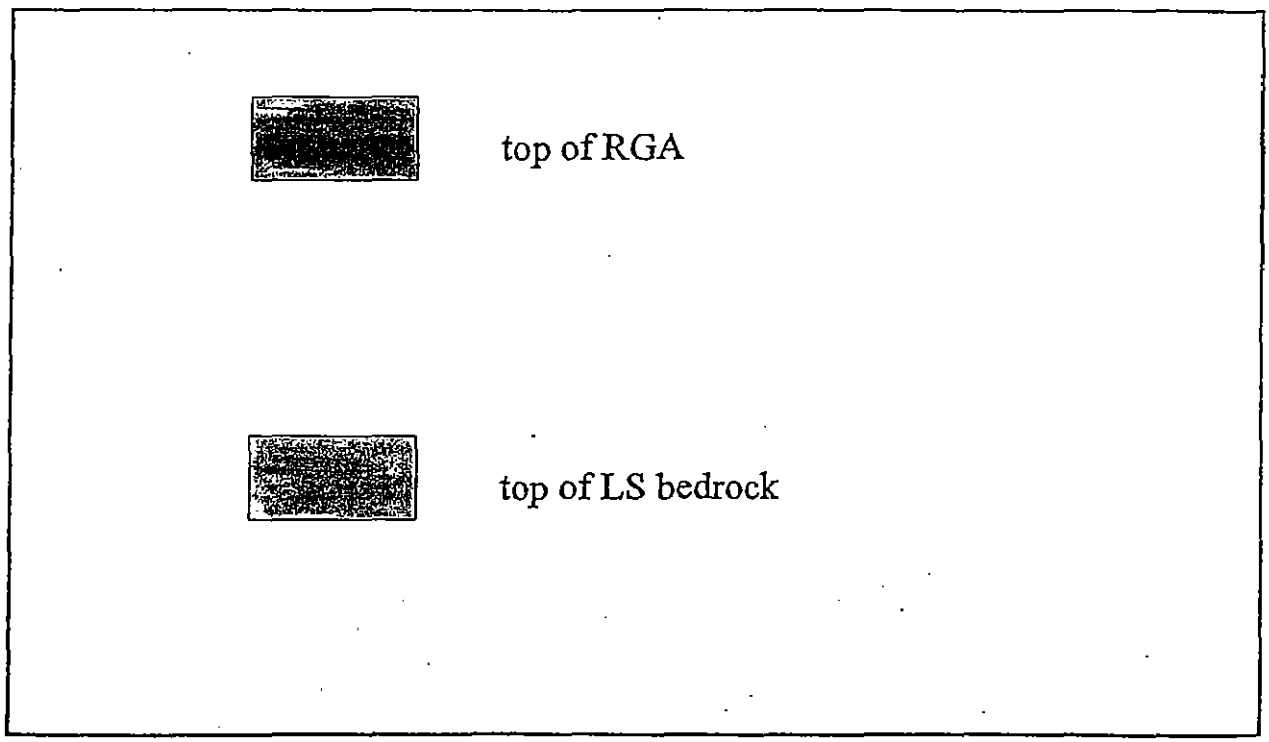
MW-202
RGA top: 22 m

MW-121
RGA top: 15.1 m
TKcm top: 26.1 m

MW-106
RGA top: 16.3 m

MW-Z16
RGA top: 18.6 m
TKcm top: 30.5 m
LS top: 108.4 m

* TKcm denotes Clayton-McNairy interval
LS denotes Mississippian bedrock

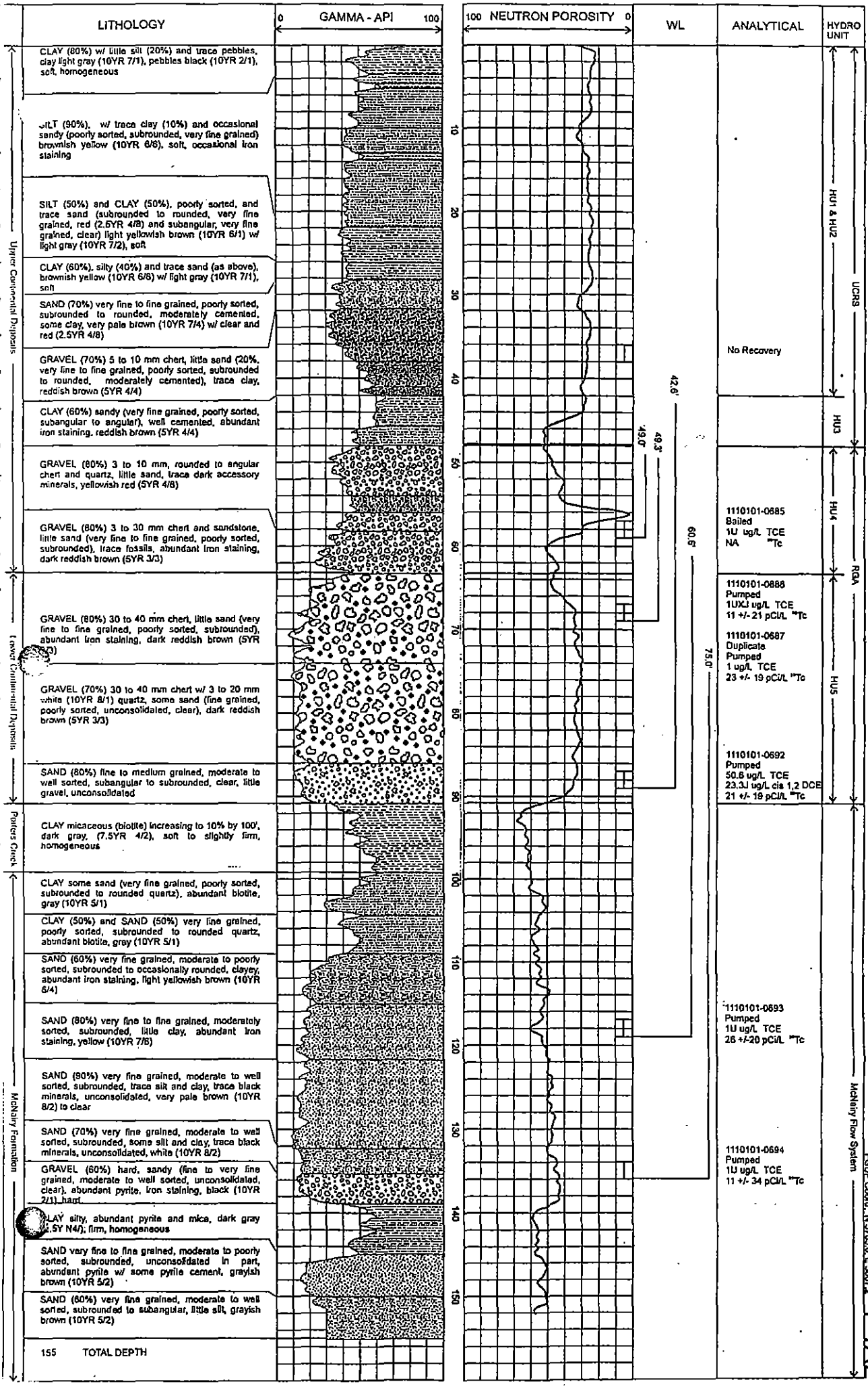


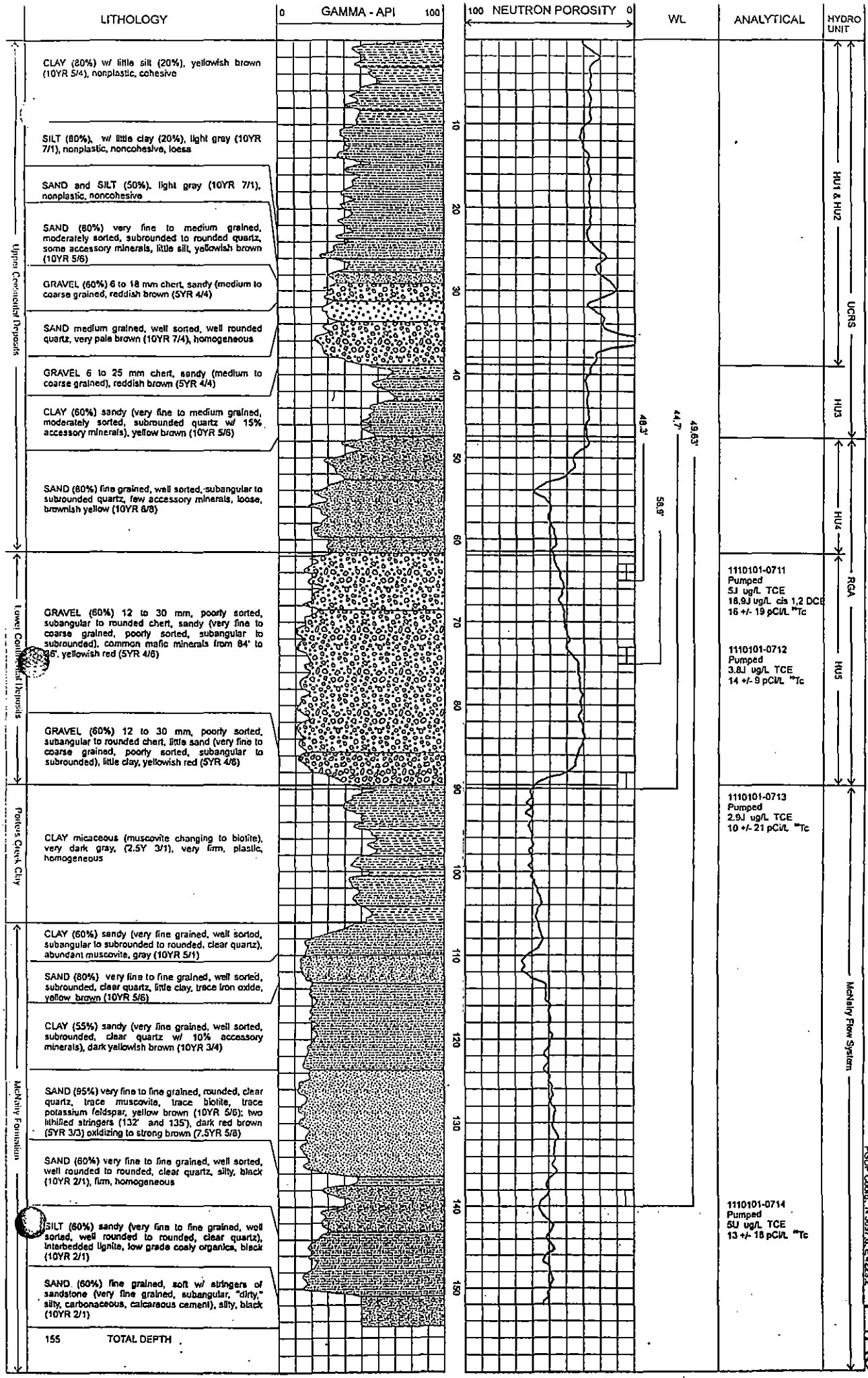
Appendix D

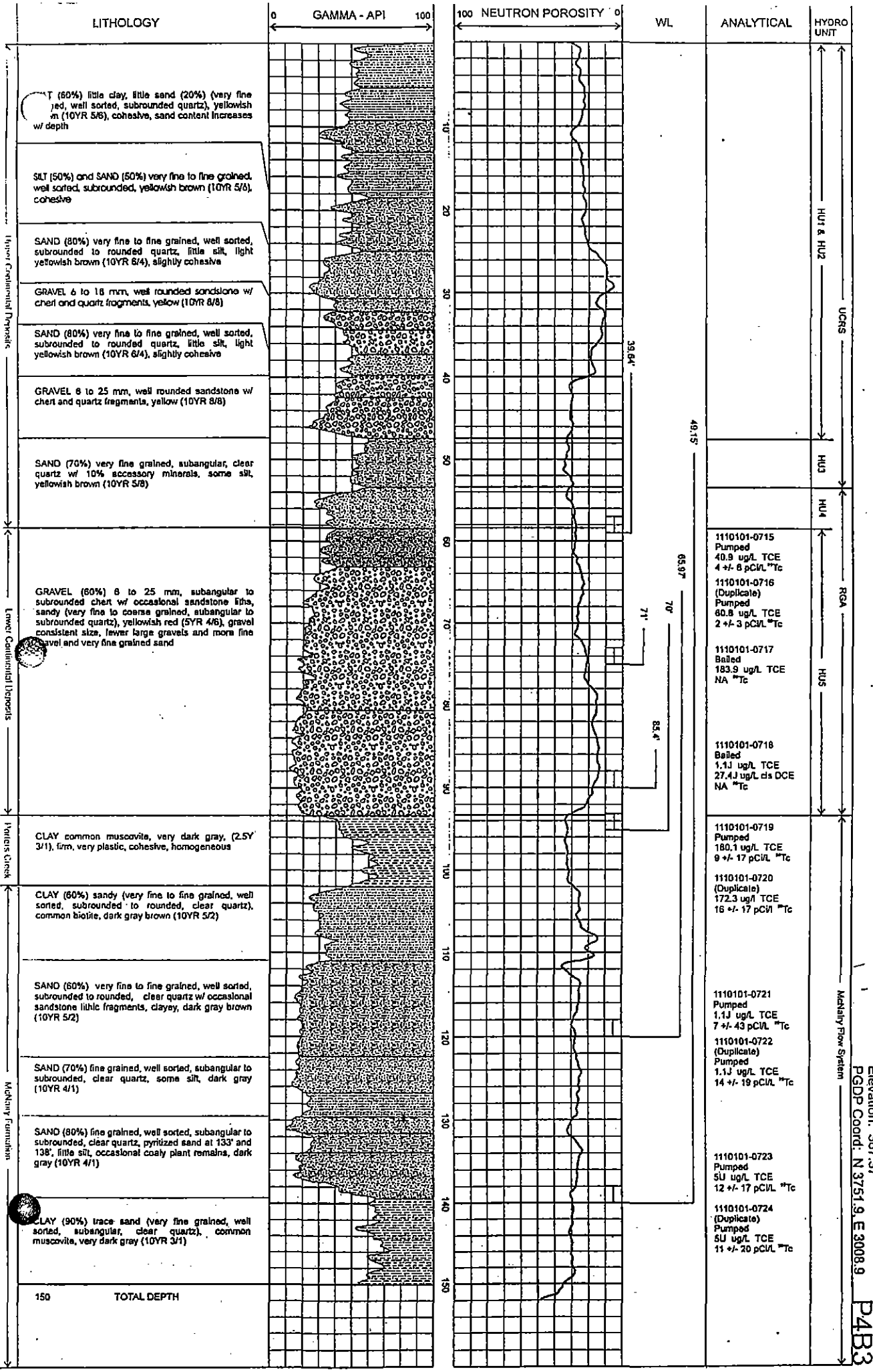
OPTIMUM OFFSET LINES

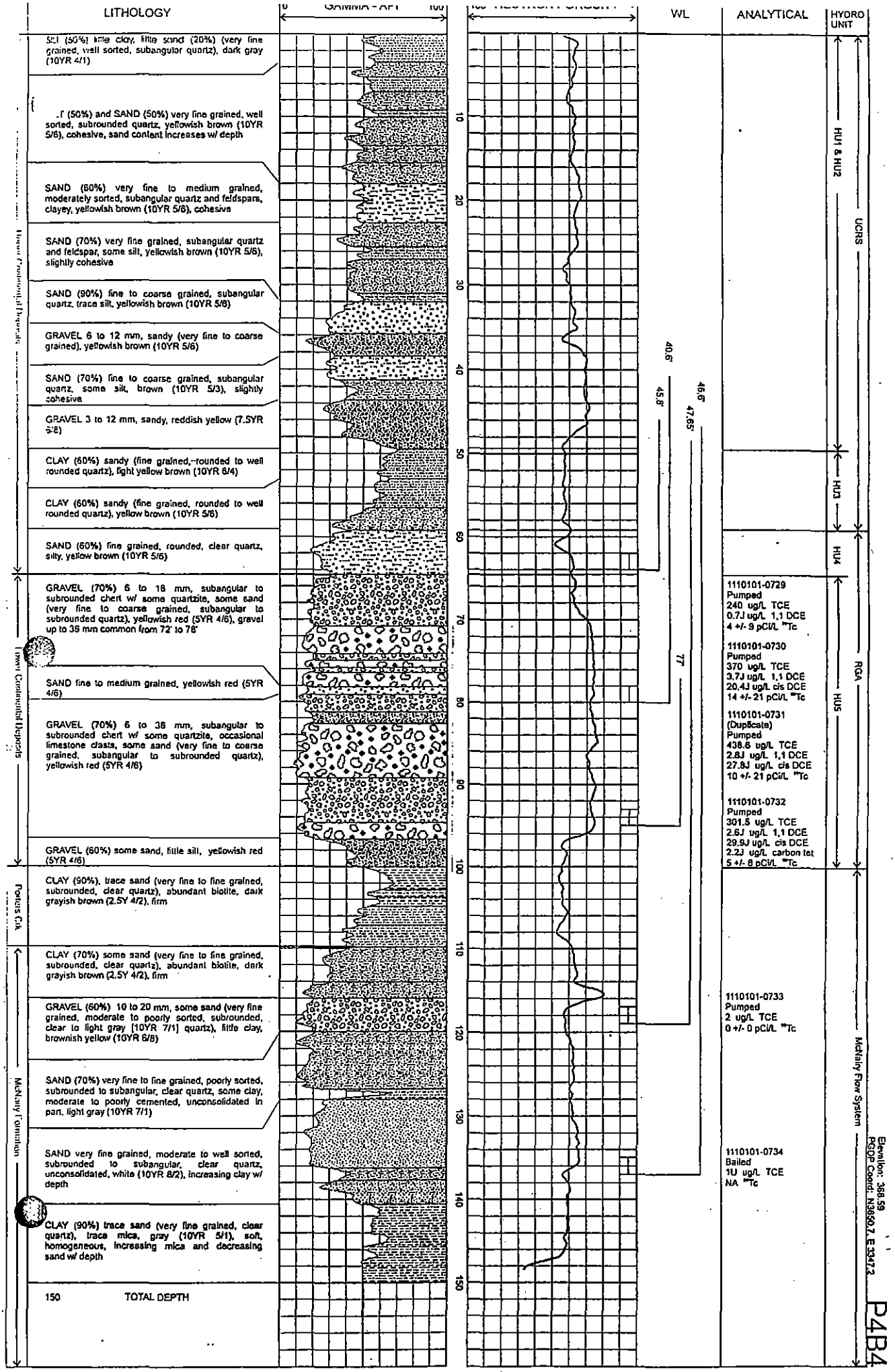
Appendix E

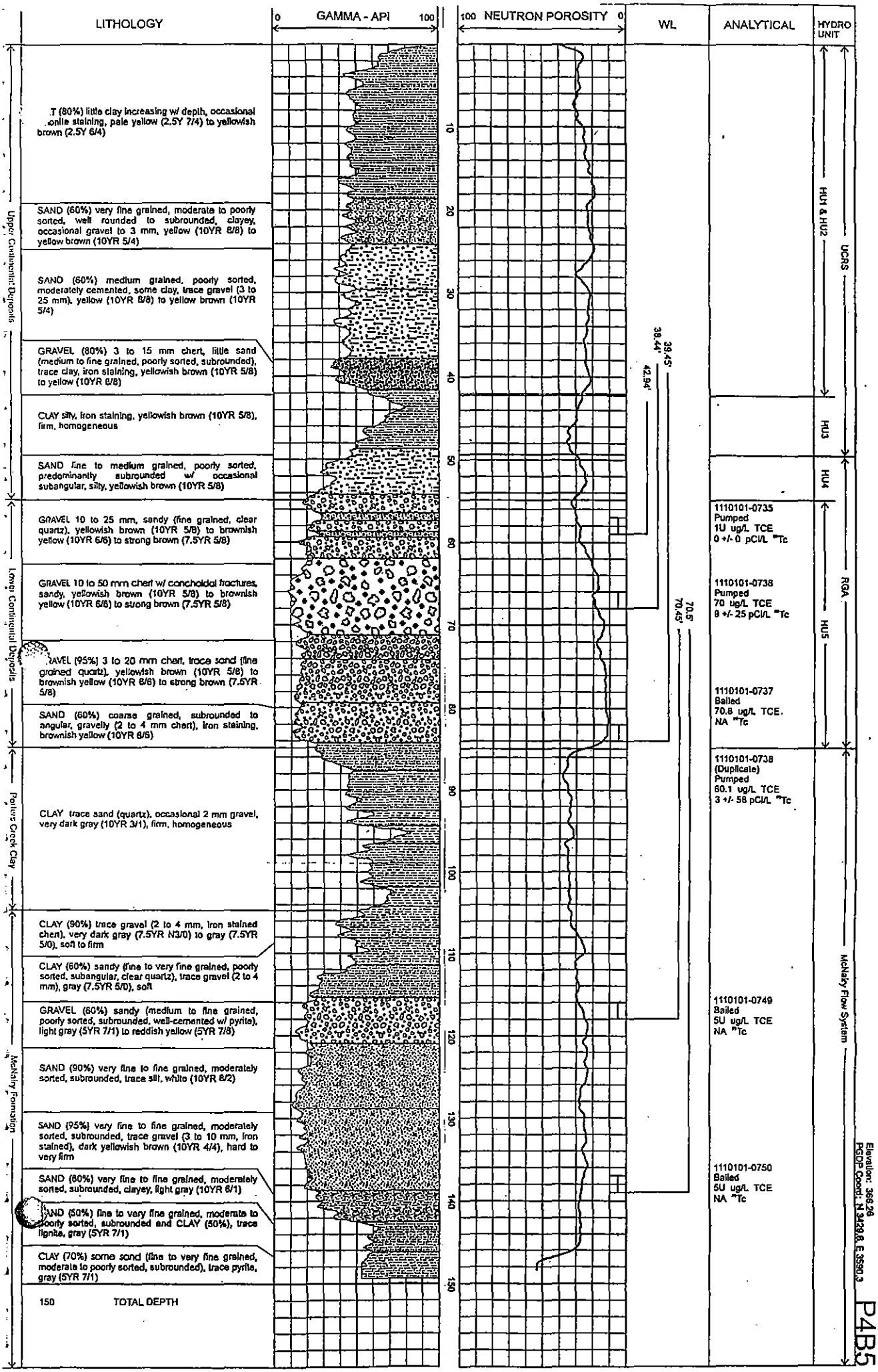
SOIL BORING LOGS

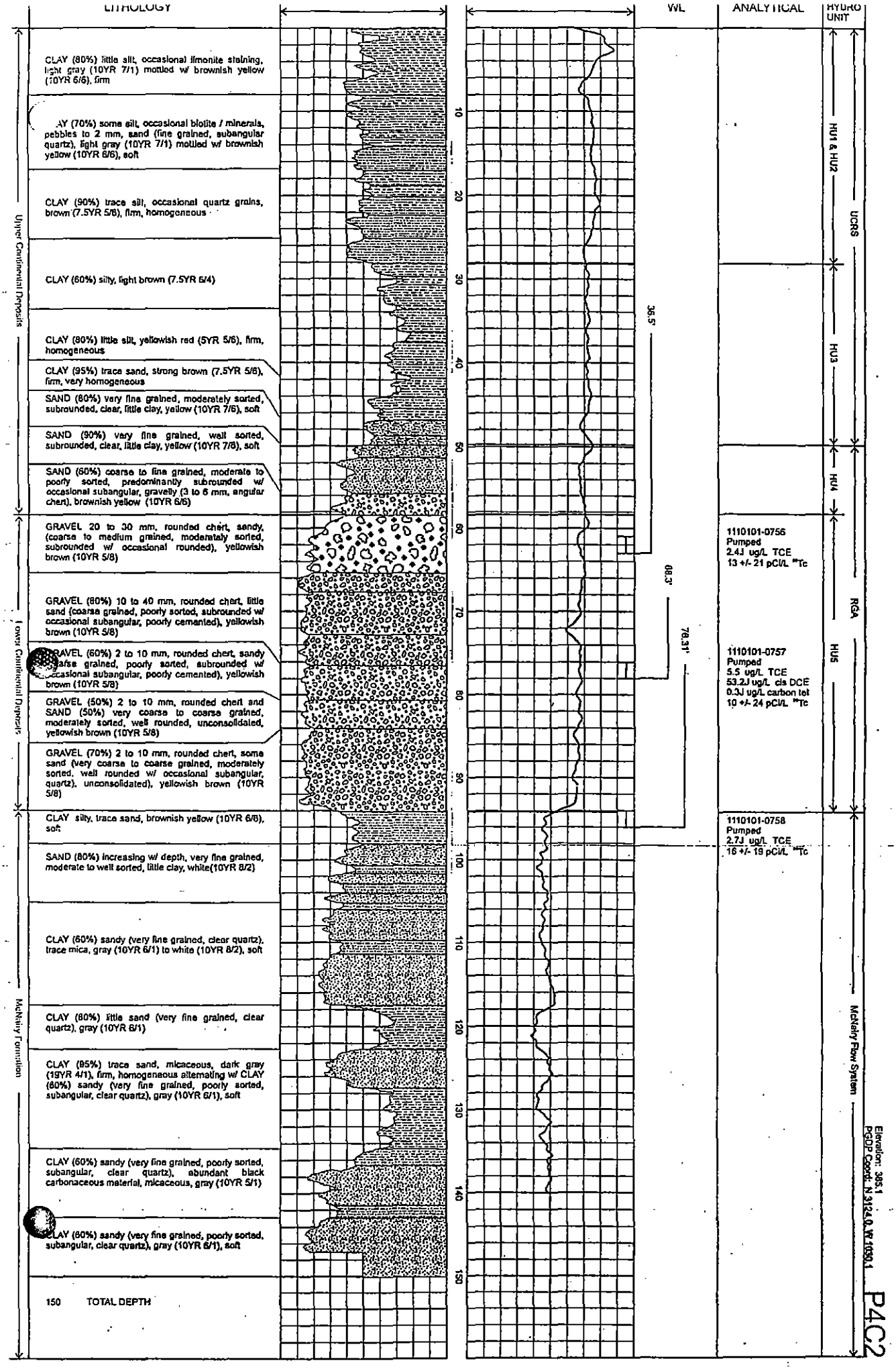

LITHOLOGY
GAMMA - API
0
100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
CLAY (80%) w/ little silt (20%) and trace pebbles, clay light gray (10YR 7/1), pebbles black (10YR 2/1), soft, homogeneous
SILT (90%), w/ trace clay (10%) and occasional sandy (poorly sorted, subrounded, very fine grained) brownish yellow (10YR 6/6), soft, occasional iron staining
SILT (50%) and CLAY (50%), poorly sorted, and trace sand (subrounded to rounded, very fine grained, red (2.5YR 4/8) and subangular, very fine grained, clear) light yellowish brown (10YR 6/1) w/ light gray (10YR 7/2), soft
CLAY (60%), silty (40%) and trace sand (as above), brownish yellow (10YR 6/8) w/ light gray (10YR 7/1), soft
SAND (70%) very fine to fine grained, poorly sorted, subrounded to rounded, moderately cemented, some clay, very pale brown (10YR 7/4) w/ clear and red (2.5YR 4/8)
GRAVEL (70%) 5 to 10 mm chert, little sand (20%, very fine to fine grained, poorly sorted, subrounded to rounded, moderately cemented), trace clay, reddish brown (5YR 4/4)
CLAY (60%) sandy (very fine grained, poorly sorted, subangular to angular), well cemented, abundant iron staining, reddish brown (5YR 4/4)
GRAVEL (80%) 3 to 10 mm, rounded to angular chert and quartz, little sand, trace dark accessory minerals, yellowish red (5YR 4/8)
GRAVEL (80%) 3 to 30 mm chert and sandstone, little sand (very fine to fine grained, poorly sorted, subrounded), trace fossils, abundant iron staining, dark reddish brown (5YR 3/3)
GRAVEL (80%) 30 to 40 mm chert, little sand (very fine to fine grained, poorly sorted, subrounded), abundant iron staining, dark reddish brown (5YR 3/3)
GRAVEL (70%) 30 to 40 mm chert w/ 3 to 20 mm white (10YR 8/1) quartz, some sand (fine grained, poorly sorted, unconsolidated, clear), dark reddish brown (5YR 3/3)
SAND (80%) fine to medium grained, moderate to well sorted, subangular to subrounded, clear, little gravel, unconsolidated
CLAY micaceous (biotite) increasing to 10% by 100', dark gray, (7.5YR 4/2), soft to slightly firm, homogeneous
CLAY some sand (very fine grained, poorly sorted, subrounded to rounded quartz), abundant biotite, gray (10YR 5/1)
CLAY (50%) and SAND (50%) very fine grained, poorly sorted, subrounded to rounded quartz, abundant biotite, gray (10YR 5/1)
SAND (60%) very fine grained, moderate to poorly sorted, subrounded to occasionally rounded, clayey, abundant iron staining, light yellowish brown (10YR 6/4)
SAND (80%) very fine to fine grained, moderately sorted, subrounded, little clay, abundant iron staining, yellow (10YR 7/6)
SAND (90%) very fine grained, moderate to well sorted, subrounded, trace silt and clay, trace black minerals, unconsolidated, very pale brown (10YR 8/2) to clear
SAND (70%) very fine grained, moderate to well sorted, subrounded, some silt and clay, trace black minerals, unconsolidated, white (10YR 8/2)
GRAVEL (60%) hard, sandy (fine to very fine grained, moderate to well sorted, unconsolidated, clear), abundant pyrite, iron staining, black (10YR 2/1) hard
CLAY silty, abundant pyrite and mica, dark gray (5Y N4/), firm, homogeneous
SAND very fine to fine grained, moderate to poorly sorted, subrounded, unconsolidated in part, abundant pyrite w/ some pyrite cement, grayish brown (10YR 5/2)
SAND (80%) very fine grained, moderate to well sorted, subrounded to subangular, little silt, grayish brown (10YR 5/2)
155 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek
McNairy Formation
42.6'
49.0'
49.3'
60.6'
75.0'
No Recovery
1110101-0685
Bailed
1U ug/L TCE
NA pCi/L Tc
1110101-0688
Pumped
1UXJ ug/L TCE
11 +/- 21 pCi/L Tc
1110101-0687
Duplicate
Pumped
1 ug/L TCE
23 +/- 19 pCi/L Tc
1110101-0692
Pumped
50.6 ug/L TCE
23.3J ug/L cis 1,2 DCE
21 +/- 19 pCi/L Tc
1110101-0693
Pumped
1U ug/L TCE
26 +/-20 pCi/L Tc
1110101-0694
Pumped
1U ug/L TCE
11 +/- 34 pCi/L Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 371.98
PGDP Coord: N 5705.6, E 3967.2
P4A2


LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
CLAY (80%) w/ little silt (20%), yellowish brown (10YR 5/4), nonplastic, cohesive
SILT (80%), w/ little clay (20%), light gray (10YR 7/1), nonplastic, noncohesive, loess
SAND and SILT (50%), light gray (10YR 7/1), nonplastic, noncohesive
SAND (80%) very fine to medium grained, moderately sorted, subrounded to rounded quartz, some accessory minerals, little silt, yellowish brown (10YR 5/6)
GRAVEL (60%) 6 to 18 mm chert, sandy (medium to coarse grained, reddish brown (5YR 4/4)
SAND medium grained, well sorted, well rounded quartz, very pale brown (10YR 7/4), homogeneous
GRAVEL 6 to 25 mm chert, sandy (medium to coarse grained), reddish brown (5YR 4/4)
CLAY (60%) sandy (very fine to medium grained, moderately sorted, subrounded quartz w/ 15% accessory minerals), yellow brown (10YR 5/6)
SAND (80%) fine grained, well sorted, subangular to subrounded quartz, few accessory minerals, loose, brownish yellow (10YR 6/8)
GRAVEL (60%) 12 to 30 mm, poorly sorted, subangular to rounded chert, sandy (very fine to coarse grained, poorly sorted, subangular to subrounded), common mafic minerals from 84' to 86', yellowish red (5YR 4/6)
GRAVEL (60%) 12 to 30 mm, poorly sorted, subangular to rounded chert, little sand (very fine to coarse grained, poorly sorted, subangular to subrounded), little clay, yellowish red (5YR 4/6)
CLAY micaceous (muscovite changing to biotite), very dark gray, (2.5Y 3/1), very firm, plastic, homogeneous
CLAY (60%) sandy (very fine grained, well sorted, subangular to subrounded to rounded, clear quartz), abundant muscovite, gray (10YR 5/1)
SAND (80%) very fine to fine grained, well sorted, subrounded, clear quartz, little clay, trace iron oxide, yellow brown (10YR 5/6)
CLAY (55%) sandy (very fine grained, well sorted, subrounded, clear quartz w/ 10% accessory minerals), dark yellowish brown (10YR 3/4)
SAND (95%) very fine to fine grained, rounded, clear quartz, trace muscovite, trace biotite, trace potassium feldspar, yellow brown (10YR 5/6); two lithified stringers (132' and 135'), dark red brown (5YR 3/3) oxidizing to strong brown (7.5YR 5/8)
SAND (60%) very fine to fine grained, well sorted, well rounded to rounded, clear quartz, silty, black (10YR 2/1), firm, homogeneous
SILT (60%) sandy (very fine to fine grained, well sorted, well rounded to rounded, clear quartz), interbedded lignite, low grade coaly organics, black (10YR 2/1)
SAND (60%) fine grained, soft w/ stringers of sandstone (very fine grained, subangular, "dirty," silty, carbonaceous, calcareous cement), silty, black (10YR 2/1)
155 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Pliocene Clack Clay
McNairy Formation
48.3'
44.7'
49.63'
58.9'
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
1110101-0711
Pumped
5J ug/L TCE
18.9J ug/L cis 1,2 DCE
16 +/- 19 pCi/L 99Tc
1110101-0712
Pumped
3.8J ug/L TCE
14 +/- 9 pCi/L 99Tc
1110101-0713
Pumped
2.9J ug/L TCE
10 +/- 21 pCi/L 99Tc
1110101-0714
Pumped
5U ug/L TCE
13 +/- 18 pCi/L 99Tc
Elevation: 371.57
PGDP Coord: N 56978, E 42293
P4A3


LITHOLOGY
GAMMA - API
0
100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
T (60%) little clay, little sand (20%) (very fine ed, well sorted, subrounded quartz), yellowish m (10YR 5/6), cohesive, sand content increases w/ depth
SILT (50%) and SAND (50%) very fine to fine grained, well sorted, subrounded, yellowish brown (10YR 5/6), cohesive
SAND (80%) very fine to fine grained, well sorted, subrounded to rounded quartz, little silt, light yellowish brown (10YR 6/4), slightly cohesive
GRAVEL 6 to 16 mm, well rounded sandstone w/ chert and quartz fragments, yellow (10YR 8/8)
SAND (80%) very fine to fine grained, well sorted, subrounded to rounded quartz, little silt, light yellowish brown (10YR 6/4), slightly cohesive
GRAVEL 6 to 25 mm, well rounded sandstone w/ chert and quartz fragments, yellow (10YR 8/8)
SAND (70%) very fine grained, subangular, clear quartz w/ 10% accessory minerals, some silt, yellowish brown (10YR 5/8)
GRAVEL (60%) 6 to 25 mm, subangular to subrounded chert w/ occasional sandstone liths, sandy (very fine to coarse grained, subangular to subrounded quartz), yellowish red (5YR 4/6), gravel consistent size, fewer large gravels and more fine gravel and very fine grained sand
CLAY common muscovite, very dark gray, (2.5Y 3/1), firm, very plastic, cohesive, homogeneous
CLAY (60%) sandy (very fine to fine grained, well sorted, subrounded to rounded, clear quartz), common biotite, dark gray brown (10YR 5/2)
SAND (60%) very fine to fine grained, well sorted, subrounded to rounded, clear quartz w/ occasional sandstone lithic fragments, clayey, dark gray brown (10YR 5/2)
SAND (70%) fine grained, well sorted, subangular to subrounded, clear quartz, some silt, dark gray (10YR 4/1)
SAND (80%) fine grained, well sorted, subangular to subrounded, clear quartz, pyritized sand at 133' and 138', little silt, occasional coaly plant remains, dark gray (10YR 4/1)
CLAY (90%) trace sand (very fine grained, well sorted, subangular, clear quartz), common muscovite, very dark gray (10YR 3/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek
McNairy Formation
39.84'
49.15'
65.97'
71'
70'
85.4'
1110101-0715
Pumped
40.9 ug/L TCE
4 +/- 6 pCi/L 99Tc
1110101-0716
(Duplicate)
Pumped
60.8 ug/L TCE
2 +/- 3 pCi/L 99Tc
1110101-0717
Bailed
183.9 ug/L TCE
NA 99Tc
1110101-0718
Bailed
1.1J ug/L TCE
27.4J ug/L cis DCE
NA 99Tc
1110101-0719
Pumped
180.1 ug/L TCE
9 +/- 17 pCi/L 99Tc
1110101-0720
(Duplicate)
172.3 ug/l TCE
16 +/- 17 pCi/l 99Tc
1110101-0721
Pumped
1.1J ug/L TCE
7 +/- 43 pCi/L 99Tc
1110101-0722
(Duplicate)
Pumped
1.1J ug/L TCE
14 +/- 19 pCi/L 99Tc
1110101-0723
Pumped
5U ug/L TCE
12 +/- 17 pCi/L 99Tc
1110101-0724
(Duplicate)
Pumped
5U ug/L TCE
11 +/- 20 pCi/L 99Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 367.37
PGDP Coord: N 3751.9, E 3008.9
P4B3


LITHOLOGY
GAMMA - API
WL
ANALYTICAL
HYDRO UNIT
SILT (50%) little clay, little sand (20%) (very fine grained, well sorted, subangular quartz), dark gray (10YR 4/1)
...T (50%) and SAND (50%) very fine grained, well sorted, subrounded quartz, yellowish brown (10YR 5/6), cohesive, sand content increases w/ depth
SAND (60%) very fine to medium grained, moderately sorted, subangular quartz and feldspars, clayey, yellowish brown (10YR 5/6), cohesive
SAND (70%) very fine grained, subangular quartz and feldspar, some silt, yellowish brown (10YR 5/6), slighlly cohesive
SAND (90%) fine to coarse grained, subangular quartz, trace silt, yellowish brown (10YR 5/6)
GRAVEL 6 to 12 mm, sandy (very fine to coarse grained), yellowish brown (10YR 5/6)
SAND (70%) fine to coarse grained, subangular quartz, some silt, brown (10YR 5/3), slighlly cohesive
GRAVEL 3 to 12 mm, sandy, reddish yellow (7.5YR 6/8)
CLAY (60%) sandy (fine grained, rounded to well rounded quartz), light yellow brown (10YR 6/4)
CLAY (60%) sandy (fine grained, rounded to well rounded quartz), yellow brown (10YR 5/6)
SAND (60%) fine grained, rounded, clear quartz, silty, yellow brown (10YR 5/6)
GRAVEL (70%) 6 to 18 mm, subangular to subrounded chert w/ some quartzite, some sand (very fine to coarse grained, subangular to subrounded quartz), yellowish red (5YR 4/6), gravel up to 35 mm common from 72' to 76'
SAND fine to medium grained, yellowish red (5YR 4/6)
GRAVEL (70%) 6 to 35 mm, subangular to subrounded chert w/ some quartzite, occasional limestone clasts, some sand (very fine to coarse grained, subangular to subrounded quartz), yellowish red (5YR 4/6)
GRAVEL (60%) some sand, little silt, yellowish red (5YR 4/6)
CLAY (90%), trace sand (very fine to fine grained, subrounded, clear quartz), abundant biotite, dark grayish brown (2.5Y 4/2), firm
CLAY (70%) some sand (very fine to fine grained, subrounded, clear quartz), abundant biotite, dark grayish brown (2.5Y 4/2), firm
GRAVEL (60%) 10 to 20 mm, some sand (very fine grained, moderate to poorly sorted, subrounded, clear to light gray [10YR 7/1] quartz), little clay, brownish yellow (10YR 6/8)
SAND (70%) very fine to fine grained, poorly sorted, subrounded to subangular, clear quartz, some clay, moderate to poorly cemented, unconsolidated in part, light gray (10YR 7/1)
SAND very fine grained, moderate to well sorted, subrounded to subangular, clear quartz, unconsolidated, white (10YR 8/2), increasing clay w/ depth
CLAY (90%) trace sand (very fine grained, clear quartz), trace mica, gray (10YR 5/1), soft, homogeneous, increasing mica and decreasing sand w/ depth
150 TOTAL DEPTH
40.6'
45.8'
46.6'
47.65'
77'
1110101-0729
Pumped
240 ug/L TCE
0.7J ug/L 1,1 DCE
4 +/- 9 pCi/L 99Tc
1110101-0730
Pumped
370 ug/L TCE
3.7J ug/L 1,1 DCE
20.4J ug/L cis DCE
14 +/- 21 pCi/L 99Tc
1110101-0731
(Duplicate)
Pumped
438.6 ug/L TCE
2.8J ug/L 1,1 DCE
27.8J ug/L cis DCE
10 +/- 21 pCi/L 99Tc
1110101-0732
Pumped
301.5 ug/L TCE
2.6J ug/L 1,1 DCE
29.9J ug/L cis DCE
2.2J ug/L carbon tet
5 +/- 8 pCi/L 99Tc
1110101-0733
Pumped
2 ug/L TCE
0 +/- 0 pCi/L 99Tc
1110101-0734
Bailed
1U ug/L TCE
NA 99Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Upper Continental Deposits
Lower Continental Deposits
Fort Us Clay
McNairy Formation
Elevation: 368.59
PGDP Coord: N39850.7, E33473.
P4B4

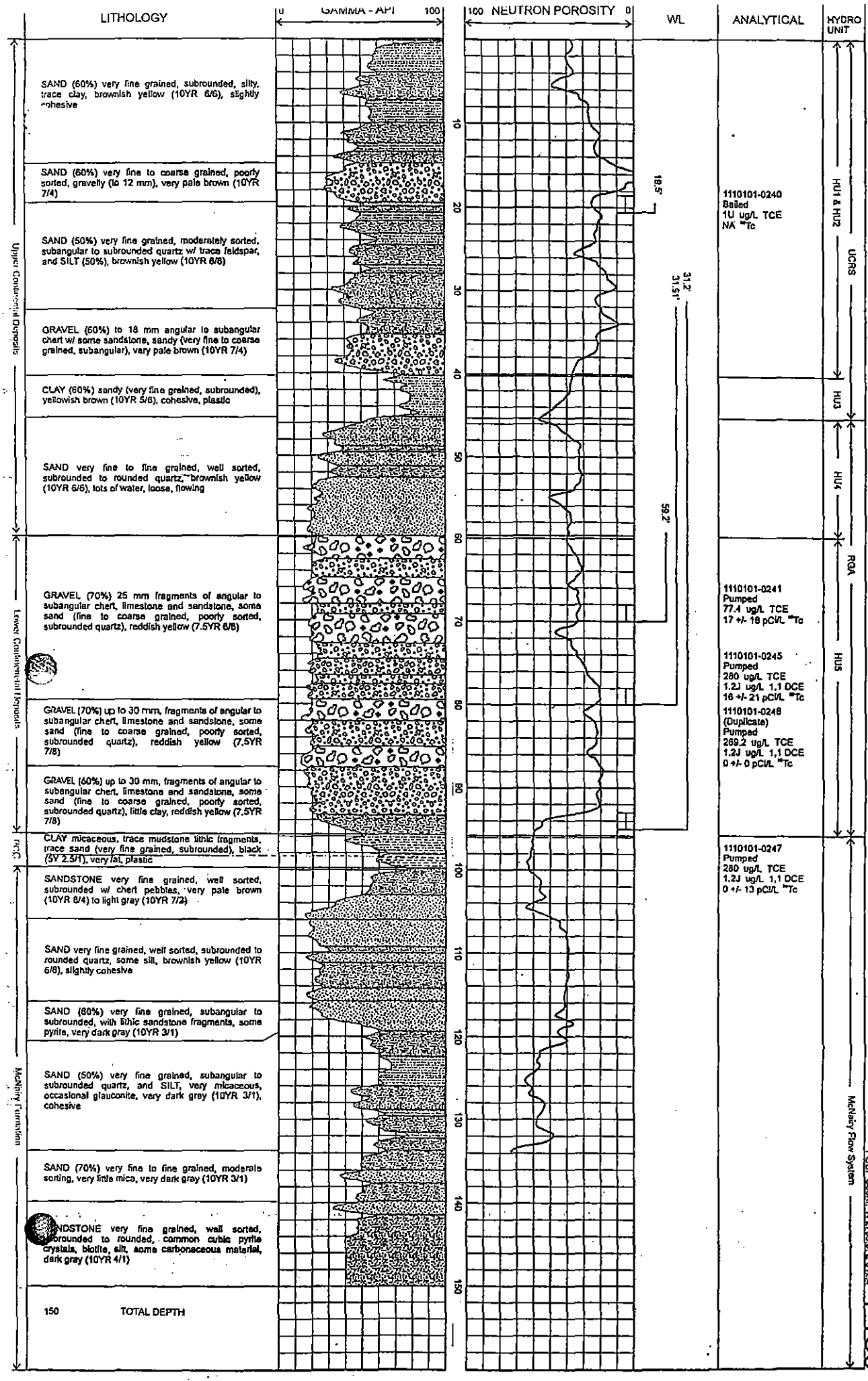

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
T (80%) little clay increasing w/ depth, occasional onite staining, pale yellow (2.5Y 7/4) to yellowish brown (2.5Y 6/4)
SAND (60%) very fine grained, moderate to poorly sorted, well rounded to subrounded, clayey, occasional gravel to 3 mm, yellow (10YR 8/8) to yellow brown (10YR 5/4)
SAND (60%) medium grained, poorly sorted, moderately cemented, some clay, trace gravel (3 to 25 mm), yellow (10YR 8/8) to yellow brown (10YR 5/4)
GRAVEL (80%) 3 to 15 mm chert, little sand (medium to fine grained, poorly sorted, subrounded), trace clay, iron staining, yellowish brown (10YR 5/8) to yellow (10YR 8/8)
CLAY silty, iron staining, yellowish brown (10YR 5/8), firm, homogeneous
SAND fine to medium grained, poorly sorted, predominantly subrounded w/ occasional subangular, silty, yellowish brown (10YR 5/8)
GRAVEL 10 to 25 mm, sandy (fine grained, clear quartz), yellowish brown (10YR 5/8) to brownish yellow (10YR 6/6) to strong brown (7.5YR 5/8)
GRAVEL 10 to 50 mm chert w/ conchoidal fractures, sandy, yellowish brown (10YR 5/8) to brownish yellow (10YR 6/6) to strong brown (7.5YR 5/8)
AVEL (95%) 3 to 20 mm chert, trace sand (fine grained quartz), yellowish brown (10YR 5/8) to brownish yellow (10YR 6/6) to strong brown (7.5YR 5/8)
SAND (60%) coarse grained, subrounded to angular, gravelly (2 to 4 mm chert), iron staining, brownish yellow (10YR 6/6)
CLAY trace sand (quartz), occasional 2 mm gravel, very dark gray (10YR 3/1), firm, homogeneous
CLAY (90%) trace gravel (2 to 4 mm, iron stained chert), very dark gray (7.5YR N3/0) to gray (7.5YR 5/0), soft to firm
CLAY (60%) sandy (fine to very fine grained, poorly sorted, subangular, clear quartz), trace gravel (2 to 4 mm), gray (7.5YR 5/0), soft
GRAVEL (60%) sandy (medium to fine grained, poorly sorted, subrounded, well-cemented w/ pyrite), light gray (5YR 7/1) to reddish yellow (5YR 7/8)
SAND (90%) very fine to fine grained, moderately sorted, subrounded, trace silt, white (10YR 8/2)
SAND (95%) very fine to fine grained, moderately sorted, subrounded, trace gravel (3 to 10 mm, iron stained), dark yellowish brown (10YR 4/4), hard to very firm
SAND (60%) very fine to fine grained, moderately sorted, subrounded, clayey, light gray (10YR 8/1)
AND (50%) fine to very fine grained, moderate to poorly sorted, subrounded and CLAY (50%), trace lignite, gray (5YR 7/1)
CLAY (70%) some sand (fine to very fine grained, moderate to poorly sorted, subrounded), trace pyrite, gray (5YR 7/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
38.44'
39.45'
42.84'
70.5'
70.45'
HU1 & HU2
UCRS
HU3
HU4
HU5
RGA
McNairy Flow System
1110101-0735
Pumped
1U ug/L TCE
0 +/- 0 pCi/L 99Tc
1110101-0738
Pumped
70 ug/L TCE
8 +/- 25 pCi/L 99Tc
1110101-0737
Bailed
70.8 ug/L TCE.
NA 99Tc
1110101-0738
(Duplicate)
Pumped
60.1 ug/L TCE
3 +/- 58 pCi/L 99Tc
1110101-0749
Bailed
5U ug/L TCE
NA 99Tc
1110101-0750
Bailed
5U ug/L TCE
NA 99Tc
Elevation: 368.28
PGDP Coord: N 3429.6, E 3590.3
P4B5

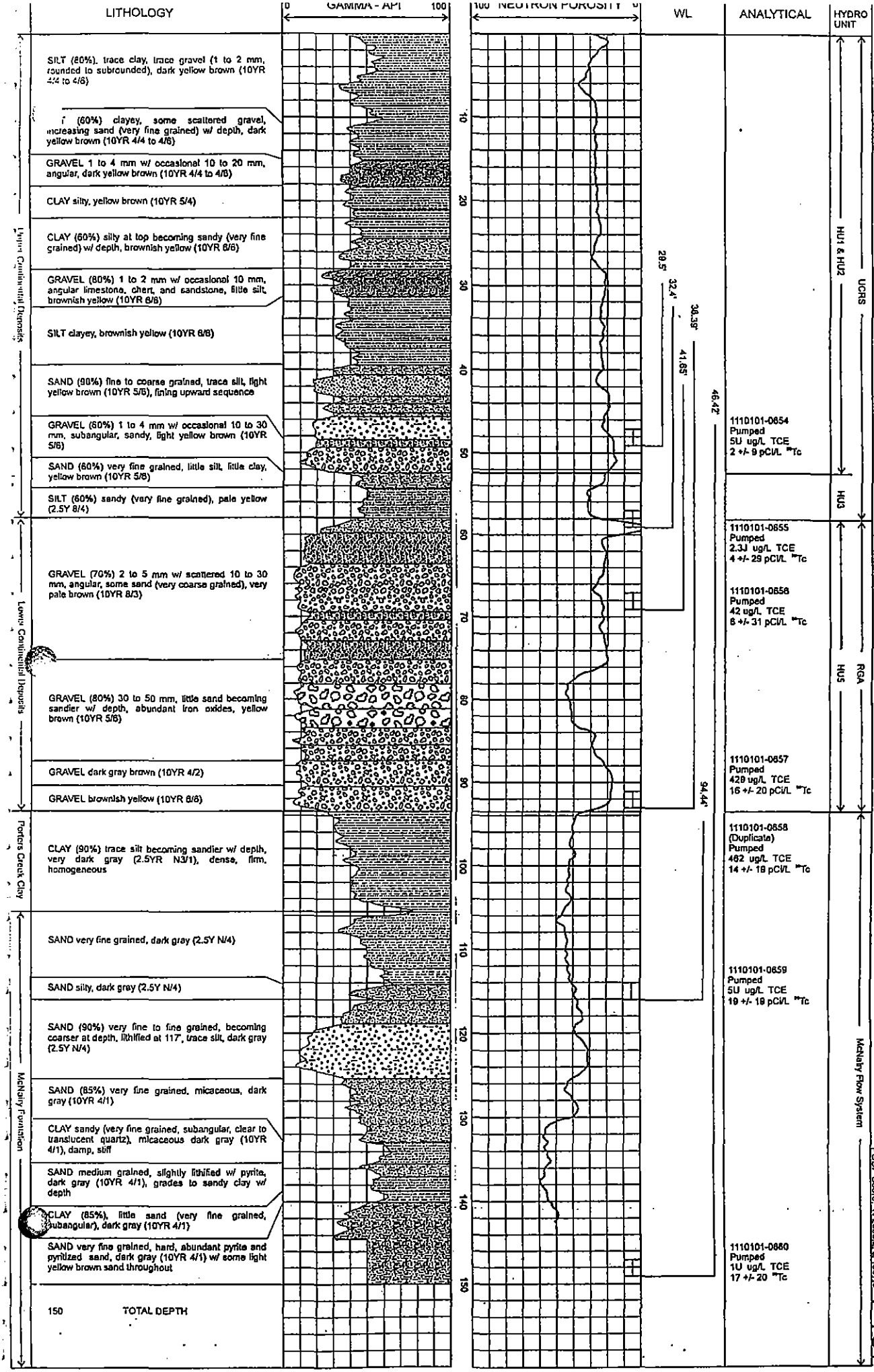

LITHOLOGY
WL
ANALYTICAL
HYDRO UNIT
CLAY (80%) little silt, occasional limonite staining, light gray (10YR 7/1) mottled w/ brownish yellow (10YR 6/6), firm
AY (70%) some silt, occasional biotite / minerals, pebbles to 2 mm, sand (fine grained, subangular quartz), light gray (10YR 7/1) mottled w/ brownish yellow (10YR 6/6), soft
CLAY (90%) trace silt, occasional quartz grains, brown (7.5YR 5/6), firm, homogeneous
CLAY (60%) silty, light brown (7.5YR 5/4)
CLAY (80%) little silt, yellowish red (5YR 5/6), firm, homogeneous
CLAY (95%) trace sand, strong brown (7.5YR 5/6), firm, very homogeneous
SAND (80%) very fine grained, moderately sorted, subrounded, clear, little clay, yellow (10YR 7/6), soft
SAND (90%) very fine grained, well sorted, subrounded, clear, little clay, yellow (10YR 7/8), soft
SAND (60%) coarse to fine grained, moderate to poorly sorted, predominantly subrounded w/ occasional subangular, gravelly (3 to 6 mm, angular chert), brownish yellow (10YR 6/6)
GRAVEL 20 to 30 mm, rounded chert, sandy, (coarse to medium grained, moderately sorted, subrounded w/ occasional rounded), yellowish brown (10YR 5/8)
GRAVEL (80%) 10 to 40 mm, rounded chert, little sand (coarse grained, poorly sorted, subrounded w/ occasional subangular, poorly cemented), yellowish brown (10YR 5/8)
RAVEL (60%) 2 to 10 mm, rounded chert, sandy oarse grained, poorly sorted, subrounded w/ ccasional subangular, poorly cemented), yellowish brown (10YR 5/8)
GRAVEL (50%) 2 to 10 mm, rounded chert and SAND (50%) very coarse to coarse grained, moderately sorted, well rounded, unconsolidated, yellowish brown (10YR 5/8)
GRAVEL (70%) 2 to 10 mm, rounded chert, some sand (very coarse to coarse grained, moderately sorted, well rounded w/ occasional subangular, quartz), unconsolidated), yellowish brown (10YR 5/8)
CLAY silty, trace sand, brownish yellow (10YR 6/6), soft
SAND (80%) increasing w/ depth, very fine grained, moderate to well sorted, little clay, white(10YR 8/2)
CLAY (60%) sandy (very fine grained, clear quartz), trace mica, gray (10YR 6/1) to white (10YR 8/2), soft
CLAY (80%) little sand (very fine grained, clear quartz), gray (10YR 6/1)
CLAY (95%) trace sand, micaceous, dark gray (10YR 4/1), firm, homogeneous alternating w/ CLAY (60%) sandy (very fine grained, poorly sorted, subangular, clear quartz), gray (10YR 6/1), soft
CLAY (60%) sandy (very fine grained, poorly sorted, subangular, clear quartz), abundant black carbonaceous material, micaceous, gray (10YR 5/1)
CLAY (60%) sandy (very fine grained, poorly sorted, subangular, clear quartz), gray (10YR 6/1), soft
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
36.5'
68.3'
78.31'
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
1110101-0756
Pumped
2.4J ug/L TCE
13 +/- 21 pCi/L 99Tc
1110101-0757
Pumped
5.5 ug/L TCE
53.2J ug/L cis DCE
0.3J ug/L carbon tet
10 +/- 24 pCi/L 99Tc
1110101-0758
Pumped
2.7J ug/L TCE
16 +/- 19 pCi/L 99Tc
Elevation: 365.1
PGDP Coord: N 3124.0, W 1030.1
P4C2

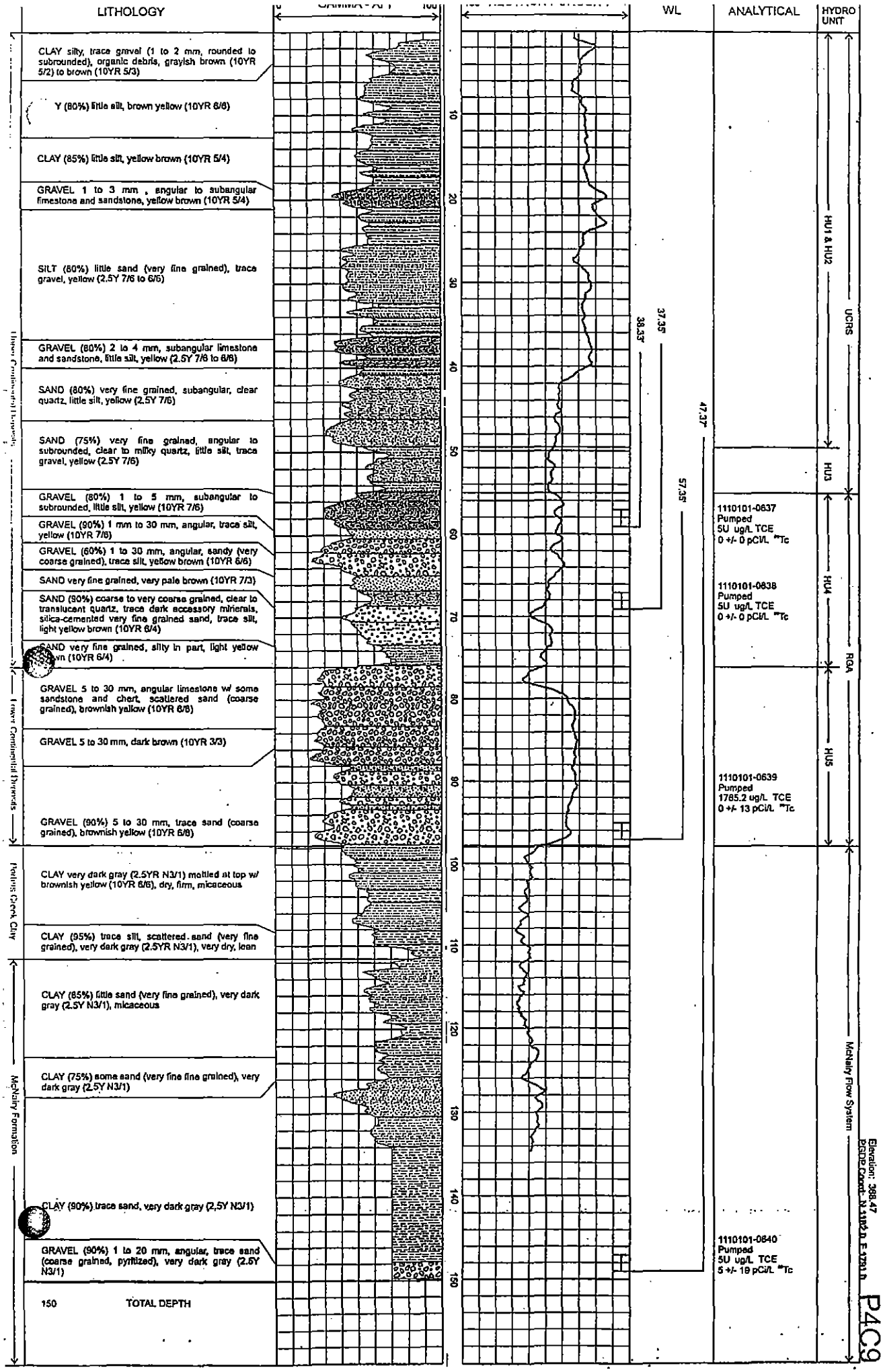
LITHOLOGY	WL	ANALYTICAL	HYDRO UNIT
SAND (60%) very fine grained, subrounded, silty, brownish yellow (10YR 6/6), slightly cohesive			HU1 & HU2 — UCRS
SAND (70%) very fine to fine grained, subrounded, some silt, brownish yellow (10YR 6/6)			
SAND (50%) very fine to fine grained, subrounded to subangular quartz and SILT (50%), brownish yellow (10YR 6/6)			
GRAVEL (60%) to 12 mm, sandy (very fine to coarse grained, poorly sorted, subrounded), yellow brown (10YR 5/4)	36.35'		
SAND (60%) very fine to medium grained, poorly sorted, subangular to subrounded, silty, yellow brown (10YR 5/4), cohesive	39.65'		
CLAY sandy (very fine grained, subangular quartz), dark yellowish brown (10YR 4/6), slightly plastic, cohesive			HU3
SAND (60%) very fine grained, subangular quartz, clayey, yellowish brown (10YR 5/6), slightly plastic, cohesive	59.75'		HU4
GRAVEL (50%) up to 36 mm, angular to subrounded chert, limestone and sandstone, and SAND very fine grained subrounded quartz, reddish yellow (7.5YR 6/6)		1110101-0266 Pumped 5U mg/L TCE 14 +/- 24 pCi/L ^{99}Tc	RGA
GRAVEL (50%) up to 36 mm, subrounded to rounded chert, limestone and sandstone, and SAND very fine grained subrounded quartz, (7.5YR 6/8)	72.16'	1110101-0267 Pumped 5U mg/L TCE 0 +/- 0 pCi/L ^{99}Tc	HU5
GRAVEL (60%) up to 18 mm, rounded chert w/ occasional sandstone, sandy (very fine to coarse grained, subangular to subrounded quartz), reddish yellow (7.5YR 6/6)		1110101-0268 Pumped 26.2 mg/L TCE 0 +/- 0 pCi/L ^{99}Tc	
GRAVEL (50%) up to 18 mm, rounded chert w/ occasional sandstone and SAND (50%) very fine to coarse grained, subangular to subrounded, reddish yellow (7.5YR 6/6)	89.51'		
SILT (65%) sandy, some iron staining, micaceous, light yellowish brown (10YR 6/4) to brown (10YR 5/3), soft			McNairy Flow System
SILT clayey, micaceous, trace sand (very fine grained, subrounded), very dark gray (7.5YR 3/1), soft, moderate to low plasticity			
GRAVEL (80%) 3 to 6 mm, angular to subangular chert, little sand (very coarse grained chert w/ some quartz), yellowish brown (10YR 5/8)		1110101-0269 Pumped 7.7 ug/L TCE 0 +/- 0 pCi/L ^{99}Tc	
CLAY silty, scattered sand (very fine w/ occasional fine grained, subrounded), mica, very dark gray (10YR 3/1), firm, moist, high plasticity, sticky			
SANDSTONE fine grained, well sorted, subrounded, well cemented w/ pyrite, common pyrite nodules, carbonaceous laminations, lignitic wood fragments, some replaced w/ pyrite, dark gray (10YR 4/1)			
SAND (80%) fine grained, well sorted, subrounded to rounded quartz w/ some black accessory minerals, scattered chert, occasional coarse grained sand, little silt, dark gray (10YR 4/1)		1110101-0270 Pumped 5U ug/L TCE NA ^{99}Tc	
151 TOTAL DEPTH			

Elevation: 370.83
PGDP Coord: N 39742.W 293.5

P4C4


LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SAND (60%) very fine grained, subrounded, silty, trace clay, brownish yellow (10YR 6/6), slightly cohesive
SAND (60%) very fine to coarse grained, poorly sorted, gravelly (to 12 mm), very pale brown (10YR 7/4)
SAND (50%) very fine grained, moderately sorted, subangular to subrounded quartz w/ trace feldspar, and SILT (50%), brownish yellow (10YR 6/6)
GRAVEL (60%) to 18 mm angular to subangular chert w/ some sandstone, sandy (very fine to coarse grained, subangular), very pale brown (10YR 7/4)
CLAY (60%) sandy (very fine grained, subrounded), yellowish brown (10YR 5/8), cohesive, plastic
SAND very fine to fine grained, well sorted, subrounded to rounded quartz, brownish yellow (10YR 6/6), lots of water, loose, flowing
GRAVEL (70%) 25 mm fragments of angular to subangular chert, limestone and sandstone, some sand (fine to coarse grained, poorly sorted, subrounded quartz), reddish yellow (7.5YR 6/8)
GRAVEL (70%) up to 30 mm, fragments of angular to subangular chert, limestone and sandstone, some sand (fine to coarse grained, poorly sorted, subrounded quartz), reddish yellow (7.5YR 7/8)
GRAVEL (60%) up to 30 mm, fragments of angular to subangular chert, limestone and sandstone, some sand (fine to coarse grained, poorly sorted, subrounded quartz), little clay, reddish yellow (7.5YR 7/8)
CLAY micaceous, trace mudstone lithic fragments, trace sand (very fine grained, subrounded), black (5Y 2.5/1), very fat, plastic
SANDSTONE very fine grained, well sorted, subrounded w/ chert pebbles, very pale brown (10YR 8/4) to light gray (10YR 7/2)
SAND very fine grained, well sorted, subrounded to rounded quartz, some silt, brownish yellow (10YR 6/8), slightly cohesive
SAND (60%) very fine grained, subangular to subrounded, with lithic sandstone fragments, some pyrite, very dark gray (10YR 3/1)
SAND (50%) very fine grained, subangular to subrounded quartz, and SILT, very micaceous, occasional glauconite, very dark gray (10YR 3/1), cohesive
SAND (70%) very fine to fine grained, moderate sorting, very little mica, very dark gray (10YR 3/1)
SANDSTONE very fine grained, well sorted, subrounded to rounded, common cubic pyrite crystals, biotite, silt, some carboneceous material, dark gray (10YR 4/1)
150 TOTAL DEPTH
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
18.5'
31.2'
31.51'
59.2'
1110101-0240
Bailed
1U ug/L TCE
NA pCi/L 99Tc
1110101-0241
Pumped
77.4 ug/L TCE
17 +/- 18 pCi/L 99Tc
1110101-0245
Pumped
280 ug/L TCE
1.2J ug/L 1,1 DCE
16 +/- 21 pCi/L 99Tc
1110101-0246
(Duplicate)
Pumped
269.2 ug/L TCE
1.2J ug/L 1,1 DCE
0 +/- 0 pCi/L 99Tc
1110101-0247
Pumped
280 ug/L TCE
1.2J ug/L 1,1 DCE
0 +/- 13 pCi/L 99Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
Elevation: 362.84
PGDP Coord. N 27535, E 9124
P4C5


LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SILT (80%), trace clay, trace gravel (1 to 2 mm, rounded to subrounded), dark yellow brown (10YR 4/4 to 4/6)
(60%) clayey, some scattered gravel, increasing sand (very fine grained) w/ depth, dark yellow brown (10YR 4/4 to 4/6)
GRAVEL 1 to 4 mm w/ occasional 10 to 20 mm, angular, dark yellow brown (10YR 4/4 to 4/6)
CLAY silty, yellow brown (10YR 5/4)
CLAY (60%) silty at top becoming sandy (very fine grained) w/ depth, brownish yellow (10YR 6/6)
GRAVEL (80%) 1 to 2 mm w/ occasional 10 mm, angular limestone, chert, and sandstone, little silt, brownish yellow (10YR 6/6)
SILT clayey, brownish yellow (10YR 6/6)
SAND (90%) fine to coarse grained, trace silt, light yellow brown (10YR 5/6), fining upward sequence
GRAVEL (60%) 1 to 4 mm w/ occasional 10 to 30 mm, subangular, sandy, light yellow brown (10YR 5/6)
SAND (60%) very fine grained, little silt, little clay, yellow brown (10YR 5/6)
SILT (60%) sandy (very fine grained), pale yellow (2.5Y 8/4)
Upper Continental Deposits
GRAVEL (70%) 2 to 5 mm w/ scattered 10 to 30 mm, angular, some sand (very coarse grained), very pale brown (10YR 8/3)
GRAVEL (80%) 30 to 50 mm, little sand becoming sandier w/ depth, abundant iron oxides, yellow brown (10YR 5/6)
GRAVEL dark gray brown (10YR 4/2)
GRAVEL brownish yellow (10YR 6/6)
Lower Continental Deposits
CLAY (90%) trace silt becoming sandier w/ depth, very dark gray (2.5YR N3/1), dense, firm, homogeneous
Porters Creek Clay
SAND very fine grained, dark gray (2.5Y N/4)
SAND silty, dark gray (2.5Y N/4)
SAND (90%) very fine to fine grained, becoming coarser at depth, lithified at 117', trace silt, dark gray (2.5Y N/4)
SAND (85%) very fine grained, micaceous, dark gray (10YR 4/1)
CLAY sandy (very fine grained, subangular, clear to translucent quartz), micaceous dark gray (10YR 4/1), damp, stiff
SAND medium grained, slightly lithified w/ pyrite, dark gray (10YR 4/1), grades to sandy clay w/ depth
CLAY (85%), little sand (very fine grained, subangular), dark gray (10YR 4/1)
SAND very fine grained, hard, abundant pyrite and pyritized sand, dark gray (10YR 4/1) w/ some light yellow brown sand throughout
McNairy Formation
150 TOTAL DEPTH
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
28.5'
32.4'
38.39'
41.65'
46.42'
94.44'
1110101-0654
Pumped
5U ug/L TCE
2 +/- 9 pCi/L 99Tc
1110101-0655
Pumped
2.3J ug/L TCE
4 +/- 29 pCi/L 99Tc
1110101-0656
Pumped
42 ug/L TCE
6 +/- 31 pCi/L 99Tc
1110101-0657
Pumped
429 ug/L TCE
16 +/- 20 pCi/L 99Tc
1110101-0658
(Duplicate)
Pumped
462 ug/L TCE
14 +/- 18 pCi/L 99Tc
1110101-0659
Pumped
5U ug/L TCE
19 +/- 19 pCi/L 99Tc
1110101-0660
Pumped
1U ug/L TCE
17 +/- 20 99Tc
HU1 & HU2
UCRS
HU3
HU5
RGA
McNairy Flow System
Elevation: 368.78
PGDP Coord: N 2098.2, E 1357.8
P4C7


LITHOLOGY
WL
ANALYTICAL
HYDRO UNIT
CLAY silty, trace gravel (1 to 2 mm, rounded to subrounded), organic debris, grayish brown (10YR 5/2) to brown (10YR 5/3)
Y (80%) little silt, brown yellow (10YR 6/6)
CLAY (85%) little silt, yellow brown (10YR 5/4)
GRAVEL 1 to 3 mm , angular to subangular limestone and sandstone, yellow brown (10YR 5/4)
SILT (80%) little sand (very fine grained), trace gravel, yellow (2.5Y 7/6 to 6/6)
GRAVEL (80%) 2 to 4 mm, subangular limestone and sandstone, little silt, yellow (2.5Y 7/6 to 6/6)
SAND (80%) very fine grained, subangular, clear quartz, little silt, yellow (2.5Y 7/6)
SAND (75%) very fine grained, angular to subrounded, clear to milky quartz, little silt, trace gravel, yellow (2.5Y 7/6)
GRAVEL (80%) 1 to 5 mm, subangular to subrounded, little silt, yellow (10YR 7/6)
GRAVEL (90%) 1 mm to 30 mm, angular, trace silt, yellow (10YR 7/6)
GRAVEL (60%) 1 to 30 mm, angular, sandy (very coarse grained), trace silt, yellow brown (10YR 6/6)
SAND very fine grained, very pale brown (10YR 7/3)
SAND (90%) coarse to very coarse grained, clear to translucent quartz, trace dark accessory minerals, silica-cemented very fine grained sand, trace silt, light yellow brown (10YR 6/4)
SAND very fine grained, silty in part, light yellow brown (10YR 6/4)
GRAVEL 5 to 30 mm, angular limestone w/ some sandstone and chert, scattered sand (coarse grained), brownish yellow (10YR 6/6)
GRAVEL 5 to 30 mm, dark brown (10YR 3/3)
GRAVEL (90%) 5 to 30 mm, trace sand (coarse grained), brownish yellow (10YR 6/6)
CLAY very dark gray (2.5YR N3/1) mottled at top w/ brownish yellow (10YR 6/6), dry, firm, micaceous
CLAY (95%) trace silt, scattered sand (very fine grained), very dark gray (2.5YR N3/1), very dry, lean
CLAY (85%) little sand (very fine grained), very dark gray (2.5Y N3/1), micaceous
CLAY (75%) some sand (very fine fine grained), very dark gray (2.5Y N3/1)
CLAY (90%) trace sand, very dark gray (2.5Y N3/1)
GRAVEL (90%) 1 to 20 mm, angular, trace sand (coarse grained, pyritized), very dark gray (2.5Y N3/1)
150 TOTAL DEPTH
38.33'
37.35'
47.37'
57.35'
1110101-0637
Pumped
5U ug/L TCE
0 +/- 0 pCi/L 99Tc
1110101-0638
Pumped
5U ug/L TCE
0 +/- 0 pCi/L 99Tc
1110101-0639
Pumped
1765.2 ug/L TCE
0 +/- 13 pCi/L 99Tc
1110101-0640
Pumped
5U ug/L TCE
5 +/- 18 pCi/L 99Tc
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Upper Continental Recharge
Lower Continental Recharge
Henry Creek Clay
McNairy Formation
Elevation: 388.47
P4C9

LITHOLOGY	WL	ANALYTICAL	HYDRO UNIT
CLAY (60%) silty, trace sand (very fine grained quartz), brownish yellow (10YR 7/6), soft			HU1 & HU2 — UCRS
GRAVEL (50%) 1 to 10 mm, angular chert, sandy (very fine to fine grained, poorly sorted, clear to very brown quartz), trace silt, yellowish brown (10YR 5/4), gravel size increases to 5 to 10 mm at base			
CLAY (80%) little silt, trace sand (very fine grained, well sorted clear quartz), light gray (10YR 7/2) mottled w/ yellow (10YR 7/8)			
CLAY (60%) sandy (very fine grained, well sorted clear quartz), light gray (10YR 7/2) mottled w/ yellow (10YR 7/8)			
GRAVEL 5 mm, rounded, sandy to silty matrix, yellow brown (10YR 5/8) to brown yellow (10YR 6/6)			
GRAVEL (70%) 2 to 5 mm, angular chert, sandy, trace silt, multicolor			
GRAVEL (80%) 10 to 15 mm, angular chert w/ occasional sandstone, little sand, light gray (10YR 7/1) to yellowish red (5YR 5/8) to gray (10YR 8/2)			
CLAY (80%) trace gravel (20 mm), light gray (2.5Y 7/0), firm, homogeneous			HU3
GRAVEL (90%) 10 to 15 mm, angular chert, trace sand, light gray (7.5YR N7/0)			HU5 — RGA
GRAVEL 2 to 5 mm, subangular to subrounded, chert, light gray (7.5YR N7/0)			
GRAVEL (90%) 10 mm to 20 mm, angular chert, some fractures indicating larger pieces, trace sand, light gray (7.5YR N7/0)			
GRAVEL (90%) 2 to 20 mm, angular chert, some fractures indicating larger pieces, trace sand, light gray (7.5YR N7/0)			
GRAVEL (60%) 2 to 20 mm, angular chert, sandy (very fine to very coarse grained, moderately sorted, subrounded, light gray (5YR 7/1)			
CLAY light olive brown (2.5Y 5/4) mottled w/ light brownish gray (10YR 6/2), firm, homogeneous, iron staining			McNairy Flow System
CLAY (95%) trace sand (light gray quartz), dark gray (2.5Y N4/0), firm homogeneous			
CLAY (90%) trace silt, dark gray (2.5Y N4/0), increasing softness			
CLAY (70%) some silt, abundant biotite w/ some lignitic material, dark gray (2.5Y N4/0), soft			
CLAY (60%) silty, decreasing biotite, occasional sand (quartz), dark gray (2.5Y N4/0) increasing softness			
CLAY (60%) sandy (fine to very fine grained, moderately sorted), trace biotite, trace pyrite, gray (2.5Y N5/0), soft			
CLAY (80%) little sand (fine to very fine grained, moderately sorted), trace biotite, trace pyrite, gray (2.5Y N5/0), soft			
GRAVEL (60%) 8 to 10 mm sandstone, sandy (fine to very fine grained, pyritized), gray (2.5Y N5/0), hard to very firm			
CLAY (60%) sandy (very fine to fine grained, gray to clear), abundant mica, gray (10YR 6/1), soft			
150 TOTAL DEPTH			

Upper Continental Deposits

Lower Continental Deposits

Porters Creek Clay

McNairy Formation

27.5'

32.7'

68.72'

70.23'

80.42'

1110101-0751
Pumped
5U ug/L TCE
4 +/- 3 pCi/L ^{99}Tc

1110101-0753
Pumped
5U ug/L TCE
0 +/- 0 pCi/L ^{99}Tc

1110101-0752
Pumped
5U ug/L TCE
0 +/-0 pCi/L ^{99}Tc

1110101-0754
Pumped
5U ug/L TCE
9 +/- 42 pCi/L ^{99}Tc

1110101-0755
Pumped
5U ug/L TCE
3 +/- 70 pCi/L ^{99}Tc

Elevation: 357.11
PGDP Coord: N 592,8 E 2820.1

P4C10

Elevation: 380.14
POOP Coord: N 1413.0, W 1915.1

P4D4

LITHOLOGY		WL	ANALYTICAL	HYDRO UNIT
GRAVEL (75%), 3 to 5 mm, little sand (very fine grained, well sorted, subrounded, white (10YR 8/1)), little clay, black (10YR 2/1) and yellowish brown (10YR 5/8)				
CLAY (80%) little silt, occasional sand (very fine grained, subrounded to subangular, clear), light gray (10Yr 7/2) mottled brownish yellow (10YR 6/8) w/ iron staining, soft				
CLAY (80%), little sand (very fine to fine grained, poorly sorted, subrounded, occasional subangular, multi-colored, clear to browish yellow (10YR 6/8) to red (2.5YR 5/8) to black (2.5YR 2.5/0)), light gray (10YR 7/2)				HU1 & HU2
CLAY (60%), sandy (very fine to fine grained, poorly sorted, subrounded, occasional subangular, multi-colored, clear to browish yellow (10YR 6/8) to red (2.5YR 5/8) to black (2.5YR 2.5/0)), trace garavel, light gray (10YR 7/2)				UCRS
SAND (60%) very fine grained, subrounded to subangular, multicolor, clayey, brownish yellow (10YR 6/6), soft				
CLAY (60%) sandy (very fine to medium grained, poorly sorted, subangular to subrounded), silty in part, brownish yellow (10YR 6/8), soft		47.22'		HU3
GRAVEL (60%) 5 to 10 mm chert, sandy (fine grained w/ occasional medium grained, poorly sorted, subrounded to subangular), strong brown (7.5YR 5/8) to reddish yellow (7.5YR 6/6), unconsolidated		50.41' 58.6' 60.05'		HU4
GRAVEL 5 to 20 mm chert, sandy (fine grained w/ occasional medium grained, poorly sorted, subrounded to subangular), strong brown (7.5YR 6) to reddish yellow (7.5YR 6/6), unconsolidated			1110101-0695 Pumped 7.2 ug/L TCE 19 +/- 21 pCi/L ^{99}Tc	
GRAVEL 5 to 30 mm chert w/ sandstone, some sand, iron staining, hard, strong brown (7.5YR 5/8), (Note: water color strong brown (7.5YR 4/6))				
GRAVEL 5 to 40 mm, increased sand (fine to medium grained w/ some coarse grained, poorly sorted, subrounded) increased iron staining, reddish yellow (7.5YR 5/6), unconsolidated			1110101-0696 Pumped 33.5 ug/L TCE 16J ug/L cis DCE 17 +/- 21 pCi/L ^{99}Tc	RGA
GRAVEL 5 to 50 mm, some sand (very fine to coarse grained, poorly sorted, subrounded), little silt, red yellow (7.5YR 6/8)			1110101-0697 Pumped 61 ug/L TCE 29J ug/L cis DCE 7 +/- 21 pCi/L ^{99}Tc	HU5
GRAVEL 5 to 50 mm, little sand (fine to coarse grained), little silt, red yellow (7.5YR 6/8)		101.35'		
SILT sandy (very fine grained, well sorted), micaceous, <1 mm laminar bedding, dark gray brown (10YR 4/2), cohesive, non-plastic, occasional zones of iron oxides, drills into chips				
SAND (80%) very fine grained, subrounded, predominantly clear quartz), some dark accessory minerals, little silt, dark gray (5YR 4/1)			1110101-0698 Pumped 3.3J ug/L TCE 0 +/- 0 pCi/L ^{99}Tc	
SILT (80%) little sand (very fine grained, subrounded) dark gray (5YR 4/1), cohesive, slightly plastic				
150 TOTAL DEPTH			1110101-0699 Pumped 5U ug/L TCE 26 +/- 21 pCi/L ^{99}Tc	

Upper Continental Deposits

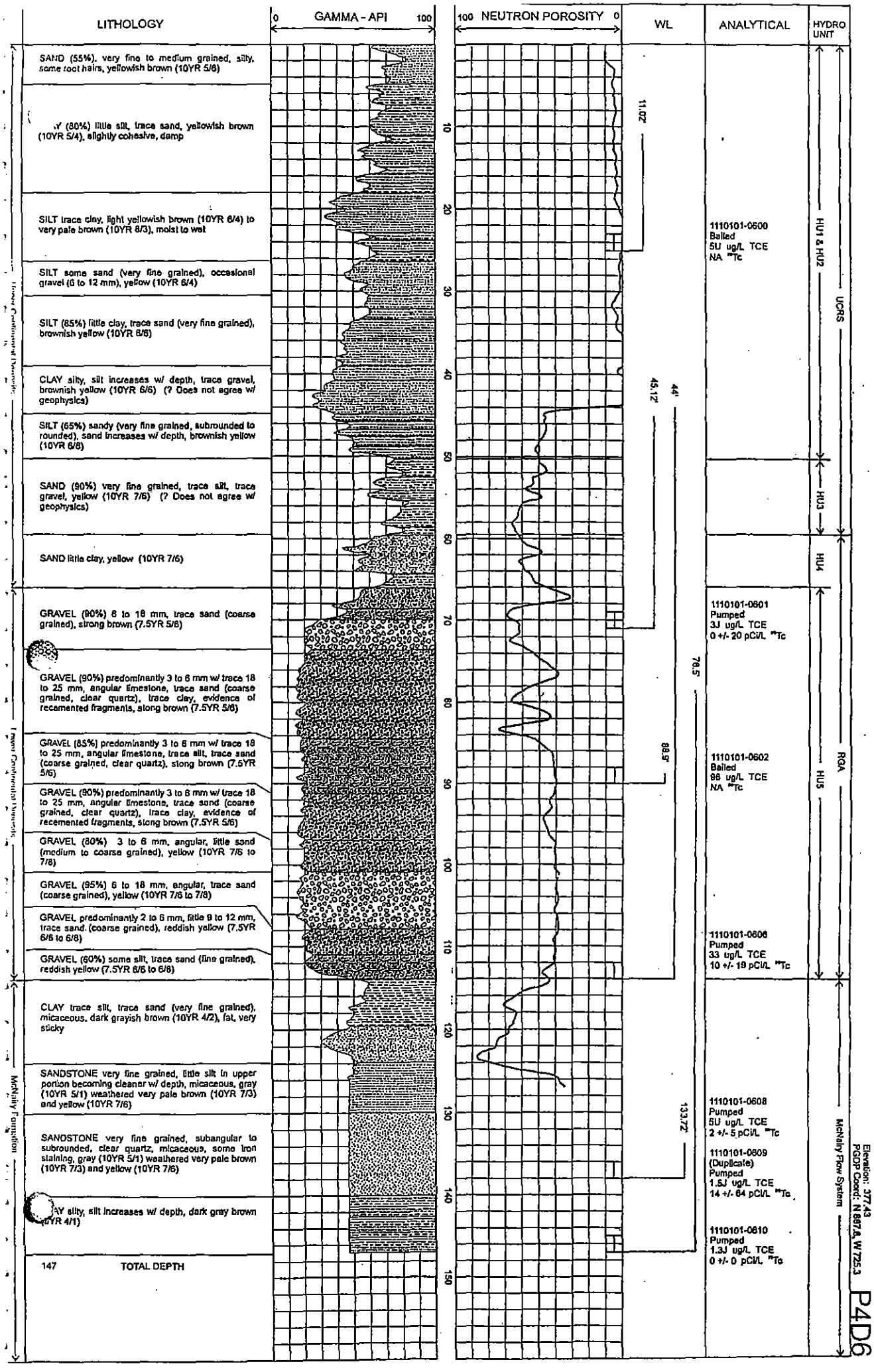
Lower Continental Deposits

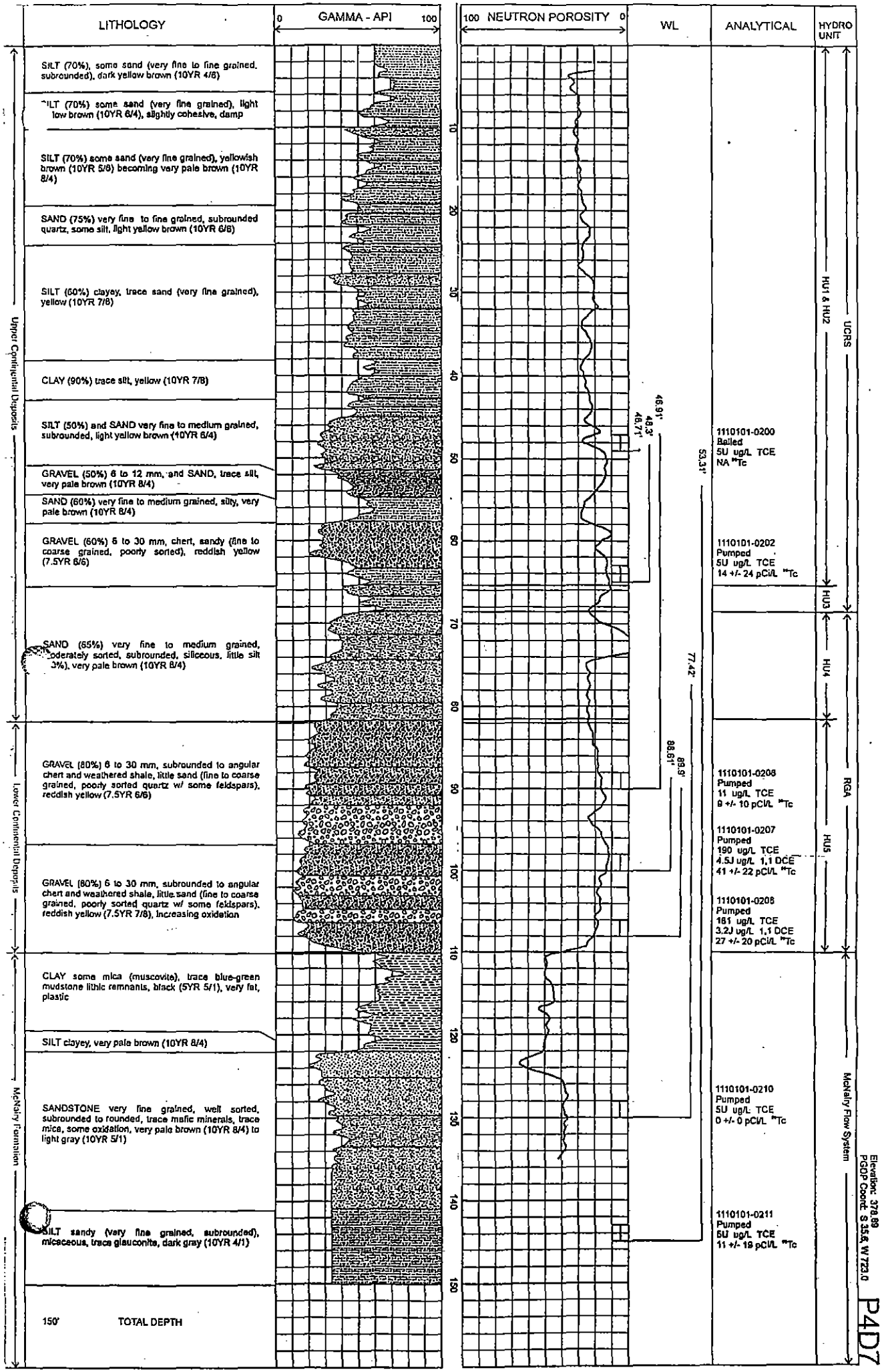
McNairy Formation

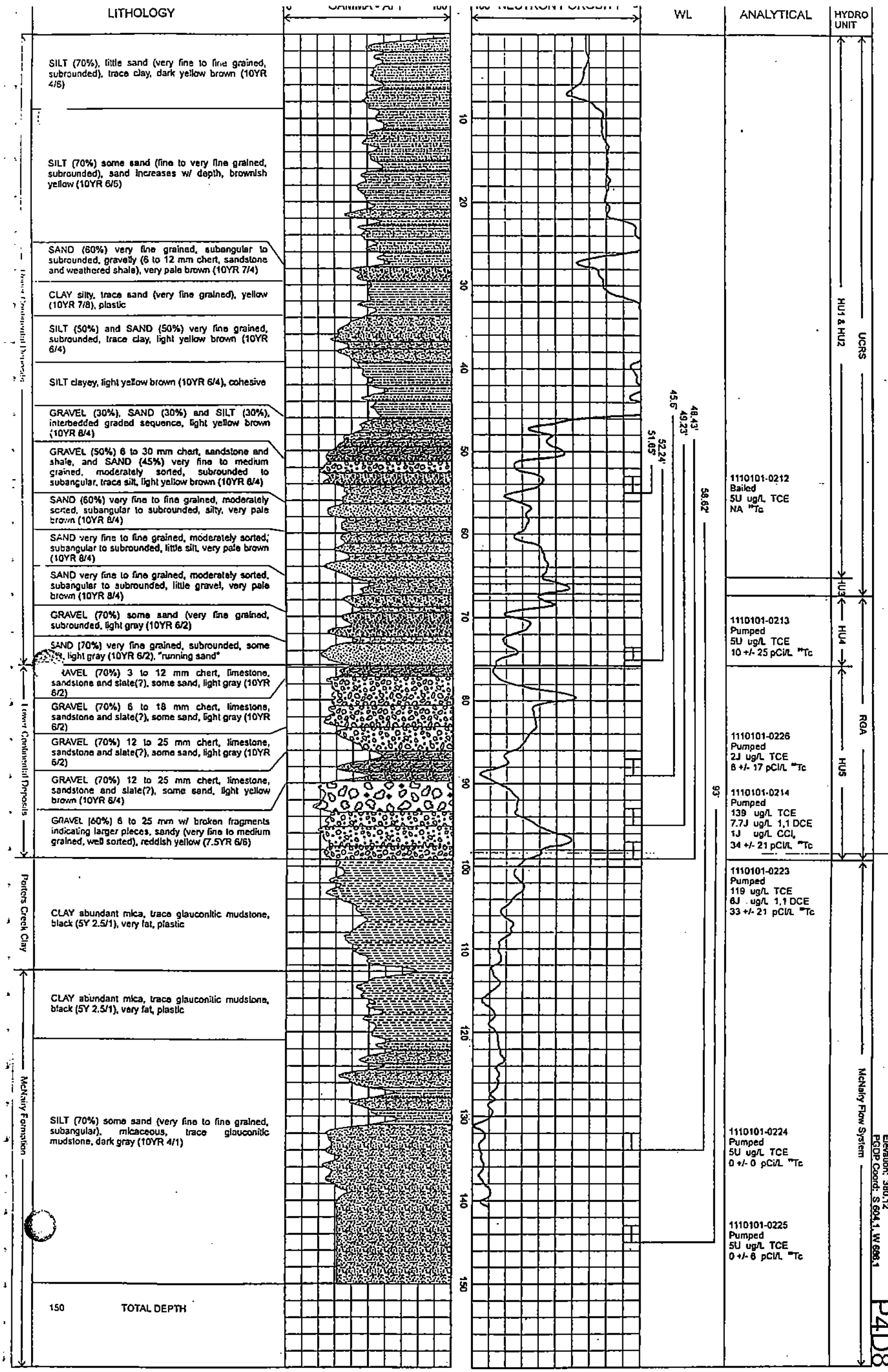
McNairy Flow System

Elevation: 378.57
PGDP Coord: N 1551.1, W 1135.8

P4D5

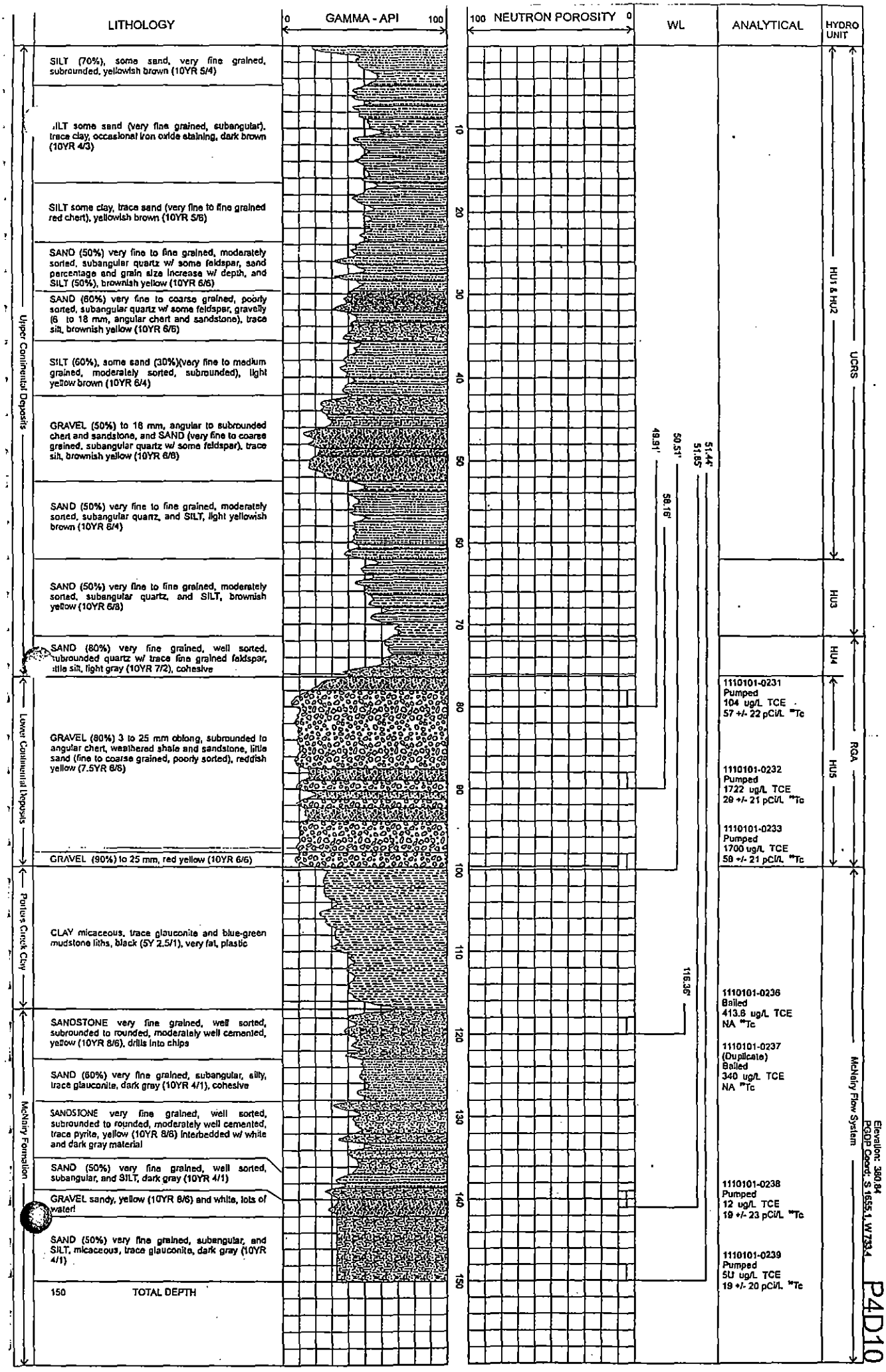

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SAND (55%), very fine to medium grained, silty, some root hairs, yellowish brown (10YR 5/8)
Y (80%) little silt, trace sand, yellowish brown (10YR 5/4), slighly cohesive, damp
SILT trace clay, light yellowish brown (10YR 6/4) to very pale brown (10YR 8/3), moist to wet
SILT some sand (very fine grained), occasional gravel (6 to 12 mm), yellow (10YR 8/4)
SILT (65%) little clay, trace sand (very fine grained), brownish yellow (10YR 6/6)
CLAY silty, silt increases w/ depth, trace gravel, brownish yellow (10YR 6/6) (? Does not agree w/ geophysics)
SILT (65%) sandy (very fine grained, subrounded to rounded), sand increases w/ depth, brownish yellow (10YR 6/6)
SAND (90%) very fine grained, trace silt, trace gravel, yellow (10YR 7/6) (? Does not agree w/ geophysics)
SAND little clay, yellow (10YR 7/6)
GRAVEL (90%) 6 to 18 mm, trace sand (coarse grained), strong brown (7.5YR 5/8)
GRAVEL (90%) predominantly 3 to 6 mm w/ trace 18 to 25 mm, angular limestone, trace sand (coarse grained, clear quartz), trace clay, evidence of recemented fragments, strong brown (7.5YR 5/8)
GRAVEL (85%) predominantly 3 to 6 mm w/ trace 18 to 25 mm, angular limestone, trace silt, trace sand (coarse grained, clear quartz), strong brown (7.5YR 5/6)
GRAVEL (90%) predominantly 3 to 6 mm w/ trace 18 to 25 mm, angular limestone, trace sand (coarse grained, clear quartz), trace clay, evidence of recemented fragments, strong brown (7.5YR 5/6)
GRAVEL (80%) 3 to 6 mm, angular, little sand (medium to coarse grained), yellow (10YR 7/6 to 7/8)
GRAVEL (95%) 6 to 18 mm, angular, trace sand (coarse grained), yellow (10YR 7/6 to 7/8)
GRAVEL predominantly 2 to 6 mm, little 9 to 12 mm, trace sand (coarse grained), reddish yellow (7.5YR 6/6 to 6/8)
GRAVEL (60%) some silt, trace sand (fine grained), reddish yellow (7.5YR 6/6 to 6/8)
CLAY trace silt, trace sand (very fine grained), micaceous, dark grayish brown (10YR 4/2), fat, very sticky
SANDSTONE very fine grained, little silt in upper portion becoming cleaner w/ depth, micaceous, gray (10YR 5/1) weathered very pale brown (10YR 7/3) and yellow (10YR 7/6)
SANDSTONE very fine grained, subangular to subrounded, clear quartz, micaceous, some iron staining, gray (10YR 5/1) weathered very pale brown (10YR 7/3) and yellow (10YR 7/6)
AY silty, silt increases w/ depth, dark gray brown (0YR 4/1)
147 TOTAL DEPTH
11.02'
45.12'
44'
78.5'
89.5'
133.72'
1110101-0600
Bailed
5U ug/L TCE
NA pCi/L Tc
1110101-0601
Pumped
3J ug/L TCE
0 +/- 20 pCi/L Tc
1110101-0602
Bailed
98 ug/L TCE
NA pCi/L Tc
1110101-0606
Pumped
33 ug/L TCE
10 +/- 19 pCi/L Tc
1110101-0608
Pumped
5U ug/L TCE
2 +/- 5 pCi/L Tc
1110101-0609
(Duplicate)
Pumped
1.5J ug/L TCE
14 +/- 64 pCi/L Tc
1110101-0610
Pumped
1.3J ug/L TCE
0 +/- 0 pCi/L Tc
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
Elevation: 377.43
PGDP Coord: N 887.8, W 725.3
P4D6

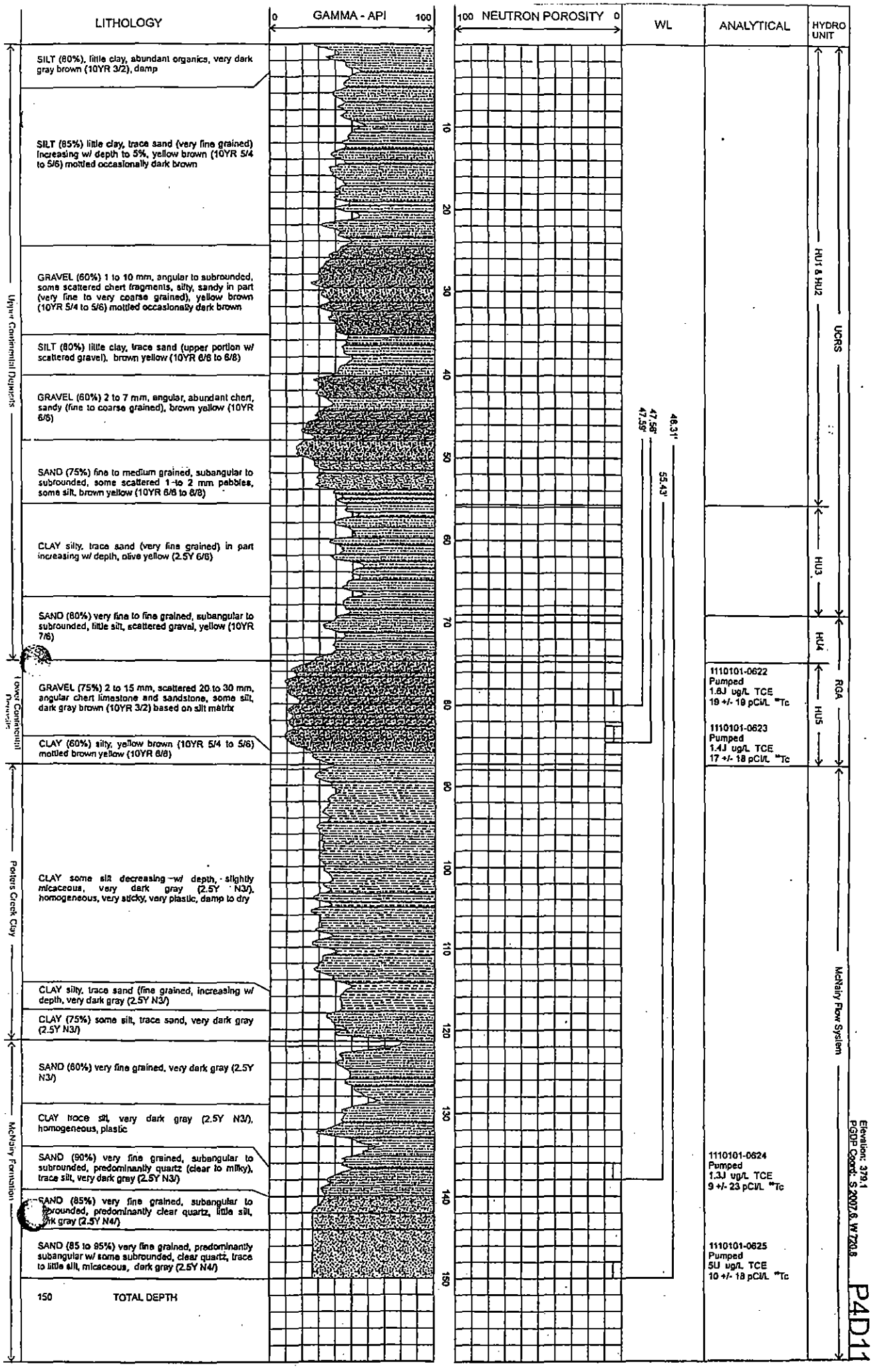

LITHOLOGY
GAMMA - API
0
100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
SILT (70%), some sand (very fine to fine grained, subrounded), dark yellow brown (10YR 4/6)
SILT (70%) some sand (very fine grained), light low brown (10YR 6/4), slightly cohesive, damp
SILT (70%) some sand (very fine grained), yellowish brown (10YR 5/6) becoming very pale brown (10YR 8/4)
SAND (75%) very fine to fine grained, subrounded quartz, some silt, light yellow brown (10YR 6/6)
SILT (60%) clayey, trace sand (very fine grained), yellow (10YR 7/8)
CLAY (90%) trace silt, yellow (10YR 7/8)
SILT (50%) and SAND very fine to medium grained, subrounded, light yellow brown (10YR 6/4)
GRAVEL (50%) 6 to 12 mm, and SAND, trace silt, very pale brown (10YR 8/4)
SAND (60%) very fine to medium grained, silty, very pale brown (10YR 8/4)
GRAVEL (60%) 6 to 30 mm, chert, sandy (fine to coarse grained, poorly sorted), reddish yellow (7.5YR 6/6)
SAND (65%) very fine to medium grained, moderately sorted, subrounded, siliceous, little silt (35%), very pale brown (10YR 8/4)
GRAVEL (80%) 6 to 30 mm, subrounded to angular chert and weathered shale, little sand (fine to coarse grained, poorly sorted quartz w/ some feldspars), reddish yellow (7.5YR 6/6)
GRAVEL (80%) 6 to 30 mm, subrounded to angular chert and weathered shale, little sand (fine to coarse grained, poorly sorted quartz w/ some feldspars), reddish yellow (7.5YR 7/8), increasing oxidation
CLAY some mica (muscovite), trace blue-green mudstone lithic remnants, black (5YR 5/1), very fat, plastic
SILT clayey, very pale brown (10YR 8/4)
SANDSTONE very fine grained, well sorted, subrounded to rounded, trace mafic minerals, trace mica, some oxidation, very pale brown (10YR 8/4) to light gray (10YR 5/1)
SILT sandy (very fine grained, subrounded), micaceous, trace glauconite, dark gray (10YR 4/1)
150' TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
46.91'
48.3'
48.71'
53.31'
77.42'
88.61'
89.9'
1110101-0200
Bailed
5U ug/L TCE
NA *Tc
1110101-0202
Pumped
5U ug/L TCE
14 +/- 24 pCi/L *Tc
1110101-0206
Pumped
11 ug/L TCE
9 +/- 10 pCi/L *Tc
1110101-0207
Pumped
190 ug/L TCE
4.5J ug/L 1,1 DCE
41 +/- 22 pCi/L *Tc
1110101-0208
Pumped
161 ug/L TCE
3.2J ug/L 1,1 DCE
27 +/- 20 pCi/L *Tc
1110101-0210
Pumped
5U ug/L TCE
0 +/- 0 pCi/L *Tc
1110101-0211
Pumped
5U ug/L TCE
11 +/- 19 pCi/L *Tc
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Elevation: 378.89
PGDP Coord: S 35,& W 723.0
P4D7



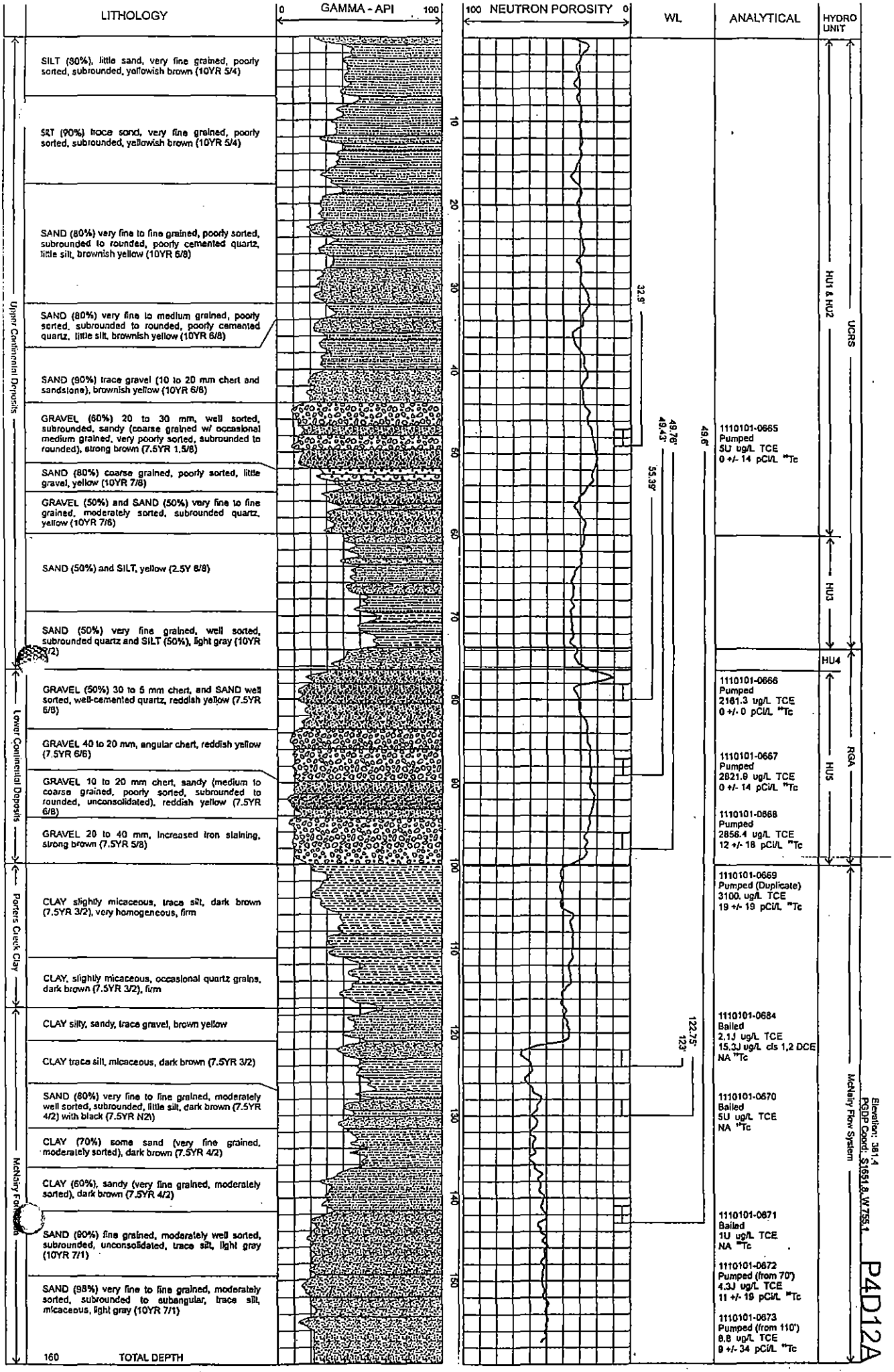
LITHOLOGY
GAMMA - API
100
NEUTRON POROSITY
WL
ANALYTICAL
HYDRO UNIT
SILT (70%), little sand (very fine to fine grained, subrounded), trace clay, dark yellow brown (10YR 4/6)
SILT (70%) some sand (fine to very fine grained, subrounded), sand increases w/ depth, brownish yellow (10YR 6/6)
SAND (60%) very fine grained, subangular to subrounded, gravelly (6 to 12 mm chert, sandstone and weathered shale), very pale brown (10YR 7/4)
CLAY silty, trace sand (very fine grained), yellow (10YR 7/8), plastic
SILT (50%) and SAND (50%) very fine grained, subrounded, trace clay, light yellow brown (10YR 6/4)
SILT clayey, light yellow brown (10YR 6/4), cohesive
GRAVEL (30%), SAND (30%) and SILT (30%), interbedded graded sequence, light yellow brown (10YR 6/4)
GRAVEL (50%) 6 to 30 mm chert, sandstone and shale, and SAND (45%) very fine to medium grained, moderately sorted, subrounded to subangular, trace silt, light yellow brown (10YR 6/4)
SAND (60%) very fine to fine grained, moderately sorted, subangular to subrounded, silty, very pale brown (10YR 8/4)
SAND very fine to fine grained, moderately sorted, subangular to subrounded, little silt, very pale brown (10YR 8/4)
SAND very fine to fine grained, moderately sorted, subangular to subrounded, little gravel, very pale brown (10YR 8/4)
GRAVEL (70%) some sand (very fine grained, subrounded, light gray (10YR 6/2)
SAND (70%) very fine grained, subrounded, some silt, light gray (10YR 6/2), "running sand"
GRAVEL (70%) 3 to 12 mm chert, limestone, sandstone and slate(?), some sand, light gray (10YR 6/2)
GRAVEL (70%) 6 to 18 mm chert, limestone, sandstone and slate(?), some sand, light gray (10YR 6/2)
GRAVEL (70%) 12 to 25 mm chert, limestone, sandstone and slate(?), some sand, light gray (10YR 6/2)
GRAVEL (70%) 12 to 25 mm chert, limestone, sandstone and slate(?), some sand, light yellow brown (10YR 6/4)
GRAVEL (60%) 6 to 25 mm w/ broken fragments indicating larger pieces, sandy (very fine to medium grained, well sorted), reddish yellow (7.5YR 6/6)
CLAY abundant mica, trace glauconitic mudstone, black (5Y 2.5/1), very fat, plastic
CLAY abundant mica, trace glauconitic mudstone, black (5Y 2.5/1), very fat, plastic
SILT (70%) some sand (very fine to fine grained, subangular), micaceous, trace glauconitic mudstone, dark gray (10YR 4/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
45.6'
48.43'
49.23'
51.65'
52.24'
58.62'
93'
1110101-0212
Bailed
5U ug/L TCE
NA 99Tc
1110101-0213
Pumped
5U ug/L TCE
10 +/- 25 pCi/L 99Tc
1110101-0226
Pumped
2J ug/L TCE
8 +/- 17 pCi/L 99Tc
1110101-0214
Pumped
139 ug/L TCE
7.7J ug/L 1,1 DCE
1J ug/L CCl4
34 +/- 21 pCi/L 99Tc
1110101-0223
Pumped
119 ug/L TCE
6J ug/L 1,1 DCE
33 +/- 21 pCi/L 99Tc
1110101-0224
Pumped
5U ug/L TCE
0 +/- 0 pCi/L 99Tc
1110101-0225
Pumped
5U ug/L TCE
0 +/- 6 pCi/L 99Tc
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Elevation: 380.12
PGDP Coord: S 604.1, W 686.1
P4D8

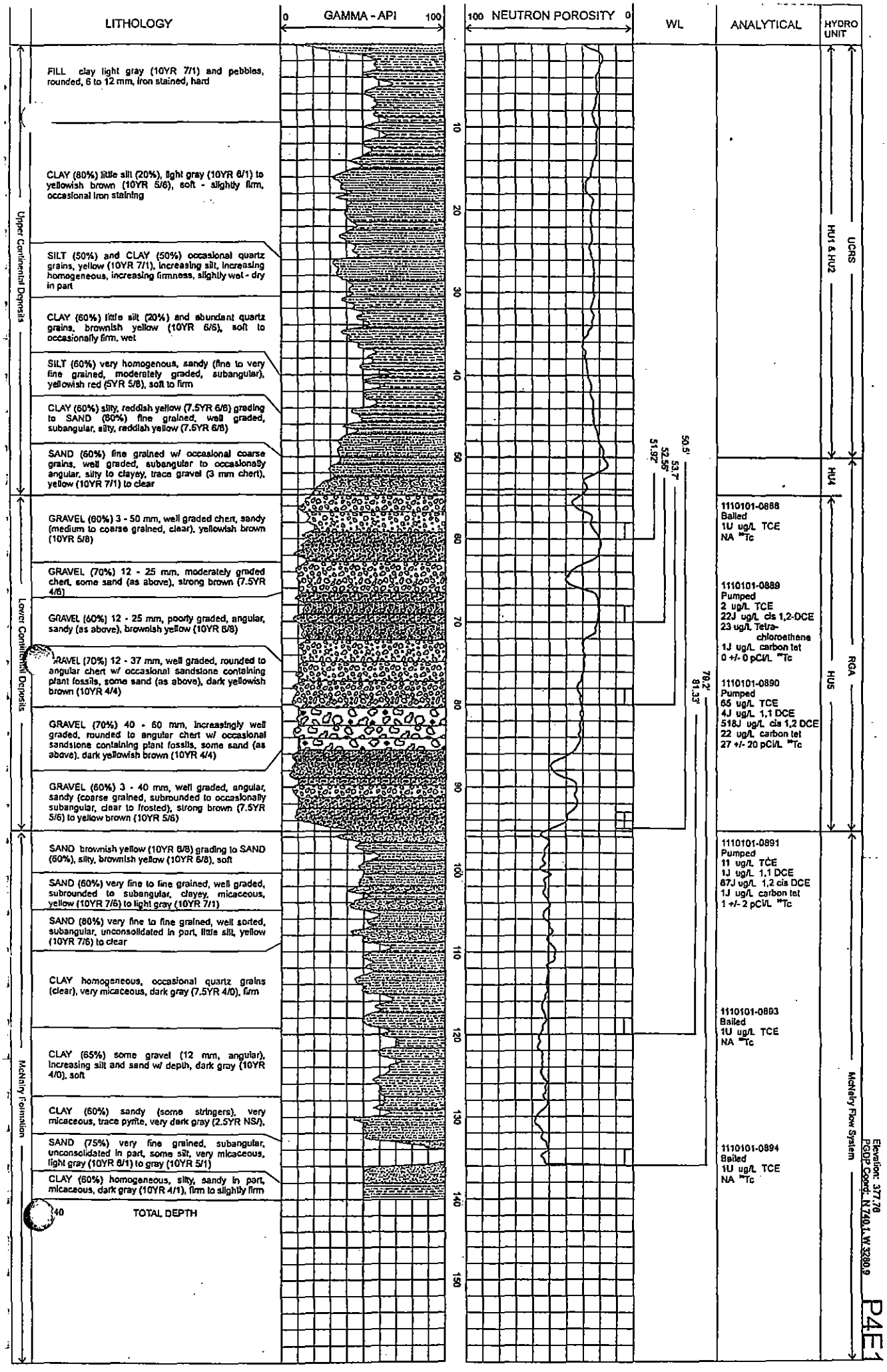
LITHOLOGY
GAMMA - API
0
100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
SILT (80%), little sand, abundant organic debris, very dark gray brown (10YR 3/2), soft, slightly damp
T clayey, scattered iron oxide staining and nations, yellowish brown (10YR 5/6)
SILT some clay, trace sand (very fine to fine grained red chert), yellowish brown (10YR 5/6)
SILT (85%) little sand (very fine to fine grained red chert, increases to 30% and becomes predominantly very fine to medium grained, subangular to subrounded quartz), yellow (2.5Y 7/6) to olive yellow
SAND (80%) very fine to coarse grained, poorly sorted, subangular quartz w/ scattered chert, gravelly (3 to 6 mm w/ some to 12 mm), trace silt, brownish yellow (10YR 6/6)
SILT clayey, trace sand (15%) (very fine to fine grained, subangular to subrounded, percentage increases w/ depth), brownish yellow (10YR 6/6)
GRAVEL (65%) angular to subangular, some sand (fine to coarse grained, subangular), trace silt, brownish yellow (10YR 6/6)
SAND (50%) fine to medium grained, moderately sorted, subangular to subrounded, and SILT, yellowish brown (10YR 5/6)
CLAY silty, trace sand (very fine to fine grained, subrounded to subangular), micaceous, pale yellow (2.5Y 7/4)
CLAY sandy (very fine to occasionally fine grained, moderately well sorted, subangular to subrounded, ht brownish gray (10YR 6/2)
SAND fine to medium grained, moderately sorted, subangular to subrounded, clean, scattered mica, light brownish gray (10YR 6/2), grain size and mica content increase w/ depth
GRAVEL (90%) 3 to 28 mm, angular to subangular w/ occasional subrounded limestone, chert and sandstone, trace sand, brownish yellow (10YR 6/8)
GRAVEL (85%) 6 to 25 mm, angular to subrounded limestone, chert and sandstone, little sand, olive yellow (2.5Y 6/6)
GRAVEL (65%) 3 to 6 mm, some sand and silt, yellow brown (10YR 6/8)
CLAY micaceous from 110' to 116', very dark gray (2.5Y N3/1), firm, dense, homogeneous, high plasticity, moist, very sticky
CLAY little silt, trace sand (very fine to fine grained), very dark gray (2.5Y N3/1)
CLAY silty, trace sand (very fine to fine grained quartz), micaceous, very dark gray (2.5Y N3/1), firm, slightly moist
SAND (65%) very fine to fine grained, subrounded, some silt, common dark gray to black accessory minerals giving overall "salt and pepper" appearance, trace glauconite, very dark gray (2.5Y N3/1) to dark greenish gray (5G 4/1)
SILT sandy, micaceous, trace black accessory minerals, very dark gray (10YR 3/1)
SAND (65%) very fine grained, fairly well sorted, subangular, common black accessory minerals, race glauconite, silty, gray (5Y 5/1) to dark gray (5Y 4/1)
SAND (80%) very fine to fine grained, moderately well sorted, subangular to subrounded, abundant black accessory minerals, common glauconite, gray (5Y 5/1) to dark gray (5Y 4/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Horlocks Creek Clay
McNairy Formation
41.23'
48.16'
49.23'
52.42'
60.72'
1110101-0611
Bailed
5U ug/L TCE
NA pCi/L Tc
1110101-0612
Pumped
441 ug/L TCE
10.1 ug/L 1,1 DCE
20 +/- 21 pCi/L Tc
1110101-0613
Pumped
677 ug/L TCE
15 ug/L 1,1 DCE
1.4J ug/L 1,1,1 TCA
53 +/- 22 pCi/L Tc
1110101-0614
Pumped
5 ug/L TCE
57 +/- 22 pCi/L Tc
1110101-0615
Pumped
2 ug/L TCE
5 +/- 25 pCi/L Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 381.99
PGDP Coord: S 1223.7, W 639.8
P4D9


LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SILT (70%), some sand, very fine grained, subrounded, yellowish brown (10YR 5/4)
SILT some sand (very fine grained, subangular), trace clay, occasional iron oxide staining, dark brown (10YR 4/3)
SILT some clay, trace sand (very fine to fine grained red chert), yellowish brown (10YR 5/6)
SAND (50%) very fine to fine grained, moderately sorted, subangular quartz w/ some feldspar, sand percentage and grain size increase w/ depth, and SILT (50%), brownish yellow (10YR 6/6)
SAND (60%) very fine to coarse grained, poorly sorted, subangular quartz w/ some feldspar, gravelly (6 to 18 mm, angular chert and sandstone), trace silt, brownish yellow (10YR 6/6)
SILT (60%), some sand (30%)(very fine to medium grained, moderately sorted, subrounded), light yellow brown (10YR 6/4)
GRAVEL (50%) to 18 mm, angular to subrounded chert and sandstone, and SAND (very fine to coarse grained, subangular quartz w/ some feldspar), trace silt, brownish yellow (10YR 6/8)
SAND (50%) very fine to fine grained, moderately sorted, subangular quartz, and SILT, light yellowish brown (10YR 6/4)
SAND (50%) very fine to fine grained, moderately sorted, subangular quartz, and SILT, brownish yellow (10YR 6/8)
SAND (80%) very fine grained, well sorted, subrounded quartz w/ trace fine grained feldspar, little silt, light gray (10YR 7/2), cohesive
GRAVEL (80%) 3 to 25 mm oblong, subrounded to angular chert, weathered shale and sandstone, little sand (fine to coarse grained, poorly sorted), reddish yellow (7.5YR 6/8)
GRAVEL (90%) to 25 mm, red yellow (10YR 6/6)
CLAY micaceous, trace glauconite and blue-green mudstone liths, black (5Y 2.5/1), very fat, plastic
SANDSTONE very fine grained, well sorted, subrounded to rounded, moderately well cemented, yellow (10YR 8/6), drills into chips
SAND (60%) very fine grained, subangular, silty, trace glauconite, dark gray (10YR 4/1), cohesive
SANDSTONE very fine grained, well sorted, subrounded to rounded, moderately well cemented, trace pyrite, yellow (10YR 8/6) interbedded w/ white and dark gray material
SAND (50%) very fine grained, well sorted, subangular, and SILT, dark gray (10YR 4/1)
GRAVEL sandy, yellow (10YR 8/6) and white, lots of water!
SAND (50%) very fine grained, subangular, and SILT, micaceous, trace glauconite, dark gray (10YR 4/1)
150 TOTAL DEPTH
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
49.91'
50.51'
51.85'
51.44'
58.16'
116.36'
1110101-0231
Pumped
104 ug/L TCE
57 +/- 22 pCi/L 99Tc
1110101-0232
Pumped
1722 ug/L TCE
29 +/- 21 pCi/L 99Tc
1110101-0233
Pumped
1700 ug/L TCE
59 +/- 21 pCi/L 99Tc
1110101-0236
Bailed
413.6 ug/L TCE
NA 99Tc
1110101-0237
(Duplicate)
Bailed
340 ug/L TCE
NA 99Tc
1110101-0238
Pumped
12 ug/L TCE
19 +/- 23 pCi/L 99Tc
1110101-0239
Pumped
5U ug/L TCE
19 +/- 20 pCi/L 99Tc
HU1 & HU2
UCRS
HU3
HU4
HU5
RGA
McNairy Flow System
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
Elevation: 380.84
PGDP Coord: S 1655.1, W 733.4
P4D10

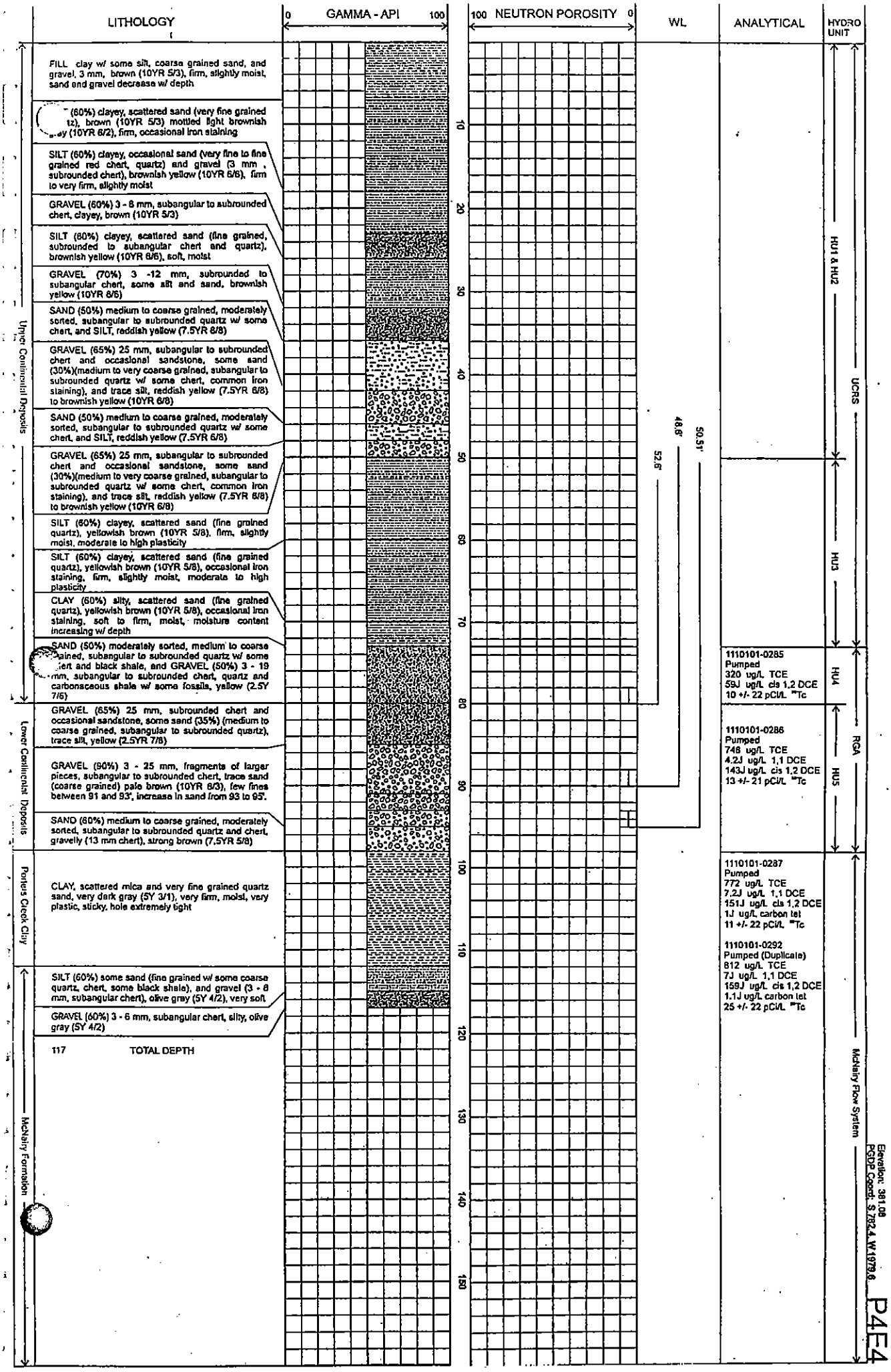

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SILT (80%), little clay, abundant organics, very dark gray brown (10YR 3/2), damp
SILT (85%) little clay, trace sand (very fine grained) increasing w/ depth to 5%, yellow brown (10YR 5/4 to 5/6) mottled occasionally dark brown
GRAVEL (60%) 1 to 10 mm, angular to subrounded, some scattered chert fragments, silty, sandy in part (very fine to very coarse grained), yellow brown (10YR 5/4 to 5/6) mottled occasionally dark brown
SILT (80%) little clay, trace sand (upper portion w/ scattered gravel), brown yellow (10YR 6/6 to 6/8)
GRAVEL (60%) 2 to 7 mm, angular, abundant chert, sandy (fine to coarse grained), brown yellow (10YR 6/6)
SAND (75%) fine to medium grained, subangular to subrounded, some scattered 1 to 2 mm pebbles, some silt, brown yellow (10YR 6/6 to 6/8)
CLAY silty, trace sand (very fine grained) in part increasing w/ depth, olive yellow (2.5Y 6/6)
SAND (80%) very fine to fine grained, subangular to subrounded, little silt, scattered gravel, yellow (10YR 7/6)
GRAVEL (75%) 2 to 15 mm, scattered 20 to 30 mm, angular chert limestone and sandstone, some silt, dark gray brown (10YR 3/2) based on silt matrix
CLAY (60%) silty, yellow brown (10YR 5/4 to 5/6) mottled brown yellow (10YR 6/8)
CLAY some silt decreasing w/ depth, slightly micaceous, very dark gray (2.5Y 3/N), homogeneous, very sticky, very plastic, damp to dry
CLAY silty, trace sand (fine grained, increasing w/ depth, very dark gray (2.5Y N3/)
CLAY (75%) some silt, trace sand, very dark gray (2.5Y N3/)
SAND (60%) very fine grained, very dark gray (2.5Y N3/)
CLAY trace silt, very dark gray (2.5Y N3/), homogeneous, plastic
SAND (90%) very fine grained, subangular to subrounded, predominantly quartz (clear to milky), trace silt, very dark gray (2.5Y N3/)
SAND (85%) very fine grained, subangular to subrounded, predominantly clear quartz, little silt, dark gray (2.5Y N4/)
SAND (85 to 95%) very fine grained, predominantly subangular w/ some subrounded, clear quartz, trace to little silt, micaceous, dark gray (2.5Y N4/)
150 TOTAL DEPTH
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
47.58'
47.59'
48.31'
55.43'
1110101-0622
Pumped
1.8J ug/L TCE
19 +/- 19 pCi/L 99Tc
1110101-0623
Pumped
1.4J ug/L TCE
17 +/- 18 pCi/L 99Tc
1110101-0624
Pumped
1.3J ug/L TCE
9 +/- 23 pCi/L 99Tc
1110101-0625
Pumped
5U ug/L TCE
10 +/- 18 pCi/L 99Tc
HU1 & HU2
UCRS
HU3
HU4
HU5
RGA
McNairy Flow System
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
Elevation: 379.1
P3DP Coord: S 2007.6, W 720.8
P4D11

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SILT (70%), some sand, very fine grained, subangular, yellowish brown (10YR 5/4), cohesive
SAND (60%) very fine to medium grained, poor sorting, subrounded to angular, sand percentage increases to 80% by 30', silty, yellow brown (10YR 5/4)
GRAVEL (60%) up to 9 mm, sandy (30%) very fine to coarse grained, poorly sorted, subrounded, trace silt, yellow brown (10YR 5/4)
GRAVEL (60%) up to 12 mm, sandy (20%) very fine to coarse grained, poorly sorted, subrounded, little silt, yellow brown (10YR 5/4)
SAND very fine grained, well sorted, subrounded quartz, yellow brown (10YR 5/4), very loose, non-cohesive, flows readily
SAND (50%) very fine to fine grained, moderately sorted, subangular quartz, and SILT, light yellowish brown (10YR 6/4), cohesive, moderately dense
SAND (70%) very fine to fine grained, moderately sorted, subangular quartz, little silt, trace gravel, light yellowish brown (10YR 6/4)
SILT (70%) little clay, trace sand (very fine grained, subrounded), brownish yellow (10YR 6/8), moderately cohesive
GRAVEL (80%) 3 to 38 mm, subrounded to angular chert, weathered shale and sandstone, little sand (fine to coarse grained, poorly sorted, subangular to subrounded), reddish yellow (7.5YR 6/6)
CLAY micaceous, trace glauconite and blue-green mudstone liths, black (5Y 2.5/1), very fat, plastic
SAND (60%) very fine grained, subrounded, silty, micaceous, trace glauconite, occasional pyrite nodules, black (5Y 2.5/1)
SAND (80%) very fine grained, subangular, little silt, black (5Y 2.5/1), common pyrite nodules 132' to 133', 120' to 140' is upward fining sequence
SAND (80%) very fine grained, subangular, little silt, micaceous, trace glauconite, trace lignite, dark gray (5YR 5/1)
150 TOTAL DEPTH
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
27.12'
40.13'
51.97'
65.0'
119.08'
1110101-0258
Bailed
1U ug/L TCE
NA TcTc
1110101-0259
Bailed
1U ug/L TCE
NA TcTc
1110101-0260
Bailed
5U ug/L TCE
NA TcTc
(Field GC)
1110101-0261
Bailed, Duplicate
1 ug/L TCE
NA TcTc
(Fixed lab)
1110101-0262
Pumped
1U ug/L TCE
4 +/- pCi/L TcTc
(Fixed lab)
1110101-0263
Pumped, Duplicate
5U ug/L TCE
NA TcTc
(Field GC)
1110101-0264
Pumped
1U ug/L TCE
0 +/- 0 pCi/L TcTc
(Fixed lab)
1110101-0265
Bailed, Duplicate
5U ug/L TCE
NA TcTc
(Field GC)
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
Elevation: 380.23
PGDP Coord: S 18458, W 883.0
P4D12


LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SILT (80%), little sand, very fine grained, poorly sorted, subrounded, yellowish brown (10YR 5/4)
SILT (90%) trace sand, very fine grained, poorly sorted, subrounded, yellowish brown (10YR 5/4)
SAND (80%) very fine to fine grained, poorly sorted, subrounded to rounded, poorly cemented quartz, little silt, brownish yellow (10YR 6/8)
SAND (80%) very fine to medium grained, poorly sorted, subrounded to rounded, poorly cemented quartz, little silt, brownish yellow (10YR 6/8)
SAND (90%) trace gravel (10 to 20 mm chert and sandstone), brownish yellow (10YR 6/8)
GRAVEL (60%) 20 to 30 mm, well sorted, subrounded, sandy (coarse grained w/ occasional medium grained, very poorly sorted, subrounded to rounded), strong brown (7.5YR 1.5/8)
SAND (80%) coarse grained, poorly sorted, little gravel, yellow (10YR 7/8)
GRAVEL (50%) and SAND (50%) very fine to fine grained, moderately sorted, subrounded quartz, yellow (10YR 7/6)
SAND (50%) and SILT, yellow (2.5Y 8/8)
SAND (50%) very fine grained, well sorted, subrounded quartz and SILT (50%), light gray (10YR /2)
GRAVEL (50%) 30 to 5 mm chert, and SAND well sorted, well-cemented quartz, reddish yellow (7.5YR 6/8)
GRAVEL 40 to 20 mm, angular chert, reddish yellow (7.5YR 6/6)
GRAVEL 10 to 20 mm chert, sandy (medium to coarse grained, poorly sorted, subrounded to rounded, unconsolidated), reddish yellow (7.5YR 6/8)
GRAVEL 20 to 40 mm, increased iron staining, strong brown (7.5YR 5/8)
CLAY slightly micaceous, trace silt, dark brown (7.5YR 3/2), very homogeneous, firm
CLAY, slightly micaceous, occasional quartz grains, dark brown (7.5YR 3/2), firm
CLAY silty, sandy, trace gravel, brown yellow
CLAY trace silt, micaceous, dark brown (7.5YR 3/2)
SAND (80%) very fine to fine grained, moderately well sorted, subrounded, little silt, dark brown (7.5YR 4/2) with black (7.5YR N2\)
CLAY (70%) some sand (very fine grained, moderately sorted), dark brown (7.5YR 4/2)
CLAY (60%), sandy (very fine grained, moderately sorted), dark brown (7.5YR 4/2)
SAND (90%) fine grained, moderately well sorted, subrounded, unconsolidated, trace silt, light gray (10YR 7/1)
SAND (98%) very fine to fine grained, moderately sorted, subrounded to subangular, trace silt, micaceous, light gray (10YR 7/1)
160 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
32.9'
49.78'
49.43'
55.39'
49.6'
122.75'
123'
1110101-0665
Pumped
5U ug/L TCE
0 +/- 14 pCi/L 99Tc
1110101-0666
Pumped
2161.3 ug/L TCE
0 +/- 0 pCi/L 99Tc
1110101-0667
Pumped
2821.9 ug/L TCE
0 +/- 14 pCi/L 99Tc
1110101-0668
Pumped
2856.4 ug/L TCE
12 +/- 18 pCi/L 99Tc
1110101-0669
Pumped (Duplicate)
3100. ug/L TCE
19 +/- 19 pCi/L 99Tc
1110101-0684
Bailed
2.1J ug/L TCE
15.3J ug/L cis 1,2 DCE
NA 99Tc
1110101-0670
Bailed
5U ug/L TCE
NA 99Tc
1110101-0671
Bailed
1U ug/L TCE
NA 99Tc
1110101-0672
Pumped (from 70')
4.3J ug/L TCE
11 +/- 19 pCi/L 99Tc
1110101-0673
Pumped (from 110')
8.8 ug/L TCE
9 +/- 34 pCi/L 99Tc
HU1 & HU2
UCRS
HU3
HU4
HU5
RGA
McNairy Flow System
Elevation: 381.4
PGDP Coord: S1651.8, W755.1
P4D12A


LITHOLOGY
0 GAMMA - API 100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
FILL clay light gray (10YR 7/1) and pebbles, rounded, 6 to 12 mm, iron stained, hard
CLAY (80%) little silt (20%), light gray (10YR 6/1) to yellowish brown (10YR 5/6), soft - slightly firm, occasional iron staining
SILT (50%) and CLAY (50%) occasional quartz grains, yellow (10YR 7/1), increasing silt, increasing homogeneous, increasing firmness, slightly wet - dry in part
CLAY (60%) little silt (20%) and abundant quartz grains, brownish yellow (10YR 6/6), soft to occasionally firm, wet
SILT (60%) very homogenous, sandy (fine to very fine grained, moderately graded, subangular), yellowish red (5YR 5/8), soft to firm
CLAY (60%) silty, reddish yellow (7.5YR 6/6) grading to SAND (60%) fine grained, well graded, subangular, silty, reddish yellow (7.5YR 6/6)
SAND (60%) fine grained w/ occasional coarse grains, well graded, subangular to occasionally angular, silty to clayey, trace gravel (3 mm chert), yellow (10YR 7/1) to clear
GRAVEL (60%) 3 - 50 mm, well graded chert, sandy (medium to coarse grained, clear), yellowish brown (10YR 5/8)
GRAVEL (70%) 12 - 25 mm, moderately graded chert, some sand (as above), strong brown (7.5YR 4/6)
GRAVEL (60%) 12 - 25 mm, poorly graded, angular, sandy (as above), brownish yellow (10YR 6/8)
GRAVEL (70%) 12 - 37 mm, well graded, rounded to angular chert w/ occasional sandstone containing plant fossils, some sand (as above), dark yellowish brown (10YR 4/4)
GRAVEL (70%) 40 - 60 mm, increasingly well graded, rounded to angular chert w/ occasional sandstone containing plant fossils, some sand (as above), dark yellowish brown (10YR 4/4)
GRAVEL (60%) 3 - 40 mm, well graded, angular, sandy (coarse grained, subrounded to occasionally subangular, clear to frosted), strong brown (7.5YR 5/6) to yellow brown (10YR 5/6)
SAND brownish yellow (10YR 6/8) grading to SAND (60%), silty, brownish yellow (10YR 6/8), soft
SAND (60%) very fine to fine grained, well graded, subrounded to subangular, clayey, micaceous, yellow (10YR 7/6) to light gray (10YR 7/1)
SAND (80%) very fine to fine grained, well sorted, subangular, unconsolidated in part, little silt, yellow (10YR 7/6) to clear
CLAY homogeneous, occasional quartz grains (clear), very micaceous, dark gray (7.5YR 4/0), firm
CLAY (65%) some gravel (12 mm, angular), increasing silt and sand w/ depth, dark gray (10YR 4/0), soft
CLAY (60%) sandy (some stringers), very micaceous, trace pyrite, very dark gray (2.5YR NS/),
SAND (75%) very fine grained, subangular, unconsolidated in part, some silt, very micaceous, light gray (10YR 8/1) to gray (10YR 5/1)
CLAY (60%) homogeneous, silty, sandy in part, micaceous, dark gray (10YR 4/1), firm to slightly firm
140 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
HU1 & HU2
UCRS
HU4
HU5
RGA
McNairy Flow System
50.5'
51.32'
52.56'
53.7'
79.2'
81.33'
1110101-0888
Bailed
1U ug/L TCE
NA pCi/L 99Tc
1110101-0889
Pumped
2 ug/L TCE
22J ug/L cis 1,2-DCE
23 ug/L Tetrachloroethene
1J ug/L carbon tet
0 +/- 0 pCi/L 99Tc
1110101-0890
Pumped
65 ug/L TCE
4J ug/L 1,1 DCE
518J ug/L cis 1,2 DCE
22 ug/L carbon tet
27 +/- 20 pCi/L 99Tc
1110101-0891
Pumped
11 ug/L TCE
1J ug/L 1,1 DCE
87J ug/L 1,2 cis DCE
1J ug/L carbon tet
1 +/- 2 pCi/L 99Tc
1110101-0893
Bailed
1U ug/L TCE
NA pCi/L 99Tc
1110101-0894
Bailed
1U ug/L TCE
NA pCi/L 99Tc
Elevation: 377.76
PGDP Coord: N 740.1, W 3280.9
P4E1

LITHOLOGY
GAMMA - API
0
100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
SILT (90%) trace clay w/ some sand (very fine grained), dark grayish brown (10YR 3/2), hard, slightly moist
(75%) very homogeneous, some clay (25%), wish brown (10YR 5/8), hard, slightly moist
SILT (80%) little clay, yellow brown (10YR 5/6), hard, slightly moist, mottled from iron staining in 1 - 3 mm laminations
SILT (50%) gravelly (40%)(1 - 3 mm, well rounded), trace clay, yellow brown (10YR 5/6)
SILT (80%) little clay, scattered sand (very fine grained to fine grained), yellow brown (10YR 5/6)
SAND very fine grained to fine grained, light yellow brown (10YR 6/4), fining upward sequence w/ some silt at top
GRAVEL (70%) 1 -3 mm, well rounded, some silt and sand, light yellow brown (10YR 6/4), basal gravel for sequence from 26 - 31 feet, dry
SAND very fine to fine grained, trace silt at top becoming coarse grained at base, light yellow brown (10YR 6/4)
GRAVEL (75%) 1 mm - 25 mm, angular, some silt, light yellow brown (10YR 6/4), basal gravel for sequence from 32 - 37 feet, becomes coarser w/ depth
CLAY (55%) sandy and silty, light yellow brown (10YR 6/4) mottled strong brown (7.5YR 5/6) from
SAND medium grained, well sorted, subangular to angular quartz, trace silt, light yellow brown (10YR 6/4), scattered dark accessory minerals
GRAVEL (60%) 1 - 3 mm, silty, reddish yellow (7.5YR 6/6), color from silt
GRAVEL (80%) 2 - 6 mm w/ occasional 25 - 37 mm, angular limestone w/ occasional chert, little sand (coarse grained), reddish yellow (7.5YR 6/8)
RAVEL (90%) 4 - 8 mm w/ abundant 25 - 37 mm, ngular limestone and chert, little sand (very coarse grained, clear to translucent quartz), reddish yellow (7.5YR 6/6), some dark accessory minerals
GRAVEL (80%) 2 - 5 mm w/ some 10 - 20 mm, angular limestone and sandstone w/ scattered chert, little sand (very coarse grained, clear to translucent quartz), dark yellowish brown (10YR 4/4)
GRAVEL (70%) 2 - 5 mm w/ some 10 - 20 mm, angular limestone and sandstone w/ scattered chert, little sand (very coarse grained, clear to translucent quartz), dark yellowish brown (10YR 4/4), becoming coarser with depth
SILT (60%) sandy (very fine to fine grained, subangular to subrounded), gray brown (10YR 5/2)
CLAY (85%) little silt, w/ scattered mica, very dark gray (5Y 3/1), very firm, moist, plastic
SAND very fine grained, micaceous, brown (10YR 5/3)
SAND very fine grained, trace silt, micaceous, very dark grayish brown (10YR 3/2)
CLAY (65%) some sand (25%)(fine to medium grained, rounded clear to milky quartz, locally pyritized in thin beds), trace silt (10%), very dark grayish brown (10YR 3/2), thin-bedded light reddish brown chert (5YR 6/4) throughout
SAND very fine grained, micaceous, trace silt and lay in part, thin stringers of chert, glauconitic, very ark grayish brown (10YR 3/2), scum on returns ndicates organic-coaly content
CLAY (85%) little silt, trace sand, micaceous, gray (10YR 5/1), plastic becoming stiff when worked, moist
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
39.26'
48.25'
48.9'
49.16'
102.1'
102.83'
1110101-0293
Bailed
5U ug/L TCE
NA Tc
1110101-0294
Bailed
5U ug/L TCE
22.1J ug/L cis 1,2 DCE
NA Tc
1110101-0295
Pumped
29.8 ug/L TCE
54.4J ug/L cis 1,2 DCE
25 +/- 18 pCi/L Tc
1110101-0296
Pumped
53.7 ug/L TCE
60.7J ug/L cis 1,2 DCE
29 +/- 19 pCi/L Tc
1110101-0297
Pumped
5U ug/L TCE
10 +/- 39 pCi/L Tc
1110101-0298
Pumped
5U ug/L TCE
22 +/- 18 pCi/L Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 379.08
PGDP Coord: N 2958, W 2327.5
P4E2


LITHOLOGY
0 GAMMA - API 100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
FILL clay w/ some silt, coarse grained sand, and gravel, 3 mm, brown (10YR 5/3), firm, slightly moist, sand and gravel decrease w/ depth
(60%) clayey, scattered sand (very fine grained tz), brown (10YR 5/3) mottled light brownish ...ay (10YR 6/2), firm, occasional iron staining
SILT (60%) clayey, occasional sand (very fine to fine grained red chert, quartz) and gravel (3 mm , subrounded chert), brownish yellow (10YR 6/6), firm to very firm, slightly moist
GRAVEL (60%) 3 - 8 mm, subangular to subrounded chert, clayey, brown (10YR 5/3)
SILT (60%) clayey, scattered sand (fine grained, subrounded to subangular chert and quartz), brownish yellow (10YR 6/6), soft, moist
GRAVEL (70%) 3 -12 mm, subrounded to subangular chert, some silt and sand, brownish yellow (10YR 6/6)
SAND (50%) medium to coarse grained, moderately sorted, subangular to subrounded quartz w/ some chert, and SILT, reddish yellow (7.5YR 6/8)
GRAVEL (65%) 25 mm, subangular to subrounded chert and occasional sandstone, some sand (30%)(medium to very coarse grained, subangular to subrounded quartz w/ some chert, common iron staining), and trace silt, reddish yellow (7.5YR 6/8) to brownish yellow (10YR 6/8)
SAND (50%) medium to coarse grained, moderately sorted, subangular to subrounded quartz w/ some chert, and SILT, reddish yellow (7.5YR 6/8)
GRAVEL (65%) 25 mm, subangular to subrounded chert and occasional sandstone, some sand (30%)(medium to very coarse grained, subangular to subrounded quartz w/ some chert, common iron staining), and trace silt, reddish yellow (7.5YR 6/8) to brownish yellow (10YR 6/8)
SILT (60%) clayey, scattered sand (fine grained quartz), yellowish brown (10YR 5/8), firm, slightly moist, moderate to high plasticity
SILT (60%) clayey, scattered sand (fine grained quartz), yellowish brown (10YR 5/8), occasional iron staining, firm, slightly moist, moderate to high plasticity
CLAY (60%) silty, scattered sand (fine grained quartz), yellowish brown (10YR 5/8), occasional iron staining, soft to firm, moist, moisture content increasing w/ depth
SAND (50%) moderately sorted, medium to coarse ...ained, subangular to subrounded quartz w/ some ...ert and black shale, and GRAVEL (50%) 3 - 19 mm, subangular to subrounded chert, quartz and carbonaceous shale w/ some fossils, yellow (2.5Y 7/6)
GRAVEL (65%) 25 mm, subrounded chert and occasional sandstone, some sand (35%) (medium to coarse grained, subangular to subrounded quartz), trace silt, yellow (2.5YR 7/8)
GRAVEL (50%) 3 - 25 mm, fragments of larger pieces, subangular to subrounded chert, trace sand (coarse grained) pale brown (10YR 6/3), few fines between 91 and 93', increase in sand from 93 to 95'.
SAND (60%) medium to coarse grained, moderately sorted, subangular to subrounded quartz and chert, gravelly (13 mm chert), strong brown (7.5YR 5/8)
CLAY, scattered mica and very fine grained quartz sand, very dark gray (5Y 3/1), very firm, moist, very plastic, sticky, hole extremely tight
SILT (60%) some sand (fine grained w/ some coarse quartz, chert, some black shale), and gravel (3 - 8 mm, subangular chert), olive gray (5Y 4/2), very soft
GRAVEL (60%) 3 - 6 mm, subangular chert, silty, olive gray (5Y 4/2)
117 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
48.8'
50.51'
52.6'
1110101-0285
Pumped
320 ug/L TCE
59J ug/L cis 1,2 DCE
10 +/- 22 pCi/L 99Tc
1110101-0286
Pumped
746 ug/L TCE
4.2J ug/L 1,1 DCE
143J ug/L cis 1,2 DCE
13 +/- 21 pCi/L 99Tc
1110101-0287
Pumped
772 ug/L TCE
7.2J ug/L 1,1 DCE
151J ug/L cis 1,2 DCE
1J ug/L carbon tet
11 +/- 22 pCi/L 99Tc
1110101-0292
Pumped (Duplicate)
812 ug/L TCE
7J ug/L 1,1 DCE
159J ug/L cis 1,2 DCE
1.1J ug/L carbon tet
25 +/- 22 pCi/L 99Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 381.08
PGDP Coord: S 7824.4 W 1979.6
P4E4

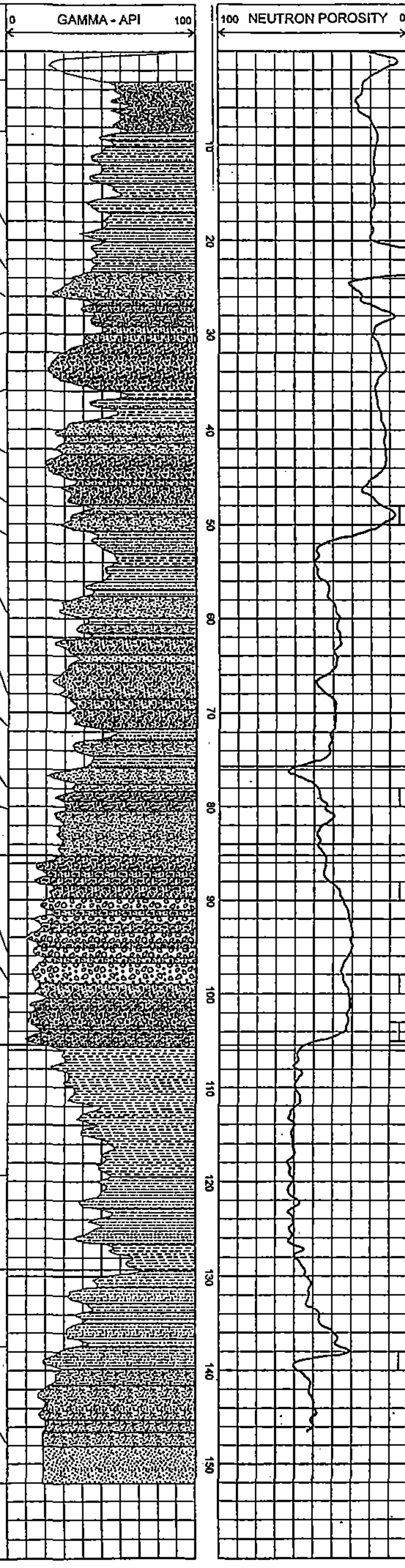
LITHOLOGY
No sample, bit plugged
FILL gravel, angular limestone, subrounded chert, clay matrix, brownish yellow (10YR 6/8)
CLAY (60%) silty, scattered sand (very fine to fine grained quartz w/ some chert), yellowish brown (10YR 5/8), soft, moist
SILT (80%) w/ little clay, common sand (very fine to fine grained, subrounded to subangular), yellowish brown (10YR 5/8), soft
SAND (50%) very fine to fine grained, subangular quartz w/ some chert, SILT and CLAY (50%), yellowish brown (10YR 5/8)
GRAVEL (75%) 6 - 25 mm w/ larger broken fragments, subrounded to subangular, some sand (very fine to coarse grained quartz), trace silt, yellow brown (10YR 5/8)
GRAVEL (85%) 3 -12 mm, angular to subrounded chert, some sand (very fine to medium grained, subrounded to subangular quartz and some chert), trace silt, strong brown (7.5YR 5/8)
SAND (50%) very fine to fine grained, moderately sorted quartz w/ some chert, and SILT, strong brown (7.5YR 5/6)
GRAVEL (85%) 3 - 6 mm w/ some up to 18 mm, angular to subangular chert, some sand (30%), and trace silt, yellow brown (10YR 5/8)
NO SAMPLE appears to be very fine grained sand/silt mix
SILT (65%) some sand (30%)(very fine to fine grained quartz), and trace gravel, 3 mm, yellow (2.5Y 7/6)
SAND (60%) very fine to fine grained, moderate to well sorted, subrounded quartz w/ some chert and black shale, some gravel (3 mm, angular to subangular fossiliferous shale and some chert), trace silt, brown yellow (10YR 6/8)
GRAVEL (60%) 3 - 12 mm w/ some larger fragments, well graded, subrounded shale, chert and occasional sandstone, sandy (very fine to coarse grained, subangular to subrounded quartz), very pale brown (10YR 7/4)
SAND (80%) very fine to fine grained, well sorted, subrounded to rounded quartz w/ scattered black accessory minerals, chert and biotite, little silt, very pale brown (10YR 7/4)
GRAVEL (85%) 6 - 12 mm, subrounded chert w/ some black shale, little sand and silt, very pale brown (10YR 7/4)
SAND (80%) very fine to fine grained, well sorted, subrounded to rounded quartz w/ scattered black accessory minerals, chert and biotite, little silt, very pale brown (10YR 7/4)
GRAVEL (85%) 3 mm - 38 mm w/ fragments of larger gravels, angular to subrounded chert and sandstone, little sand (very fine to coarse grained quartz and chert), trace silt, brownish yellow (10YR 6/8)
GRAVEL (60%) 3 mm - 25 mm w/ fragments of larger gravels, subangular to subrounded chert, sandy (very fine to coarse grained, subrounded quartz and chert), brownish yellow (10YR 6/8)
SAND (60%) fine to very coarse grained, well graded, subangular to subrounded, gravelly (3 - 25 mm, fragments of larger pieces, subangular to subrounded chert), brownish yellow (10YR 6/8)
GRAVEL (70%) 13 mm, subangular to subrounded chert, some sand (medium to very coarse grained, subrounded to rounded quartz and chert, some black acc minerals), yellowish brown (10YR 6/8)
CLAY, scattered mica and very fine grained quartz sand, very dark gray (5Y 3/1), firm, moist, very plastic
CLAY, silty, scattered mica and very fine grained quartz sand, very dark gray (5Y 3/1), soft, moist, plastic
SILT (50%) and SAND (50%) fine grained, well sorted, subrounded to rounded, mica, black accessory minerals and occasional glauconite, very dark gray (5Y 3/1), sand content increasing w/ depth
SAND (80%) fine grained, well sorted, subangular to subrounded quartz, black accessory minerals and occasional glauconite and mica, little silt, dark gray (5Y 4/1)
SAND fine grained, well sorted, subrounded quartz, black accessory minerals, occasional glauconite and mica, some semi-consolidated layers, brownish yellow (10YR 6/8), iron staining
152 TOTAL DEPTH

Upper Continental Deposits

Lower Continental Deposits

Porters Creek Clay

McNairy Formation



WL

47.51'
51.77
50.9'
50.13'
51.85'
69.51'

ANALYTICAL	HYDRO UNIT
1110101-0271 Bailed 5U ug/L TCE NA 99Tc	HU1 & HU2 / UCRS
1110101-0272 Bailed 5U ug/L TCE NA 99Tc	HU4
1110101-0273 Pumped 4.1J ug/L TCE 34 +/- 20 pCi/L 99Tc	HU5 / RGA
1110101-0274 Bailed 100 ug/L TCE 19 ug/L 1,1 DCE 34.8J ug/L cis 1,2 DCE	HU5 / RGA
1110101-0275 Pumped 519 ug/L TCE 22.9 ug/L 1,1 DCE 115.4J ug/L cis 1,2 DCE 1.2J ug/L 1,1,1 TCA 2.8J ug/L carbon tet 19 +/- 24 pCi/L 99Tc	McNairy Flow System
1110101-0284 Bailed 5U ug/L TCE NA 99Tc	McNairy Flow System

Elevation: 381.99
PGDP Coord.: S 1894.5 W 1606.8

P4E6

LITHOLOGY	GAMMA - API (0 – 100)	NEUTRON POROSITY (100 – 0)	WL	ANALYTICAL	HYDRO UNIT
CLAY (80%) little silt (20%), reddish yellow (7.5YR 7/6), firm, iron staining					
CLAY (80%) little silt (20%), occasional sand grains (quartz and chert), reddish yellow (7.5YR 7/6), mottled w/ gray (10YR 6/1), firm to soft					
CLAY (70%) some silt, homogeneous, brownish yellow (10YR 6/8), soft, damp					
CLAY (80%) w/ little silt, trace biotite, pebbles, brownish yellow (10YR 6/6) mottled w/ light gray (10YR 7/1), soft, damp					
CLAY (60%) silty, occasional sand grains (chert), light gray (10YR 7/1), firm, occasional iron staining					
GRAVEL (50%) 3 - 6 mm, chert, sandy (40%)(medium to coarse grained, poorly sorted, clear to brownish yellow (10YR 6/8)), trace silt, yellowish brown (10YR 5/6) to brown (7.5YR 5/8)					
GRAVEL (60%) 3 - 6 mm, chert, some sand (medium to coarse grained, poorly sorted, clear to brownish yellow (10YR 6/8)), trace silt, yellowish brown (10YR 5/6) to brown (7.5YR 5/8), decrease in sand and silt					
CLAY (40%) some sand (30%)(very fine to fine grained), and gravel (30%)(18 - 25 mm, chert), yellow (2.5YR 7/6)					
GRAVEL (65%) very rounded chert w/ some quartz, some sand (35%), white (2.5Y 8/2)					
CLAY (90%) trace silt, light gray (2.5Y N7/), firm, homogeneous					
CLAY (70%) some sand (30%)(fine grained, moderately well sorted, subrounded, clear quartz), light gray (10YR 7/1), soft, some mottled iron staining					
CLAY (60%) sandy (fine grained, moderately well sorted, subrounded, clear quartz), white (10YR 8/2), homogeneous					
CLAY (90%) trace sand (fine grained, moderately well sorted, subrounded, clear quartz), white (10YR 8/2), homogeneous					
CLAY (60%) sandy (fine grained, moderately sorted, subrounded, multicolor quartz and chert), white (10YR 8/2), soft, moist					
GRAVEL (90%) 2 to 25 mm w/ some larger fragments, rounded to angular chert, trace sand and silt, white (10YR 8/2) to brownish yellow (10YR 6/8) to light gray (10YR 7/1)					
GRAVEL (80%) 2 to 25 mm w/ some larger fragments, rounded to angular chert, little sand (coarse to very coarse grained, poorly sorted, subrounded to rounded quartz), yellow (10YR 7/8)					
GRAVEL (85%) 2 to 50 mm w/ some larger fragments, rounded to angular chert, little sand (very coarse grained, poorly sorted, subrounded to rounded quartz), yellow (10YR 7/8)					
CLAY little silt, scattered very fine grained quartz sand, very dark gray (2.5Y 3/1), soft to firm					
CLAY (95%) trace silt, very dark gray (2.5Y N/3), firm to very firm, very homogeneous					
CLAY (95%) trace silt, trace gravel (5 mm), very dark gray (2.5Y N/3), firm, very homogeneous					
SAND (60%) very fine to fine grained, moderately well sorted, subrounded to subangular, abundant biotite, trace pyrite, clayey, gray (2.5Y N5/) to dark gray					
SAND (50%) quartz, and CLAY (50%), trace biotite, dark gray (2.5Y N4/), soft					
SAND (70%) fine to very fine grained, well sorted, subrounded, moderately cemented quartz, mica, some clay, light gray (2.5Y N8/ to 10YR 6/1)					
150 TOTAL DEPTH					

Upper Continental Deposits

Lower Continental Deposits

Pliocene Aged Unit

McNairy Formation

52.61'
53.6'
68.43'
106.43'
116.43'

1110101-0759
Bailed
0.1J ug/L TCE
18J ug/L cis 1,2 DCE
NA **Tc

1110101-0760
Pumped
1331 ug/L TCE
NA **Tc

1110101-0761
Pumped
2365 ug/L TCE
12 +/- 23 pCi/L **Tc

1110101-0762
Pumped
2284 ug/L TCE
3 +/- 32 pCi/L **Tc

1110101-0763
Bailed
1.6J ug/L TCE
28J ug/L cis 1,2 DCE
NA **Tc

1110101-0764
Pumped
0.3J ug/L TCE
10 +/- 6 pCi/L **Tc

HU1 & HU2

UCRS

HU3

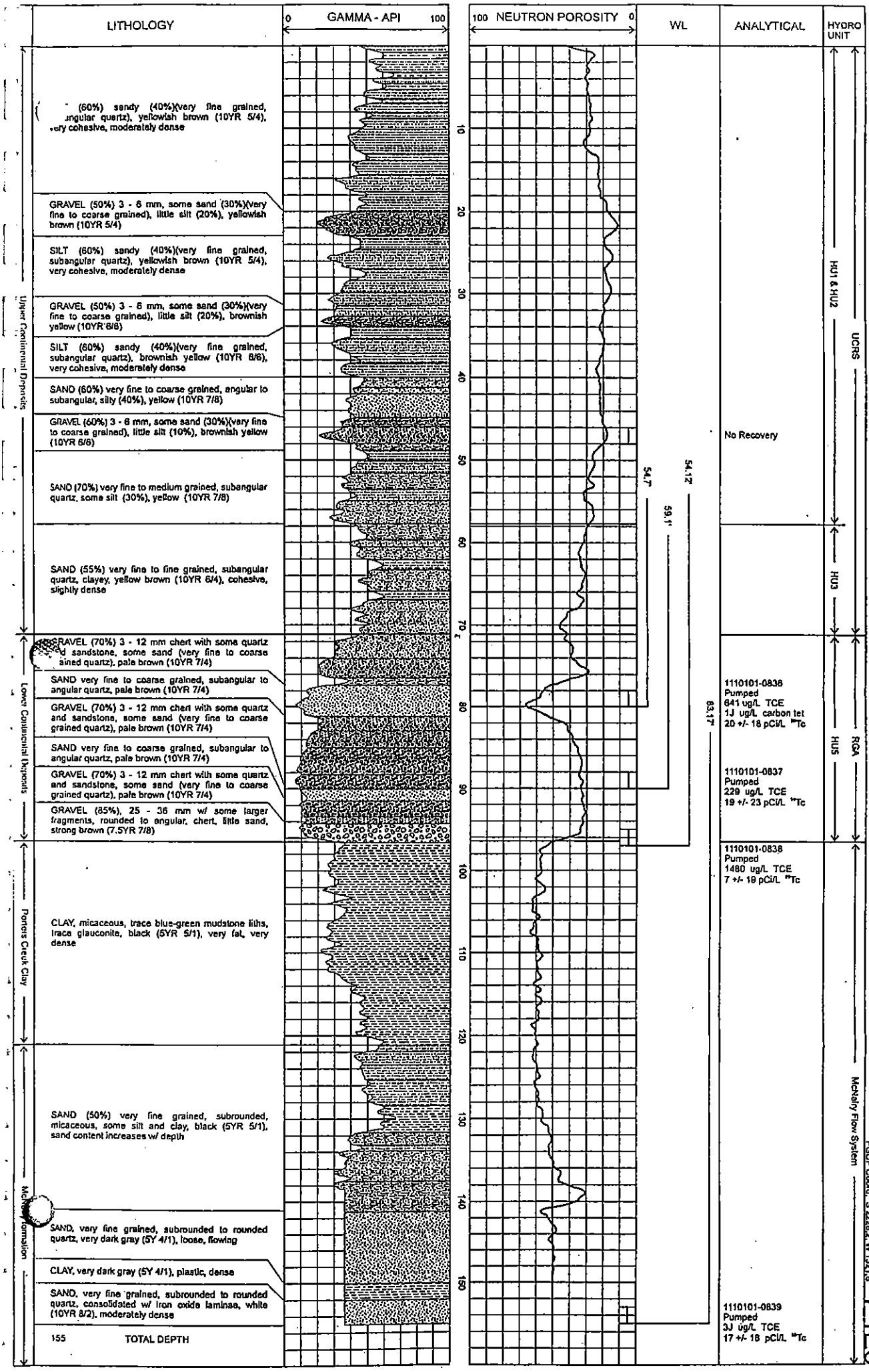
HU5

RGA

McNairy Flow System

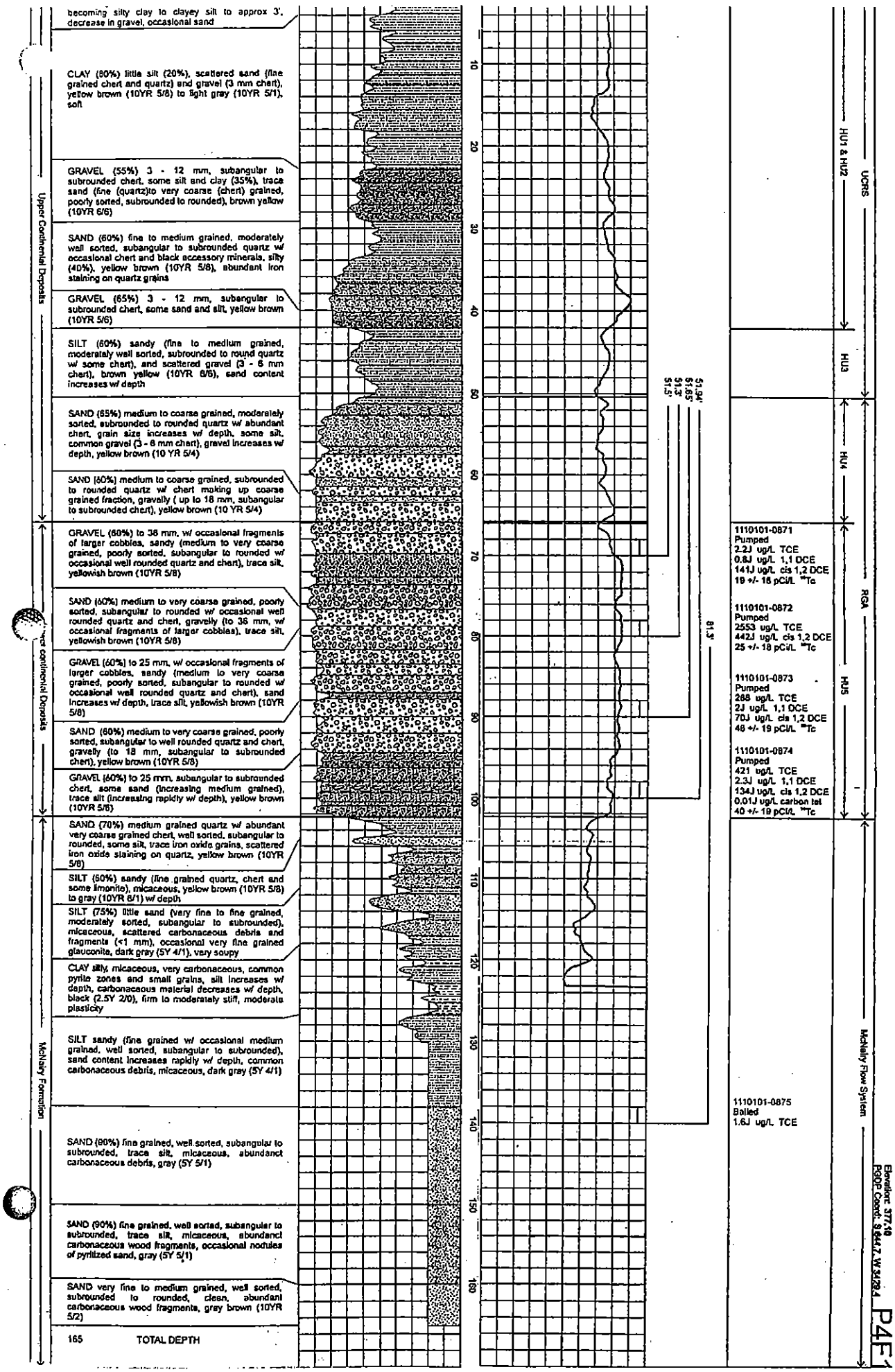
Elevation: 380.42
PGDP Coord: S 1914.8, W 931.3

P4E7



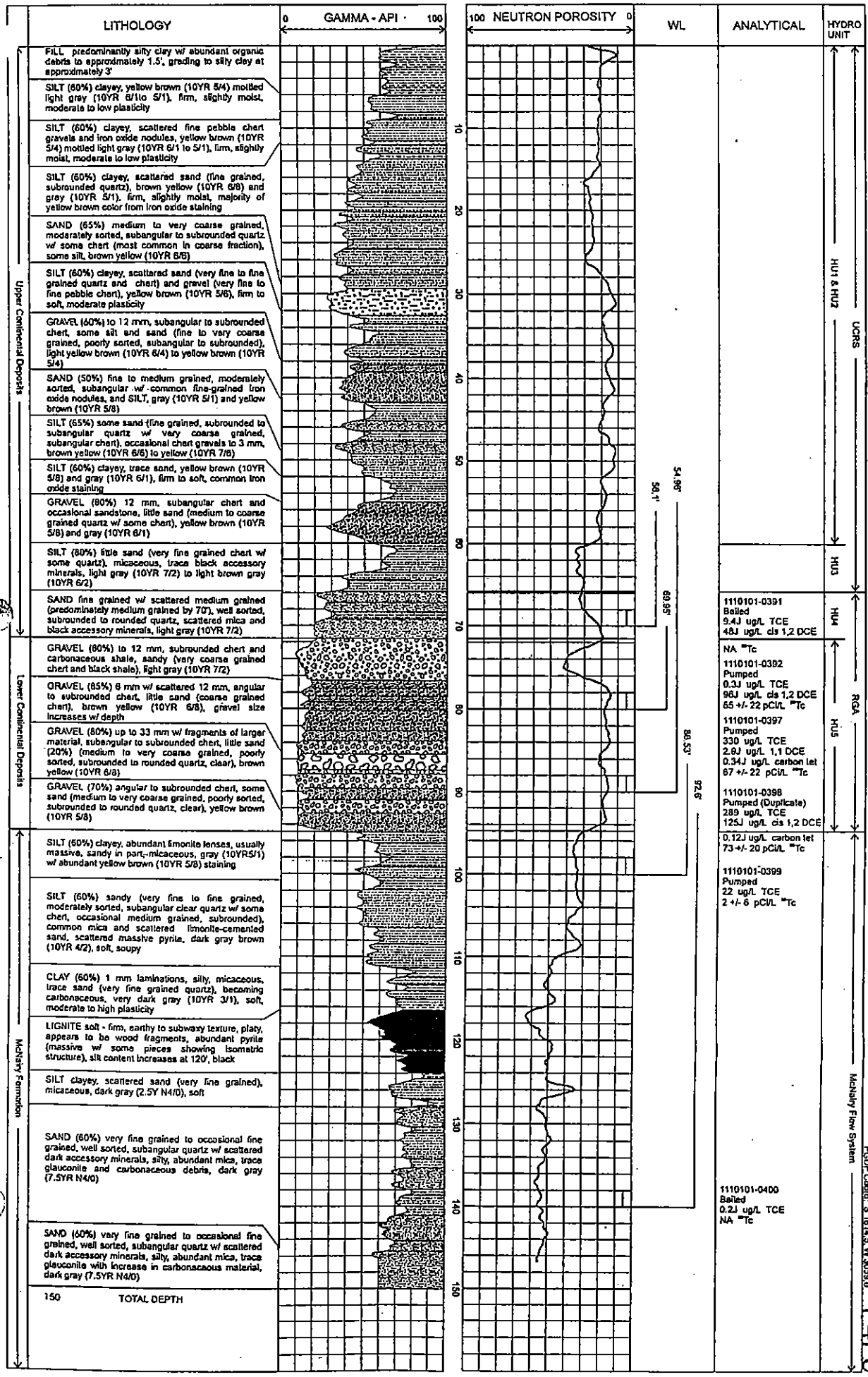
Elevation: 360.97
PGDP Coord: S 22282.2, W 13218.8

P4E8

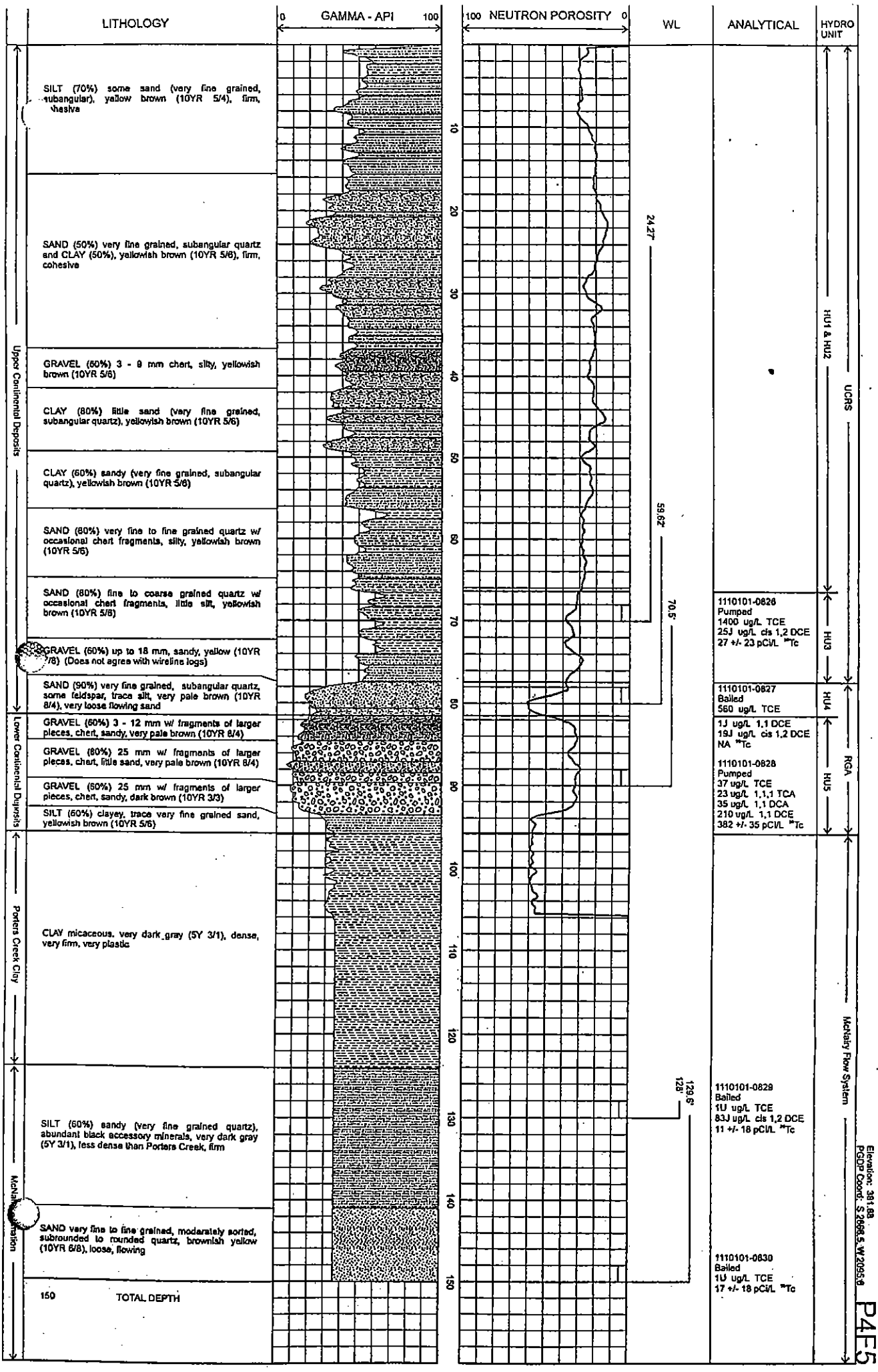

becoming silty clay to clayey silt to approx 3', decrease in gravel, occasional sand
CLAY (80%) little silt (20%), scattered sand (fine grained chert and quartz) and gravel (3 mm chert), yellow brown (10YR 5/8) to light gray (10YR 5/1), soft
GRAVEL (55%) 3 - 12 mm, subangular to subrounded chert, some silt and clay (35%), trace sand (fine (quartz)to very coarse (chert) grained, poorly sorted, subrounded to rounded), brown yellow (10YR 6/6)
SAND (60%) fine to medium grained, moderately well sorted, subangular to subrounded quartz w/ occasional chert and black accessory minerals, silty (40%), yellow brown (10YR 5/8), abundant iron staining on quartz grains
GRAVEL (65%) 3 - 12 mm, subangular to subrounded chert, some sand and silt, yellow brown (10YR 5/6)
SILT (60%) sandy (fine to medium grained, moderately well sorted, subrounded to round quartz w/ some chert), and scattered gravel (3 - 6 mm chert), brown yellow (10YR 6/6), sand content increases w/ depth
SAND (65%) medium to coarse grained, moderately sorted, subrounded to rounded quartz w/ abundant chert, grain size increases w/ depth, some silt, common gravel (3 - 6 mm chert), gravel increases w/ depth, yellow brown (10 YR 5/4)
SAND (60%) medium to coarse grained, subrounded to rounded quartz w/ chert making up coarse grained fraction, gravelly (up to 18 mm, subangular to subrounded chert), yellow brown (10 YR 5/4)
GRAVEL (60%) to 36 mm, w/ occasional fragments of larger cobbles, sandy (medium to very coarse grained, poorly sorted, subangular to rounded w/ occasional well rounded quartz and chert), trace silt, yellowish brown (10YR 5/8)
SAND (60%) medium to very coarse grained, poorly sorted, subangular to rounded w/ occasional well rounded quartz and chert, gravelly (to 36 mm, w/ occasional fragments of larger cobbles), trace silt, yellowish brown (10YR 5/8)
GRAVEL (60%) to 25 mm, w/ occasional fragments of larger cobbles, sandy (medium to very coarse grained, poorly sorted, subangular to rounded w/ occasional well rounded quartz and chert), sand increases w/ depth, trace silt, yellowish brown (10YR 5/8)
SAND (60%) medium to very coarse grained, poorly sorted, subangular to well rounded quartz and chert, gravelly (to 18 mm, subangular to subrounded chert), yellow brown (10YR 5/8)
GRAVEL (60%) to 25 mm, subangular to subrounded chert, some sand (increasing medium grained), trace silt (increasing rapidly w/ depth), yellow brown (10YR 5/8)
SAND (70%) medium grained quartz w/ abundant very coarse grained chert, well sorted, subangular to rounded, some silt, trace iron oxide grains, scattered iron oxide staining on quartz, yellow brown (10YR 5/8)
SILT (60%) sandy (fine grained quartz, chert and some limonite), micaceous, yellow brown (10YR 5/8) to gray (10YR 6/1) w/ depth
SILT (75%) little sand (very fine to fine grained, moderately sorted, subangular to subrounded), micaceous, scattered carbonaceous debris and fragments (<1 mm), occasional very fine grained glauconite, dark gray (5Y 4/1), very soupy
CLAY silty, micaceous, very carbonaceous, common pyrite zones and small grains, silt increases w/ depth, carbonaceous material decreases w/ depth, black (2.5Y 2/0), firm to moderately stiff, moderate plasticity
SILT sandy (fine grained w/ occasional medium grained, well sorted, subangular to subrounded), sand content increases rapidly w/ depth, common carbonaceous debris, micaceous, dark gray (5Y 4/1)
SAND (90%) fine grained, well sorted, subangular to subrounded, trace silt, micaceous, abundant carbonaceous debris, gray (5Y 5/1)
SAND (90%) fine grained, well sorted, subangular to subrounded, trace silt, micaceous, abundant carbonaceous wood fragments, occasional nodules of pyritized sand, gray (5Y 5/1)
SAND very fine to medium grained, well sorted, subrounded to rounded, clean, abundant carbonaceous wood fragments, gray brown (10YR 5/2)
165 TOTAL DEPTH
Upper Continental Deposits
Upper Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
51.94'
51.65'
51.3'
51.5'
81.3'
HU1 & HU2
UCRS
HU3
HU4
HU5
RGA
McNairy Flow System
1110101-0871
Pumped
2.2J ug/L TCE
0.8J ug/L 1,1 DCE
141J ug/L cis 1,2 DCE
19 +/- 18 pCi/L 99Tc
1110101-0872
Pumped
2553 ug/L TCE
442J ug/L cis 1,2 DCE
25 +/- 18 pCi/L 99Tc
1110101-0873
Pumped
268 ug/L TCE
2J ug/L 1,1 DCE
70J ug/L cis 1,2 DCE
46 +/- 19 pCi/L 99Tc
1110101-0874
Pumped
421 ug/L TCE
2.3J ug/L 1,1 DCE
134J ug/L cis 1,2 DCE
0.01J ug/L carbon tet
40 +/- 19 pCi/L 99Tc
1110101-0875
Bailed
1.6J ug/L TCE
Elevation: 377.19
PSOP Coord: 9,844.7, W 9,928.4
P4F1

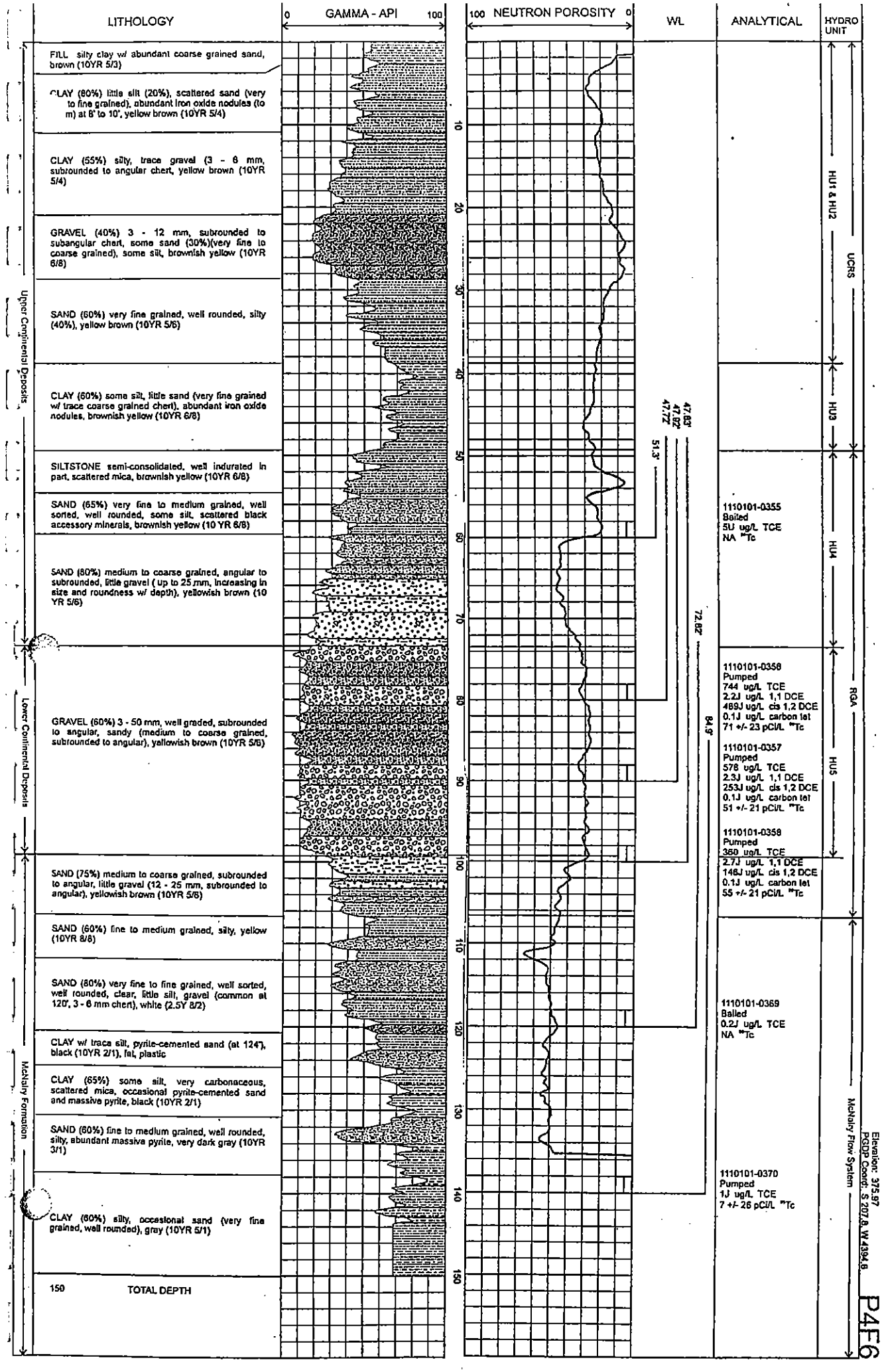
SILT (60%) sandy (very fine grained quartz), yellow brown (10YR 5/6), cohesive, sand content increases w/ depth
SAND (55%) very fine grained, subrounded quartz, silty, pale brown (10YR 8/4)
GRAVEL (60%) 3 - 6 mm, sandy (very fine grained), brownish yellow (10YR 6/6)
SAND (50%) very fine grained quartz, and SILT(50%), brownish yellow (10YR 6/6)
GRAVEL (60%) 3 - 6 mm, angular chert, sandy, trace silt, brownish yellow (10YR 6/6), sand content increases w/ depth
SAND (65%) very fine grained quartz, gravelly (3 - 6 mm, angular chert), brownish yellow (10 YR 6/6)
SAND (60%) very fine to fine grained, subangular to subrounded quartz, clayey, pale brown (10YR 8/4) to brownish yellow (10 YR 6/6), cohesive
SAND (65%) very fine to fine grained, subangular quartz, some silt, yellow (10YR 7/8)
SAND (65%) very fine grained quartz, gravelly (3 - 6 mm, angular chert), brownish yellow (10 YR 6/6)
GRAVEL (70%) 3 - 6 mm chert and sandstone, some sand (fine to coarse grained, subangular quartz), yellowish red (5YR 5/8)
GRAVEL (60%) 12 - 15 mm w/ fresh fractures indicating larger material, sandy (very coarse grained), strong brown (7.5YR 5/6)
GRAVEL (70%) 4 - 30 mm, some sand (very coarse grained), strong brown (7.5YR 5/8)
GRAVEL (60%) 4 - 30 mm w/ fresh fractures indicating larger material, some sand (very coarse grained), increase in iron oxide, strong brown (7.5YR 7/8)
SAND (70%) fine to medium grained quartz, some silt, strong brown (7.5YR 7/8), slightly cohesive
SAND (60%) fine to medium grained quartz, silty and clayey, strong brown (7.5YR 7/8), slightly cohesive
SILT (60%) and clay, sandy (very fine grained, subangular quartz), yellowish brown (10YR 5/6)
SILT (50%) and clay, sandy (very fine grained, subangular quartz), yellowish brown (10YR 5/6)
SILT and CLAY (75%), some sand (very fine grained quartz), trace black accessory minerals, dark gray (7.5YR 4/1), cohesive
SILT and CLAY (60%) sandy (very fine grained quartz), trace black accessory minerals, dark gray (7.5YR 4/1), cohesive
SAND (75%) very fine grained, silty, common accessory minerals, occasional glauconite, dark gray (7.5YR 4/1)
SILT (60%) clayey, common dark accessory minerals, abundant mica, trace sand (very fine to fine grained, subangular to subrounded, clear quartz), dark gray (10YR 4/1), moderately cohesive
CLAY (60%) silty, common biotite, some muscovite, dark gray (10YR 4/1), very cohesive, more dense than previous unit
170 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
54.33'
54.5'
54.55'
55'
No Recovery
No Recovery
1110101-0831
Pumped
1J ug/L TCE
32 +/- 20 pCi/L 99Tc
1110101-0832
Pumped
148 ug/L TCE
1J ug/L 1,1 DCE
42J ug/L cis 1,2 DCE
65 +/- 21 pCi/L 99Tc
1110101-0833
Pumped
580 ug/L TCE
2J ug/L 1,1 DCE
156J ug/L cis 1,2 DCE
1J ug/L carbon tet
100 +/- 23 pCi/L 99Tc
1110101-0834
Pumped
656 ug/L TCE
2J ug/L 1,1 DCE
166J ug/L cis 1,2 DCE
69 +/- 21 pCi/L 99Tc
1110101-0835
Pumped
19 ug/L TCE
13 +/- 18 pCi/L 99Tc
HU1 & HU2
UCR3
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 381.36
FSDP Coord: S 1021.4, W 3298.0

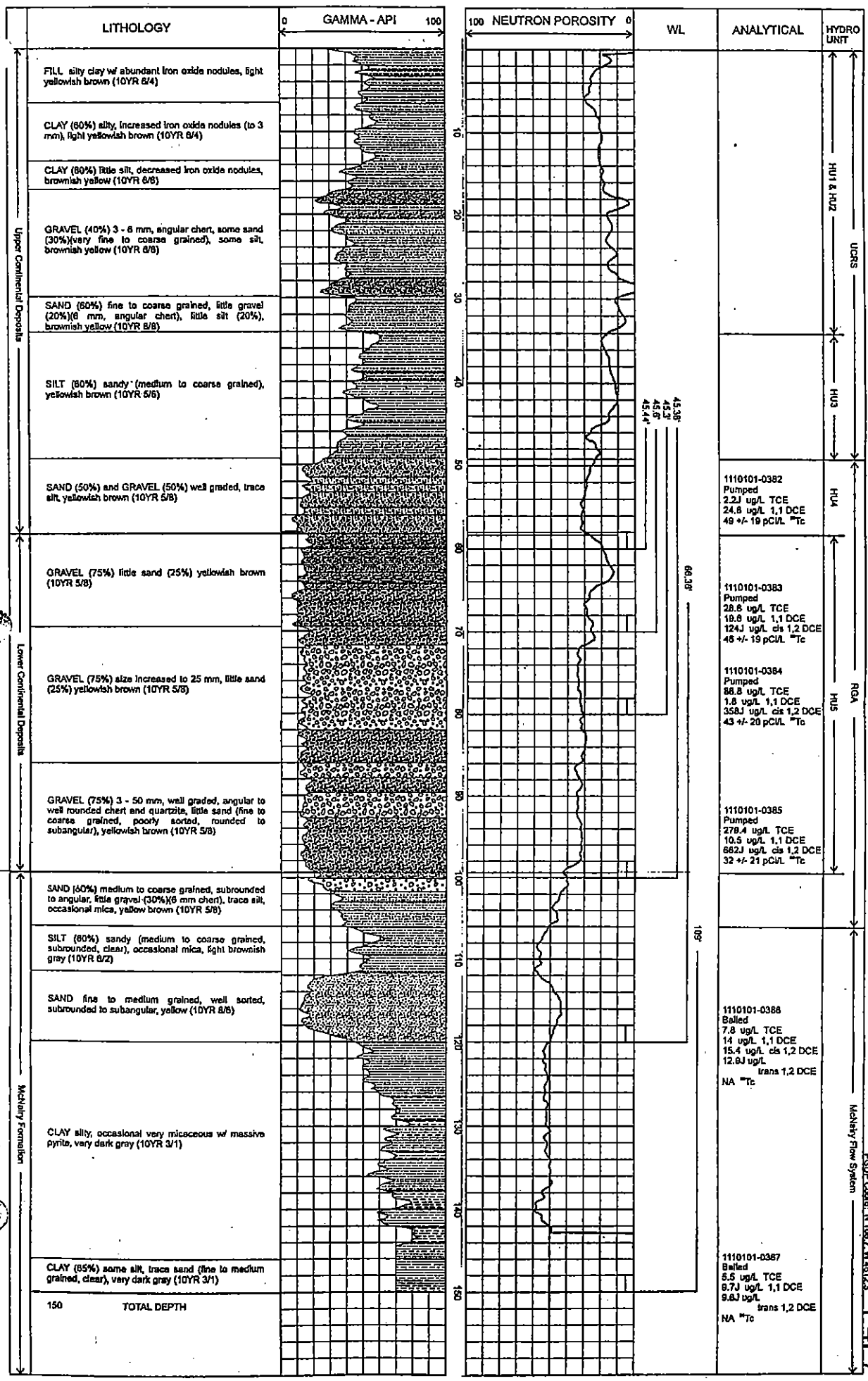
P4F2

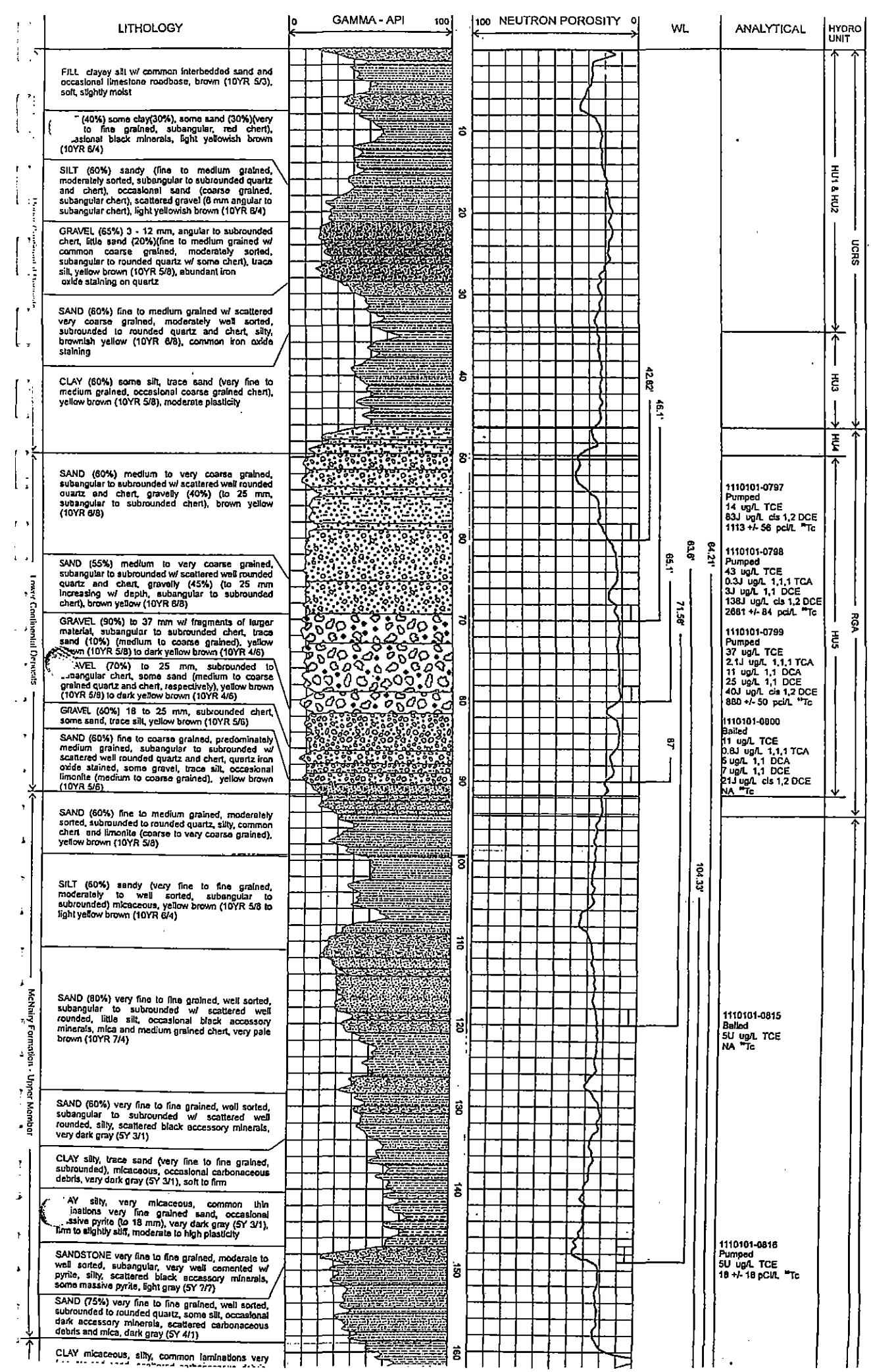

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
FILL predominantly silty clay w/ abundant organic debris to approximately 1.5', grading to silty clay at approximately 3'
SILT (60%) clayey, yellow brown (10YR 5/4) mottled light gray (10YR 6/1 to 5/1), firm, slightly moist, moderate to low plasticity
SILT (60%) clayey, scattered fine pebble chert gravels and iron oxide nodules, yellow brown (10YR 5/4) mottled light gray (10YR 6/1 to 5/1), firm, slightly moist, moderate to low plasticity
SILT (60%) clayey, scattered sand (fine grained, subrounded quartz), brown yellow (10YR 6/8) and gray (10YR 5/1), firm, slightly moist, majority of yellow brown color from iron oxide staining
SAND (65%) medium to very coarse grained, moderately sorted, subangular to subrounded quartz w/ some chert (most common in coarse fraction), some silt, brown yellow (10YR 6/6)
SILT (60%) clayey, scattered sand (very fine to fine grained quartz and chert) and gravel (very fine to fine pebble chert), yellow brown (10YR 5/6), firm to soft, moderate plasticity
GRAVEL (60%) to 12 mm, subangular to subrounded chert, some silt and sand (fine to very coarse grained, poorly sorted, subangular to subrounded), light yellow brown (10YR 6/4) to yellow brown (10YR 5/4)
SAND (50%) fine to medium grained, moderately sorted, subangular w/ common fine-grained iron oxide nodules, and SILT, gray (10YR 5/1) and yellow brown (10YR 5/8)
SILT (65%) some sand (fine grained, subrounded to subangular quartz w/ very coarse grained, subangular chert), occasional chert gravels to 3 mm, brown yellow (10YR 6/6) to yellow (10YR 7/6)
SILT (60%) clayey, trace sand, yellow brown (10YR 5/8) and gray (10YR 6/1), firm to soft, common iron oxide staining
GRAVEL (80%) 12 mm, subangular chert and occasional sandstone, little sand (medium to coarse grained quartz w/ some chert), yellow brown (10YR 5/8) and gray (10YR 6/1)
SILT (80%) little sand (very fine grained chert w/ some quartz), micaceous, trace black accessory minerals, light gray (10YR 7/2) to light brown gray (10YR 6/2)
SAND fine grained w/ scattered medium grained (predominately medium grained by 70'), well sorted, subrounded to rounded quartz, scattered mica and black accessory minerals, light gray (10YR 7/2)
GRAVEL (80%) to 12 mm, subrounded chert and carbonaceous shale, sandy (very coarse grained chert and black shale), light gray (10YR 7/2)
GRAVEL (65%) 6 mm w/ scattered 12 mm, angular to subrounded chert, little sand (coarse grained chert), brown yellow (10YR 6/8), gravel size increases w/ depth
GRAVEL (80%) up to 33 mm w/ fragments of larger material, subangular to subrounded chert, little sand (20%) (medium to very coarse grained, poorly sorted, subrounded to rounded quartz, clear), brown yellow (10YR 6/8)
GRAVEL (70%) angular to subrounded chert, some sand (medium to very coarse grained, poorly sorted, subrounded to rounded quartz, clear), yellow brown (10YR 5/8)
SILT (60%) clayey, abundant limonite lenses, usually massive, sandy in part, micaceous, gray (10YR5/1) w/ abundant yellow brown (10YR 5/8) staining
SILT (60%) sandy (very fine to fine grained, moderately sorted, subangular clear quartz w/ some chert, occasional medium grained, subrounded), common mica and scattered limonite-cemented sand, scattered massive pyrite, dark gray brown (10YR 4/2), soft, soupy
CLAY (60%) 1 mm laminations, silty, micaceous, trace sand (very fine grained quartz), becoming carbonaceous, very dark gray (10YR 3/1), soft, moderate to high plasticity
LIGNITE soft - firm, earthy to subwaxy texture, platy, appears to be wood fragments, abundant pyrite (massive w/ some pieces showing isometric structure), silt content increases at 120', black
SILT clayey, scattered sand (very fine grained), micaceous, dark gray (2.5Y N4/0), soft
SAND (60%) very fine grained to occasional fine grained, well sorted, subangular quartz w/ scattered dark accessory minerals, silty, abundant mica, trace glauconite and carbonaceous debris, dark gray (7.5YR N4/0)
SAND (60%) very fine grained to occasional fine grained, well sorted, subangular quartz w/ scattered dark accessory minerals, silty, abundant mica, trace glauconite with increase in carbonaceous material, dark gray (7.5YR N4/0)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
54.96'
56.1'
69.95'
88.53'
92.6'
HU1 & HU2
UCRS
HU3
HU4
HU5
RGA
McNairy Flow System
1110101-0391
Bailed
9.4J ug/L TCE
48J ug/L cis 1,2 DCE
NA 99Tc
1110101-0392
Pumped
0.3J ug/L TCE
96J ug/L cis 1,2 DCE
65 +/- 22 pCi/L 99Tc
1110101-0397
Pumped
330 ug/L TCE
2.9J ug/L 1,1 DCE
0.34J ug/L carbon tet
67 +/- 22 pCi/L 99Tc
1110101-0398
Pumped (Duplicate)
289 ug/L TCE
125J ug/L cis 1,2 DCE
0.12J ug/L carbon tet
73 +/- 20 pCi/L 99Tc
1110101-0399
Pumped
22 ug/L TCE
2 +/- 6 pCi/L 99Tc
1110101-0400
Bailed
0.2J ug/L TCE
NA 99Tc
Elevation: 382.28
PGDP Coord: S 1614.5, W 3059.0
P4E3

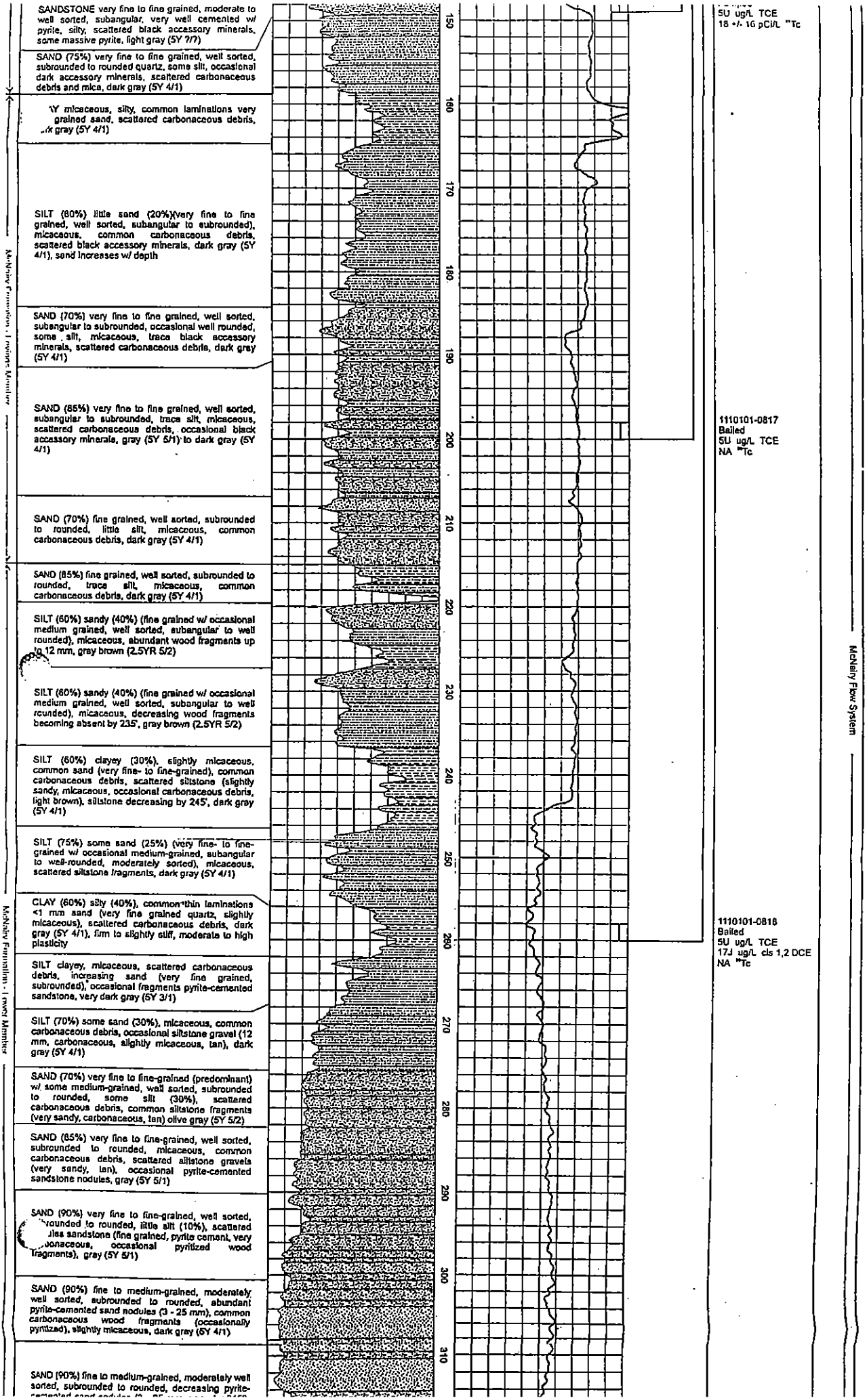
SILT (60%) clayey, trace sand (very fine grained, subrounded to rounded quartz w/ scattered fine grained chert), yellowish brown (10YR 5/6), soft to firm, moderate to low plasticity
CLAY (60%), silty, trace sand (very fine to fine grained, subangular to subrounded), light yellow brown (2.5Y 6/4), very soupy
SILT (60%) clayey, scattered sand (fine grained, subrounded chert and quartz), brown yellow (10YR 6/8), soft to firm
SILT (60%) clayey, scattered sand (fine grained, subrounded chert and quartz) and gravel (6 - 12 mm, subangular to subrounded chert), brown yellow (10YR 6/8), soft to firm
SILT (60%) clayey, scattered sand (fine grained, subrounded chert and quartz), brown yellow (10YR 6/8), soft to firm
SILT (60%) clayey, occasional iron oxide grains, becoming sandy w/ depth (fine grained, subangular to subrounded quartz), brown yellow (10YR 6/6)
SILT (60%) clayey, scattered sand (fine grained chert, quartz and carbonaceous shale), micaceous, light yellow brown (10YR 8/4)
SILT (60%) sandy (fine grained, very well sorted, subrounded to rounded quartz w/ occasional black accessory minerals), light yellow brown (10YR 6/4), interbedded w/ clayey silts, yellow brown (10YR 5/8)
SAND (70%) fine grained, very well sorted, subrounded to rounded, some silt, occasional black accessory minerals, light yellow brown (2.5Y 6/4), grain size increases w/ depth
SAND (80%) medium to coarse grained, moderately to poorly sorted, subrounded to rounded quartz w/ common chert and occasional black accessory minerals, little silt, scattered gravel (to 8 mm, chert), some iron staining, light yellow brown (2.5Y 6/4)
GRAVEL (60%) to 18mm, angular to subrounded chert, sandy (medium to coarse grained, subangular to well rounded quartz and chert), common iron staining, brown yellow (10YR 6/6 to 6/8)
CLAY trace sand (very fine to fine grained quartz), micaceous, very dark gray (5Y 3/1), firm, very
CLAY trace sand (very fine to fine grained quartz), micaceous, very dark gray (5Y 3/1), firm, very plastic, slight increase in silt
CLAY (60%) little silt (20%), trace sand (very fine to fine grained quartz), micaceous, very dark gray (5Y 3/1), firm, very plastic
SILT (60%) sandy (fine grained, subangular quartz) micaceous, scattered carbonaceous debris and glauconite, dark gray (5Y 4/1), soft
SAND (60%) very fine to fine grained, moderately sorted, subangular to subrounded quartz w/ some chert, iron stained, silty, micaceous, occasional carbonaceous debris, yellow brown (10YR 5/8)
SAND predominately fine grained w/ some medium grained, moderately sorted, subrounded to rounded quartz, common mica, iron stained, yellow brown (10YR 5/8)
SAND predominately fine grained w/ some medium grained, moderately sorted, subrounded to rounded quartz, common mica, iron stained, some silty clay interbeds, yellow brown (10YR 5/8)
SILT clayey, micaceous, yellow brown (10YR 5/8), soft, moderate plasticity
165 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
53.84'
61.84'
89.85'
98.5'
1110101-0881
Bailed
28 ug/L TCE
NA 99Tc
1110101-0882
Pumped
540 ug/L TCE
2J ug/L 1,1,1 TCA
34 ug/L 1,1 DCE
525J ug/L cis 1,2 DCE
24 +/- 20 pCi/L 99Tc
1110101-0883
Pumped (Duplicate)
383 ug/L TCE
2J ug/L 1,1,1 TCA
31 ug/L 1,1 DCE
512J ug/L cis 1,2 DCE
1J ug/L carbon tet
27 +/- 20 pCi/L 99Tc
1110101-0884
Bailed
220 ug/L TCE
1J ug/L 1,1,1 TCA
34 ug/L 1,1 DCE
105J ug/L cis 1,2 DCE
1J ug/L carbon tet
NA 99Tc
1110101-0888
Bailed
1J ug/L TCE
32J ug/L cis 1,2 DCE
NA 99Tc
UCRS
HU1 & HU2
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 381.44
PGDP Coord: S 21713, W 23457
P4F4

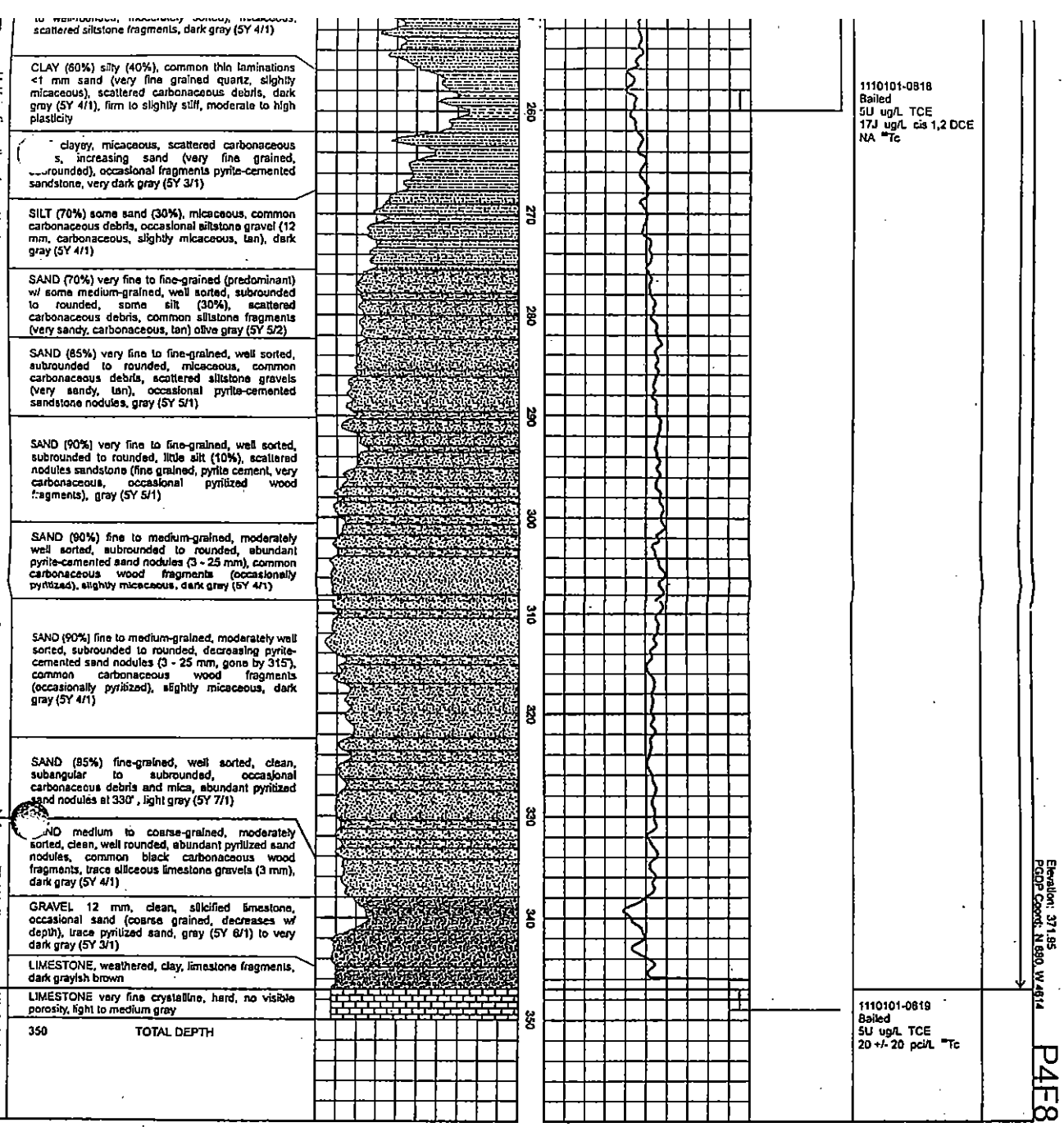

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SILT (70%) some sand (very fine grained, subangular), yellow brown (10YR 5/4), firm, cohesive
SAND (50%) very fine grained, subangular quartz and CLAY (50%), yellowish brown (10YR 5/6), firm, cohesive
GRAVEL (60%) 3 - 9 mm chert, silty, yellowish brown (10YR 5/6)
CLAY (80%) little sand (very fine grained, subangular quartz), yellowish brown (10YR 5/6)
CLAY (60%) sandy (very fine grained, subangular quartz), yellowish brown (10YR 5/6)
SAND (80%) very fine to fine grained quartz w/ occasional chert fragments, silty, yellowish brown (10YR 5/6)
SAND (80%) fine to coarse grained quartz w/ occasional chert fragments, little silt, yellowish brown (10YR 5/8)
GRAVEL (60%) up to 18 mm, sandy, yellow (10YR 7/8) (Does not agree with wireline logs)
SAND (90%) very fine grained, subangular quartz, some feldspar, trace silt, very pale brown (10YR 8/4), very loose flowing sand
GRAVEL (60%) 3 - 12 mm w/ fragments of larger pieces, chert, sandy, very pale brown (10YR 8/4)
GRAVEL (80%) 25 mm w/ fragments of larger pieces, chert, little sand, very pale brown (10YR 8/4)
GRAVEL (60%) 25 mm w/ fragments of larger pieces, chert, sandy, dark brown (10YR 3/3)
SILT (60%) clayey, trace very fine grained sand, yellowish brown (10YR 5/6)
CLAY micaceous, very dark gray (5Y 3/1), dense, very firm, very plastic
SILT (60%) sandy (very fine grained quartz), abundant black accessory minerals, very dark gray (5Y 3/1), less dense than Porters Creek, firm
SAND very fine to fine grained, moderately sorted, subrounded to rounded quartz, brownish yellow (10YR 6/8), loose, flowing
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
24.27'
59.62'
70.5'
129.8'
128'
1110101-0826
Pumped
1400 ug/L TCE
25J ug/L cis 1,2 DCE
27 +/- 23 pCi/L 99Tc
1110101-0827
Bailed
560 ug/L TCE
1J ug/L 1,1 DCE
19J ug/L cis 1,2 DCE
NA 99Tc
1110101-0828
Pumped
37 ug/L TCE
23 ug/L 1,1,1 TCA
35 ug/L 1,1 DCA
210 ug/L 1,1 DCE
382 +/- 35 pCi/L 99Tc
1110101-0829
Bailed
1U ug/L TCE
83J ug/L cis 1,2 DCE
11 +/- 18 pCi/L 99Tc
1110101-0830
Bailed
1U ug/L TCE
17 +/- 18 pCi/L 99Tc
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Elevation: 381.68
PGDP Coord: S 2668.5, W 2095.9
P4E5

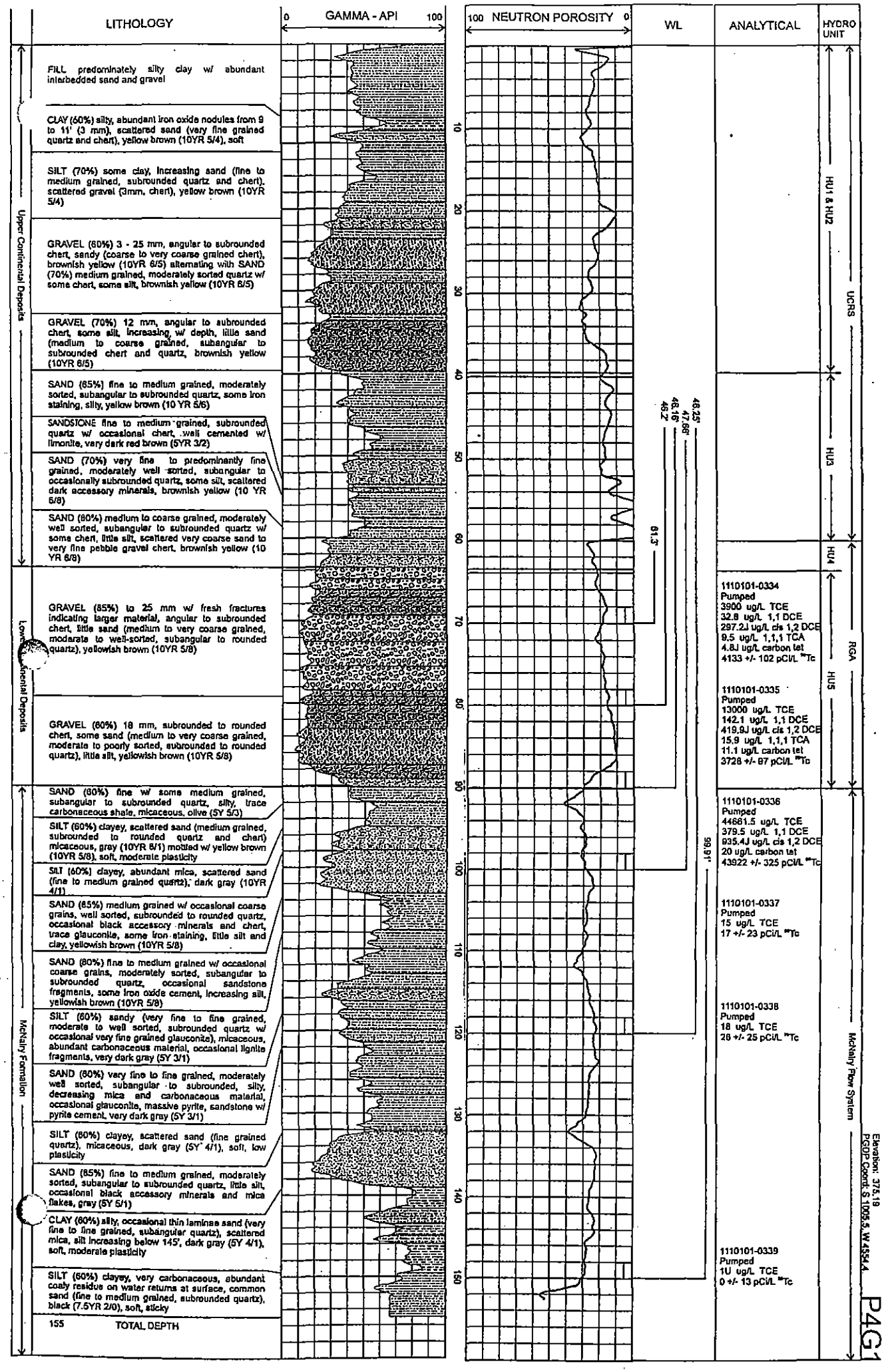

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
FILL silty clay w/ abundant coarse grained sand, brown (10YR 5/3)
CLAY (60%) little silt (20%), scattered sand (very to fine grained), abundant iron oxide nodules (to m) at 8' to 10', yellow brown (10YR 5/4)
CLAY (55%) silty, trace gravel (3 - 6 mm, subrounded to angular chert, yellow brown (10YR 5/4)
GRAVEL (40%) 3 - 12 mm, subrounded to subangular chert, some sand (30%)(very fine to coarse grained), some silt, brownish yellow (10YR 6/8)
SAND (60%) very fine grained, well rounded, silty (40%), yellow brown (10YR 5/6)
CLAY (60%) some silt, little sand (very fine grained w/ trace coarse grained chert), abundant iron oxide nodules, brownish yellow (10YR 6/8)
SILTSTONE semi-consolidated, well indurated in part, scattered mica, brownish yellow (10YR 6/8)
SAND (65%) very fine to medium grained, well sorted, well rounded, some silt, scattered black accessory minerals, brownish yellow (10 YR 6/8)
SAND (80%) medium to coarse grained, angular to subrounded, little gravel (up to 25 mm, increasing in size and roundness w/ depth), yellowish brown (10 YR 5/6)
GRAVEL (60%) 3 - 50 mm, well graded, subrounded to angular, sandy (medium to coarse grained, subrounded to angular), yellowish brown (10YR 5/6)
SAND (75%) medium to coarse grained, subrounded to angular, little gravel (12 - 25 mm, subrounded to angular), yellowish brown (10YR 5/6)
SAND (60%) fine to medium grained, silty, yellow (10YR 8/8)
SAND (80%) very fine to fine grained, well sorted, well rounded, clear, little silt, gravel (common at 120', 3 - 6 mm chert), white (2.5Y 8/2)
CLAY w/ trace silt, pyrite-cemented sand (at 124'), black (10YR 2/1), fat, plastic
CLAY (65%) some silt, very carbonaceous, scattered mica, occasional pyrite-cemented sand and massive pyrite, black (10YR 2/1)
SAND (60%) fine to medium grained, well rounded, silty, abundant massive pyrite, very dark gray (10YR 3/1)
CLAY (60%) silty, occasional sand (very fine grained, well rounded), gray (10YR 5/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
47.83'
47.82'
47.72'
51.3'
72.82'
84.9'
1110101-0355
Bailed
5U ug/L TCE
NA 99Tc
1110101-0356
Pumped
744 ug/L TCE
2.2J ug/L 1,1 DCE
469J ug/L cis 1,2 DCE
0.1J ug/L carbon tet
71 +/- 23 pCi/L 99Tc
1110101-0357
Pumped
578 ug/L TCE
2.3J ug/L 1,1 DCE
253J ug/L cis 1,2 DCE
0.1J ug/L carbon tet
51 +/- 21 pCi/L 99Tc
1110101-0358
Pumped
360 ug/L TCE
2.7J ug/L 1,1 DCE
148J ug/L cis 1,2 DCE
0.1J ug/L carbon tet
55 +/- 21 pCi/L 99Tc
1110101-0369
Bailed
0.2J ug/L TCE
NA 99Tc
1110101-0370
Pumped
1J ug/L TCE
7 +/- 26 pCi/L 99Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 375.97
PGDP Coord: S 207,8, W 4394.6
P4F6

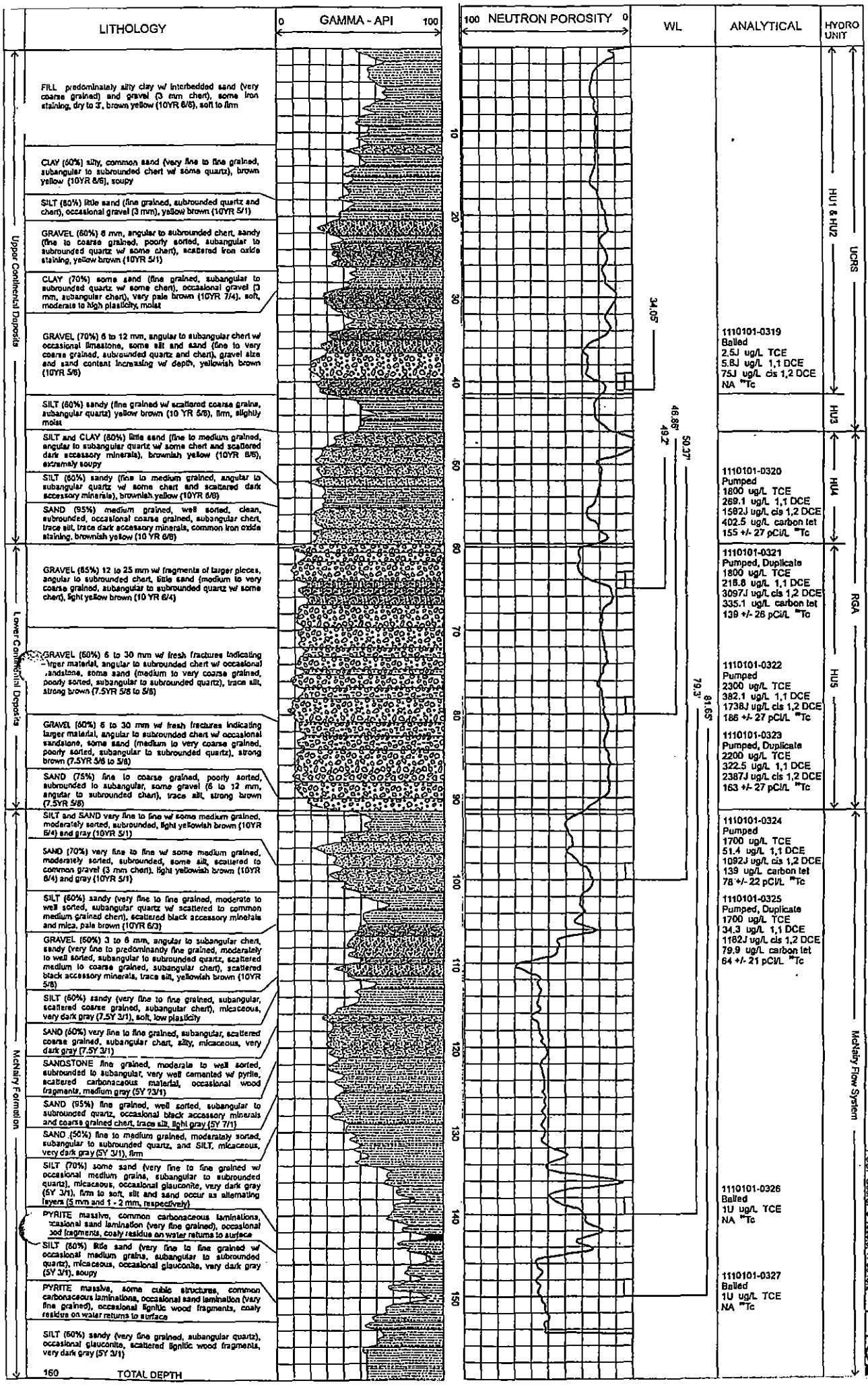

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
FILL silty clay w/ abundant iron oxide nodules, light yellowish brown (10YR 6/4)
CLAY (60%) silty, increased iron oxide nodules (to 3 mm), light yellowish brown (10YR 6/4)
CLAY (60%) little silt, decreased iron oxide nodules, brownish yellow (10YR 6/6)
GRAVEL (40%) 3 - 6 mm, angular chert, some sand (30%)(very fine to coarse grained), some silt, brownish yellow (10YR 6/6)
SAND (60%) fine to coarse grained, little gravel (20%)(6 mm, angular chert), little silt (20%), brownish yellow (10YR 6/6)
SILT (60%) sandy (medium to coarse grained), yellowish brown (10YR 5/6)
SAND (50%) and GRAVEL (50%) well graded, trace silt, yellowish brown (10YR 5/8)
GRAVEL (75%) little sand (25%) yellowish brown (10YR 5/8)
GRAVEL (75%) size increased to 25 mm, little sand (25%) yellowish brown (10YR 5/8)
GRAVEL (75%) 3 - 50 mm, well graded, angular to well rounded chert and quartzite, little sand (fine to coarse grained, poorly sorted, rounded to subangular), yellowish brown (10YR 5/8)
SAND (60%) medium to coarse grained, subrounded to angular, little gravel (30%)(6 mm chert), trace silt, occasional mica, yellow brown (10YR 5/8)
SILT (60%) sandy (medium to coarse grained, subrounded, clear), occasional mica, light brownish gray (10YR 6/2)
SAND fine to medium grained, well sorted, subrounded to subangular, yellow (10YR 8/6)
CLAY silty, occasional very micaceous w/ massive pyrite, very dark gray (10YR 3/1)
CLAY (65%) some silt, trace sand (fine to medium grained, clear), very dark gray (10YR 3/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
45.38'
45.2'
45.6'
45.4'
66.38'
109'
HU1 & HU2
UCRS
HU3
HU4
HU5
RGA
McNairy Flow System
1110101-0382
Pumped
2.2J ug/L TCE
24.8 ug/L 1,1 DCE
49 +/- 19 pCi/L 99Tc
1110101-0383
Pumped
28.6 ug/L TCE
19.6 ug/L 1,1 DCE
124J ug/L cis 1,2 DCE
45 +/- 19 pCi/L 99Tc
1110101-0384
Pumped
86.8 ug/L TCE
1.8 ug/L 1,1 DCE
358J ug/L cis 1,2 DCE
43 +/- 20 pCi/L 99Tc
1110101-0385
Pumped
278.4 ug/L TCE
10.5 ug/L 1,1 DCE
862J ug/L cis 1,2 DCE
32 +/- 21 pCi/L 99Tc
1110101-0386
Bailed
7.8 ug/L TCE
14 ug/L 1,1 DCE
15.4 ug/L cis 1,2 DCE
12.6J ug/L trans 1,2 DCE
NA 99Tc
1110101-0387
Bailed
5.5 ug/L TCE
9.7J ug/L 1,1 DCE
9.6J ug/L trans 1,2 DCE
NA 99Tc
Elevation: 372.09
P4F7


LITHOLOGY
GAMMA - API
0
100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
FILL clayey silt w/ common interbedded sand and occasional limestone roadbase, brown (10YR 5/3), soft, slightly moist
(40%) some clay(30%), some sand (30%)(very to fine grained, subangular, red chert), ...sional black minerals, light yellowish brown (10YR 6/4)
SILT (60%) sandy (fine to medium grained, moderately sorted, subangular to subrounded quartz and chert), occasional sand (coarse grained, subangular chert), scattered gravel (8 mm angular to subangular chert), light yellowish brown (10YR 6/4)
GRAVEL (65%) 3 - 12 mm, angular to subrounded chert, little sand (20%)(fine to medium grained w/ common coarse grained, moderately sorted, subangular to rounded quartz w/ some chert), trace silt, yellow brown (10YR 5/8), abundant iron oxide staining on quartz
SAND (60%) fine to medium grained w/ scattered very coarse grained, moderately well sorted, subrounded to rounded quartz and chert, silty, brownish yellow (10YR 6/8), common iron oxide staining
CLAY (60%) some silt, trace sand (very fine to medium grained, occasional coarse grained chert), yellow brown (10YR 5/8), moderate plasticity
SAND (60%) medium to very coarse grained, subangular to subrounded w/ scattered well rounded quartz and chert, gravelly (40%) (to 25 mm, subangular to subrounded chert), brown yellow (10YR 6/8)
SAND (55%) medium to very coarse grained, subangular to subrounded w/ scattered well rounded quartz and chert, gravelly (45%) (to 25 mm increasing w/ depth, subangular to subrounded chert), brown yellow (10YR 6/8)
GRAVEL (90%) to 37 mm w/ fragments of larger material, subangular to subrounded chert, trace sand (10%) (medium to coarse grained), yellow ...wn (10YR 5/8) to dark yellow brown (10YR 4/6)
...AVEL (70%) to 25 mm, subrounded to ...bangular chert, some sand (medium to coarse grained quartz and chert, respectively), yellow brown (10YR 5/8) to dark yellow brown (10YR 4/6)
GRAVEL (60%) 18 to 25 mm, subrounded chert, some sand, trace silt, yellow brown (10YR 5/6)
SAND (60%) fine to coarse grained, predominately medium grained, subangular to subrounded w/ scattered well rounded quartz and chert, quartz iron oxide stained, some gravel, trace silt, occasional limonite (medium to coarse grained), yellow brown (10YR 5/6)
SAND (60%) fine to medium grained, moderately sorted, subrounded to rounded quartz, silty, common chert and limonite (coarse to very coarse grained), yellow brown (10YR 5/8)
SILT (60%) sandy (very fine to fine grained, moderately to well sorted, subangular to subrounded) micaceous, yellow brown (10YR 5/8 to light yellow brown (10YR 6/4)
SAND (80%) very fine to fine grained, well sorted, subangular to subrounded w/ scattered well rounded, little silt, occasional black accessory minerals, mica and medium grained chert, very pale brown (10YR 7/4)
SAND (60%) very fine to fine grained, well sorted, subangular to subrounded w/ scattered well rounded, silty, scattered black accessory minerals, very dark gray (5Y 3/1)
CLAY silty, trace sand (very fine to fine grained, subrounded), micaceous, occasional carbonaceous debris, very dark gray (5Y 3/1), soft to firm
...AY silty, very micaceous, common thin ...inations very fine grained sand, occasional ...ssive pyrite (to 18 mm), very dark gray (5Y 3/1), firm to slightly stiff, moderate to high plasticity
SANDSTONE very fine to fine grained, moderate to well sorted, subangular, very well cemented w/ pyrite, silty, scattered black accessory minerals, some massive pyrite, light gray (5Y 7/7)
SAND (75%) very fine to fine grained, well sorted, subrounded to rounded quartz, some silt, occasional dark accessory minerals, scattered carbonaceous debris and mica, dark gray (5Y 4/1)
CLAY micaceous, silty, common laminations very
Lower Continental Deposits
McNairy Formation - Upper Member
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
42.82'
46.1'
65.1'
71.58'
83.6'
87'
104.33'
64.21'
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
1110101-0797
Pumped
14 ug/L TCE
83J ug/L cis 1,2 DCE
1113 +/- 56 pci/L 99Tc
1110101-0798
Pumped
43 ug/L TCE
0.3J ug/L 1,1,1 TCA
3J ug/L 1,1 DCE
138J ug/L cis 1,2 DCE
2681 +/- 84 pci/L 99Tc
1110101-0799
Pumped
37 ug/L TCE
2.1J ug/L 1,1,1 TCA
11 ug/L 1,1 DCA
25 ug/L 1,1 DCE
40J ug/L cis 1,2 DCE
880 +/- 50 pci/L 99Tc
1110101-0800
Bailed
11 ug/L TCE
0.8J ug/L 1,1,1 TCA
5 ug/L 1,1 DCA
7 ug/L 1,1 DCE
21J ug/L cis 1,2 DCE
NA 99Tc
1110101-0815
Bailed
5U ug/L TCE
NA 99Tc
1110101-0816
Pumped
5U ug/L TCE
18 +/- 18 pCi/L 99Tc


SANDSTONE very fine to fine grained, moderate to well sorted, subangular, very well cemented w/ pyrite, silty, scattered black accessory minerals, some massive pyrite, light gray (5Y 7/7)
SAND (75%) very fine to fine grained, well sorted, subrounded to rounded quartz, some silt, occasional dark accessory minerals, scattered carbonaceous debris and mica, dark gray (5Y 4/1)
micaceous, silty, common laminations very grained sand, scattered carbonaceous debris, dark gray (5Y 4/1)
SILT (60%) little sand (20%)(very fine to fine grained, well sorted, subangular to subrounded), micaceous, common carbonaceous debris, scattered black accessory minerals, dark gray (5Y 4/1), sand increases w/ depth
SAND (70%) very fine to fine grained, well sorted, subangular to subrounded, occasional well rounded, some silt, micaceous, trace black accessory minerals, scattered carbonaceous debris, dark gray (5Y 4/1)
SAND (85%) very fine to fine grained, well sorted, subangular to subrounded, trace silt, micaceous, scattered carbonaceous debris, occasional black accessory minerals, gray (5Y 5/1) to dark gray (5Y 4/1)
SAND (70%) fine grained, well sorted, subrounded to rounded, little silt, micaceous, common carbonaceous debris, dark gray (5Y 4/1)
SAND (85%) fine grained, well sorted, subrounded to rounded, trace silt, micaceous, common carbonaceous debris, dark gray (5Y 4/1)
SILT (60%) sandy (40%) (fine grained w/ occasional medium grained, well sorted, subangular to well rounded), micaceous, abundant wood fragments up to 12 mm, gray brown (2.5YR 5/2)
SILT (60%) sandy (40%) (fine grained w/ occasional medium grained, well sorted, subangular to well rounded), micaceous, decreasing wood fragments becoming absent by 235', gray brown (2.5YR 5/2)
SILT (60%) clayey (30%), slightly micaceous, common sand (very fine- to fine-grained), common carbonaceous debris, scattered siltstone (slightly sandy, micaceous, occasional carbonaceous debris, light brown), siltstone decreasing by 245', dark gray (5Y 4/1)
SILT (75%) some sand (25%) (very fine- to fine-grained w/ occasional medium-grained, subangular to well-rounded, moderately sorted), micaceous, scattered siltstone fragments, dark gray (5Y 4/1)
CLAY (60%) silty (40%), common thin laminations <1 mm sand (very fine grained quartz, slightly micaceous), scattered carbonaceous debris, dark gray (5Y 4/1), firm to slightly stiff, moderate to high plasticity
SILT clayey, micaceous, scattered carbonaceous debris, increasing sand (very fine grained, subrounded), occasional fragments pyrite-cemented sandstone, very dark gray (5Y 3/1)
SILT (70%) some sand (30%), micaceous, common carbonaceous debris, occasional siltstone gravel (12 mm, carbonaceous, slightly micaceous, tan), dark gray (5Y 4/1)
SAND (70%) very fine to fine-grained (predominant) w/ some medium-grained, well sorted, subrounded to rounded, some silt (30%), scattered carbonaceous debris, common siltstone fragments (very sandy, carbonaceous, tan) olive gray (5Y 5/2)
SAND (85%) very fine to fine-grained, well sorted, subrounded to rounded, micaceous, common carbonaceous debris, scattered siltstone gravels (very sandy, tan), occasional pyrite-cemented sandstone nodules, gray (5Y 5/1)
SAND (90%) very fine to fine-grained, well sorted, rounded to rounded, little silt (10%), scattered sandstone (fine grained, pyrite cement, very carbonaceous, occasional pyritized wood fragments), gray (5Y 5/1)
SAND (90%) fine to medium-grained, moderately well sorted, subrounded to rounded, abundant pyrite-cemented sand nodules (3 - 25 mm), common carbonaceous wood fragments (occasionally pyritized), slightly micaceous, dark gray (5Y 4/1)
SAND (90%) fine to medium-grained, moderately well sorted, subrounded to rounded, decreasing pyrite-
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
5U ug/L TCE
18 +/- 16 pCi/L 99Tc
1110101-0817
Bailed
5U ug/L TCE
NA 99Tc
1110101-0818
Bailed
5U ug/L TCE
17J ug/L cis 1,2 DCE
NA 99Tc
McMinn Formation - Lower Member
McNairy Formation - Upper Member
McNairy Flow System

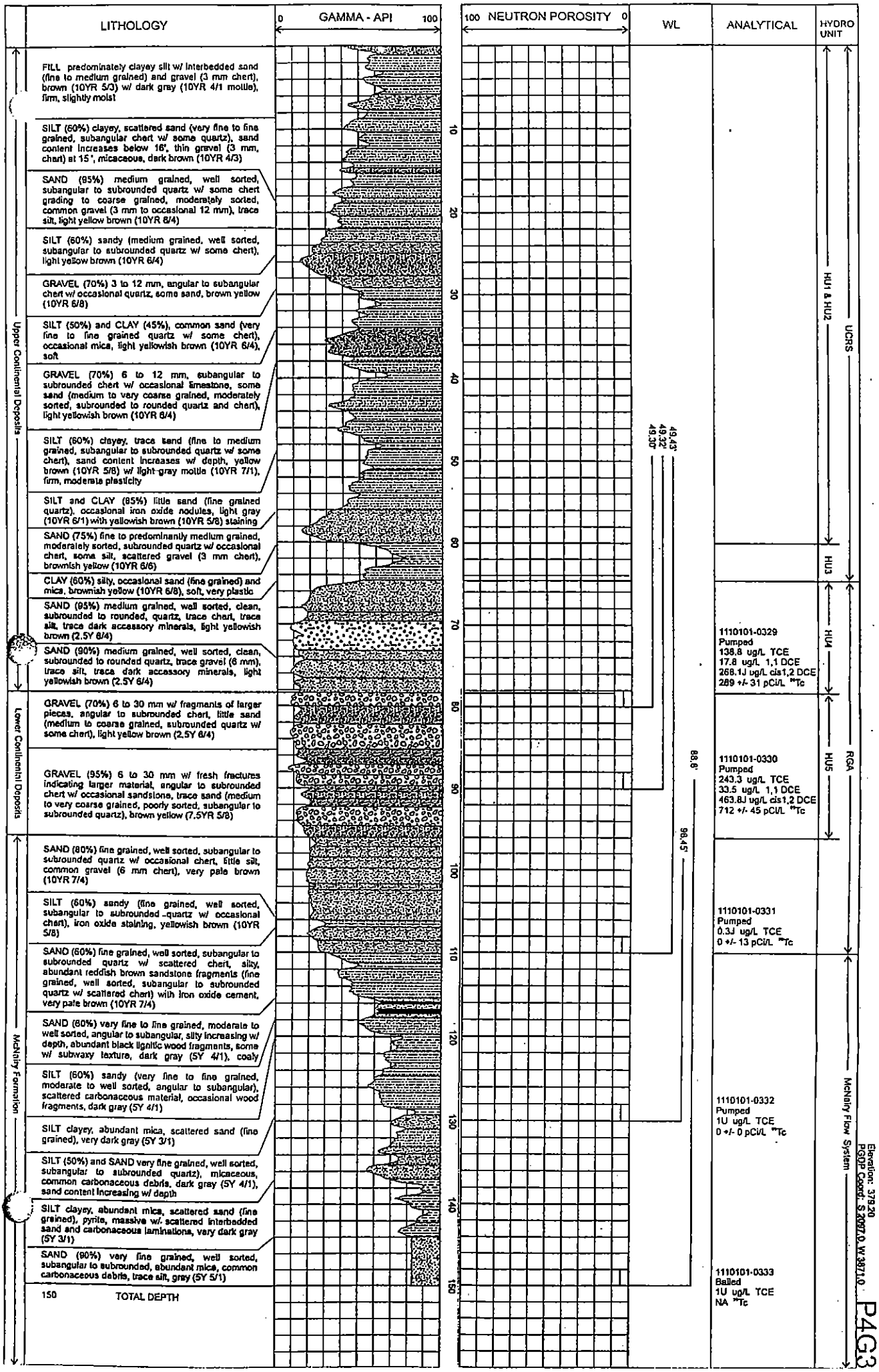

scattered siltstone fragments, dark gray (5Y 4/1)
CLAY (60%) silty (40%), common thin laminations <1 mm sand (very fine grained quartz, slightly micaceous), scattered carbonaceous debris, dark gray (5Y 4/1), firm to slightly stiff, moderate to high plasticity
clayey, micaceous, scattered carbonaceous s, increasing sand (very fine grained, rounded), occasional fragments pyrite-cemented sandstone, very dark gray (5Y 3/1)
SILT (70%) some sand (30%), micaceous, common carbonaceous debris, occasional siltstone gravel (12 mm, carbonaceous, slightly micaceous, tan), dark gray (5Y 4/1)
SAND (70%) very fine to fine-grained (predominant) w/ some medium-grained, well sorted, subrounded to rounded, some silt (30%), scattered carbonaceous debris, common siltstone fragments (very sandy, carbonaceous, tan) olive gray (5Y 5/2)
SAND (85%) very fine to fine-grained, well sorted, subrounded to rounded, micaceous, common carbonaceous debris, scattered siltstone gravels (very sandy, tan), occasional pyrite-cemented sandstone nodules, gray (5Y 5/1)
SAND (90%) very fine to fine-grained, well sorted, subrounded to rounded, little silt (10%), scattered nodules sandstone (fine grained, pyrite cement, very carbonaceous, occasional pyritized wood fragments), gray (5Y 5/1)
SAND (90%) fine to medium-grained, moderately well sorted, subrounded to rounded, abundant pyrite-cemented sand nodules (3 - 25 mm), common carbonaceous wood fragments (occasionally pyritized), slightly micaceous, dark gray (5Y 4/1)
SAND (90%) fine to medium-grained, moderately well sorted, subrounded to rounded, decreasing pyrite-cemented sand nodules (3 - 25 mm, gone by 315'), common carbonaceous wood fragments (occasionally pyritized), slightly micaceous, dark gray (5Y 4/1)
SAND (85%) fine-grained, well sorted, clean, subangular to subrounded, occasional carbonaceous debris and mica, abundant pyritized sand nodules at 330', light gray (5Y 7/1)
ND medium to coarse-grained, moderately sorted, clean, well rounded, abundant pyritized sand nodules, common black carbonaceous wood fragments, trace siliceous limestone gravels (3 mm), dark gray (5Y 4/1)
GRAVEL 12 mm, clean, silicified limestone, occasional sand (coarse grained, decreases w/ depth), trace pyritized sand, gray (5Y 6/1) to very dark gray (5Y 3/1)
LIMESTONE, weathered, clay, limestone fragments, dark grayish brown
LIMESTONE very fine crystalline, hard, no visible porosity, light to medium gray
350 TOTAL DEPTH
"Rubble Zone"
Mississippian Limestone
260
270
280
290
300
310
320
330
340
350
1110101-0818
Bailed
5U ug/L TCE
17J ug/L cis 1,2 DCE
NA pCi/L Tc
1110101-0819
Bailed
5U ug/L TCE
20 +/- 20 pci/L Tc
Elevation: 371.95
PGDP Coord: N 690, W 4614
P4F8

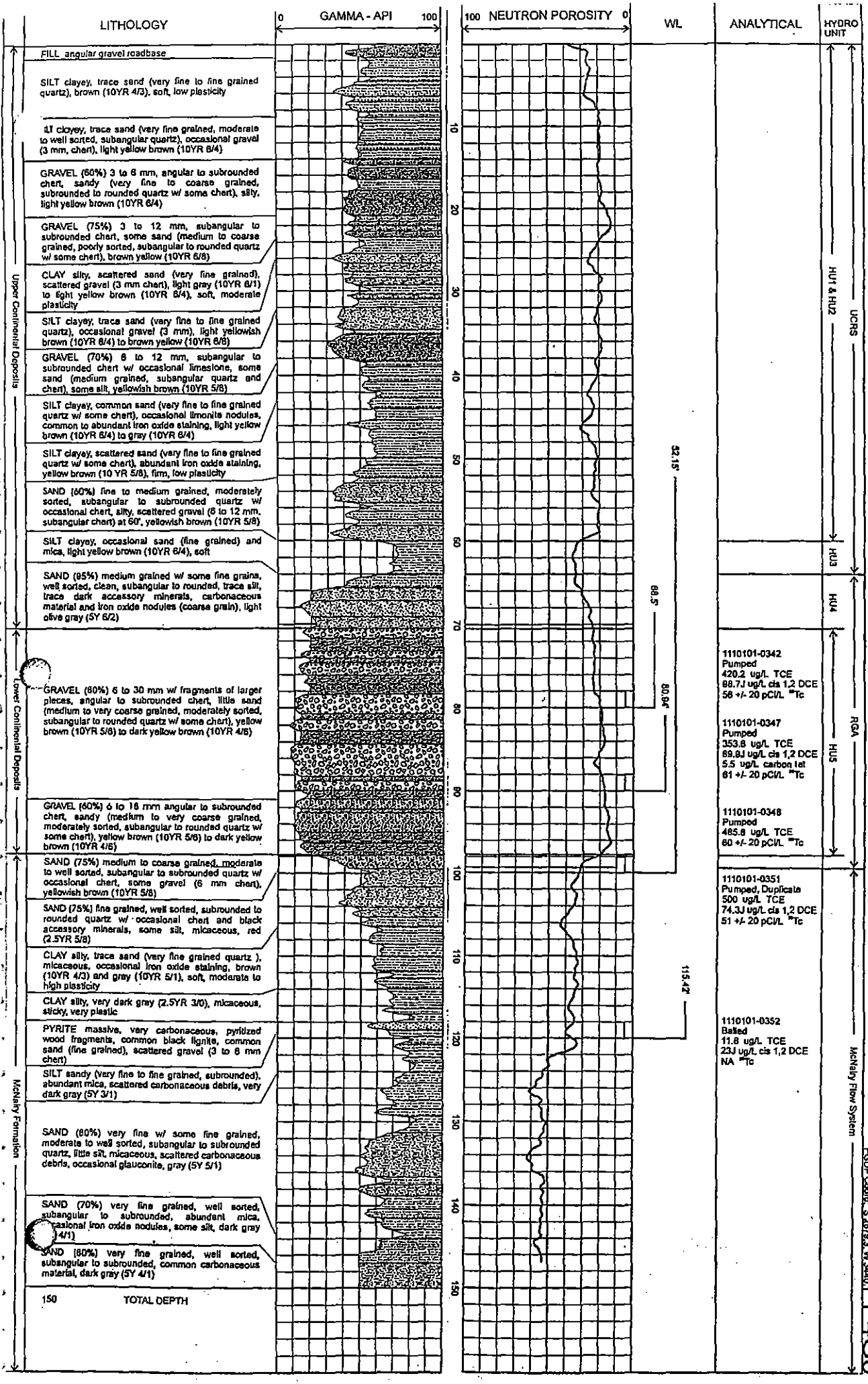

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
FILL predominately silty clay w/ abundant interbedded sand and gravel
CLAY (60%) silty, abundant iron oxide nodules from 9 to 11' (3 mm), scattered sand (very fine grained quartz and chert), yellow brown (10YR 5/4), soft
SILT (70%) some clay, increasing sand (fine to medium grained, subrounded quartz and chert), scattered gravel (3mm, chert), yellow brown (10YR 5/4)
GRAVEL (60%) 3 - 25 mm, angular to subrounded chert, sandy (coarse to very coarse grained chert), brownish yellow (10YR 6/5) alternating with SAND (70%) medium grained, moderately sorted quartz w/ some chert, some silt, brownish yellow (10YR 6/5)
GRAVEL (70%) 12 mm, angular to subrounded chert, some silt, increasing w/ depth, little sand (medium to coarse grained, subangular to subrounded chert and quartz, brownish yellow (10YR 6/5)
SAND (65%) fine to medium grained, moderately sorted, subangular to subrounded quartz, some iron staining, silty, yellow brown (10 YR 5/6)
SANDSTONE fine to medium grained, subrounded quartz w/ occasional chert, well cemented w/ limonite, very dark red brown (5YR 3/2)
SAND (70%) very fine to predominantly fine grained, moderately well sorted, subangular to occasionally subrounded quartz, some silt, scattered dark accessory minerals, brownish yellow (10 YR 6/8)
SAND (80%) medium to coarse grained, moderately well sorted, subangular to subrounded quartz w/ some chert, little silt, scattered very coarse sand to very fine pebble gravel chert, brownish yellow (10 YR 6/8)
GRAVEL (85%) to 25 mm w/ fresh fractures indicating larger material, angular to subrounded chert, little sand (medium to very coarse grained, moderate to well-sorted, subangular to rounded quartz), yellowish brown (10YR 5/8)
GRAVEL (80%) 18 mm, subrounded to rounded chert, some sand (medium to very coarse grained, moderate to poorly sorted, subrounded to rounded quartz), little silt, yellowish brown (10YR 5/8)
SAND (80%) fine w/ some medium grained, subangular to subrounded quartz, silty, trace carbonaceous shale, micaceous, olive (5Y 5/3)
SILT (60%) clayey, scattered sand (medium grained, subrounded to rounded quartz and chert) micaceous, gray (10YR 6/1) mottled w/ yellow brown (10YR 5/8), soft, moderate plasticity
SILT (60%) clayey, abundant mica, scattered sand (fine to medium grained quartz), dark gray (10YR 4/1)
SAND (65%) medium grained w/ occasional coarse grains, well sorted, subrounded to rounded quartz, occasional black accessory minerals and chert, trace glauconite, some iron staining, little silt and clay, yellowish brown (10YR 5/8)
SAND (80%) fine to medium grained w/ occasional coarse grains, moderately sorted, subangular to subrounded quartz, occasional sandstone fragments, some iron oxide cement, increasing silt, yellowish brown (10YR 5/8)
SILT (60%) sandy (very fine to fine grained, moderate to well sorted, subrounded quartz w/ occasional very fine grained glauconite), micaceous, abundant carbonaceous material, occasional lignite fragments, very dark gray (5Y 3/1)
SAND (60%) very fine to fine grained, moderately well sorted, subangular to subrounded, silty, decreasing mica and carbonaceous material, occasional glauconite, massive pyrite, sandstone w/ pyrite cement, very dark gray (5Y 3/1)
SILT (80%) clayey, scattered sand (fine grained quartz), micaceous, dark gray (5Y 4/1), soft, low plasticity
SAND (85%) fine to medium grained, moderately sorted, subangular to subrounded quartz, little silt, occasional black accessory minerals and mica flakes, gray (5Y 5/1)
CLAY (60%) silty, occasional thin laminae sand (very fine to fine grained, subangular quartz), scattered mica, silt increasing below 145', dark gray (5Y 4/1), soft, moderate plasticity
SILT (60%) clayey, very carbonaceous, abundant coaly residue on water returns at surface, common sand (fine to medium grained, subrounded quartz), black (7.5YR 2/0), soft, sticky
155 TOTAL DEPTH
48.25'
47.66'
46.16'
46.2'
61.3'
99.91'
HU1 & HU2
UCRS
HU3
HU4
HU5
RGA
McNairy Flow System
1110101-0334
Pumped
3900 ug/L TCE
32.8 ug/L 1,1 DCE
297.2J ug/L cis 1,2 DCE
9.5 ug/L 1,1,1 TCA
4.8J ug/L carbon tet
4133 +/- 102 pCi/L 99Tc
1110101-0335
Pumped
13000 ug/L TCE
142.1 ug/L 1,1 DCE
419.9J ug/L cis 1,2 DCE
15.9 ug/L 1,1,1 TCA
11.1 ug/L carbon tet
3726 +/- 87 pCi/L 99Tc
1110101-0336
Pumped
44661.5 ug/L TCE
379.5 ug/L 1,1 DCE
935.4J ug/L cis 1,2 DCE
20 ug/L carbon tet
43922 +/- 325 pCi/L 99Tc
1110101-0337
Pumped
15 ug/L TCE
17 +/- 23 pCi/L 99Tc
1110101-0338
Pumped
18 ug/L TCE
28 +/- 25 pCi/L 99Tc
1110101-0339
Pumped
1U ug/L TCE
0 +/- 13 pCi/L 99Tc
Elevation: 375.19
PGDP Coord: S 1005.5, W 4554.4
P4G1

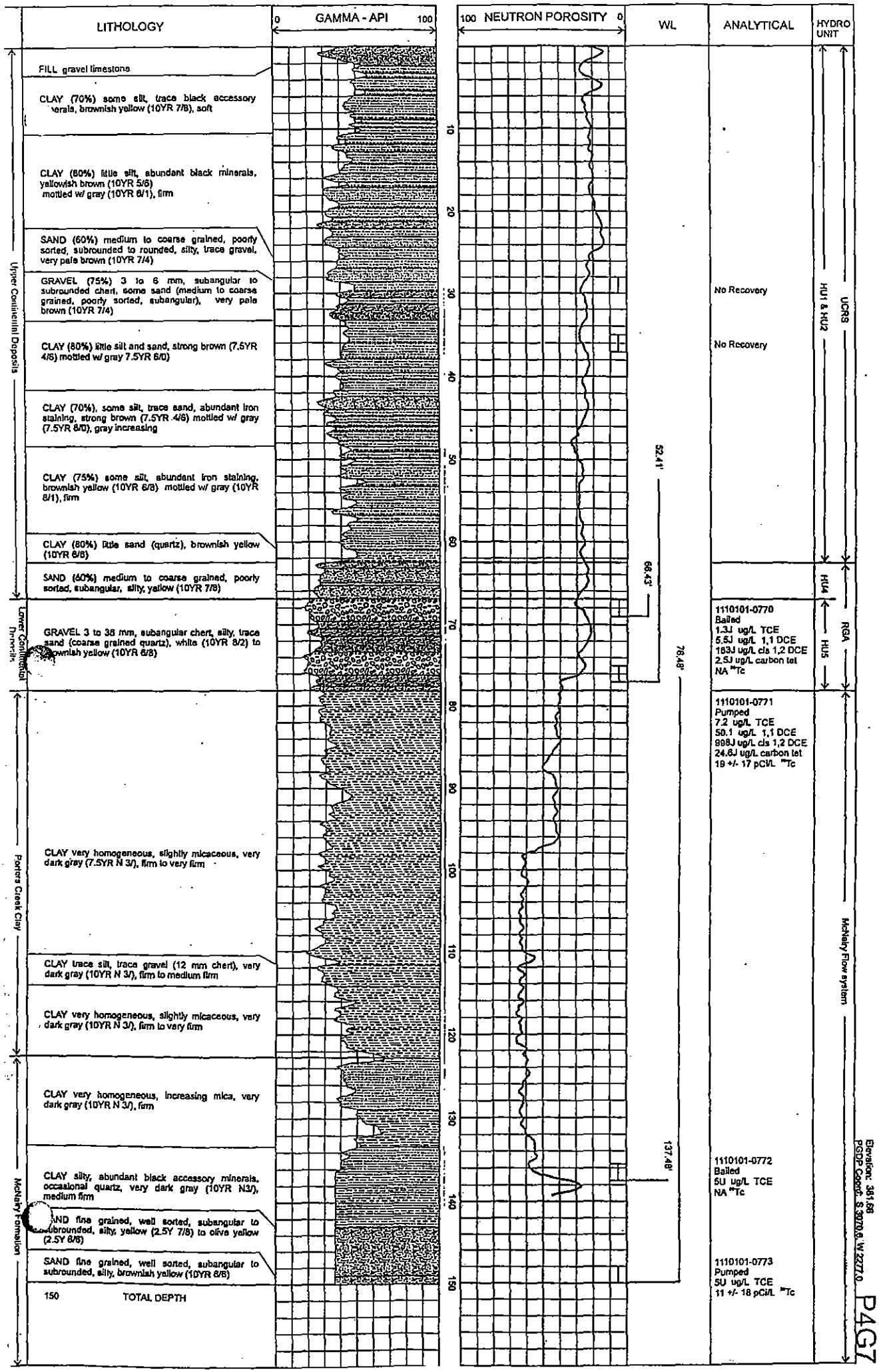


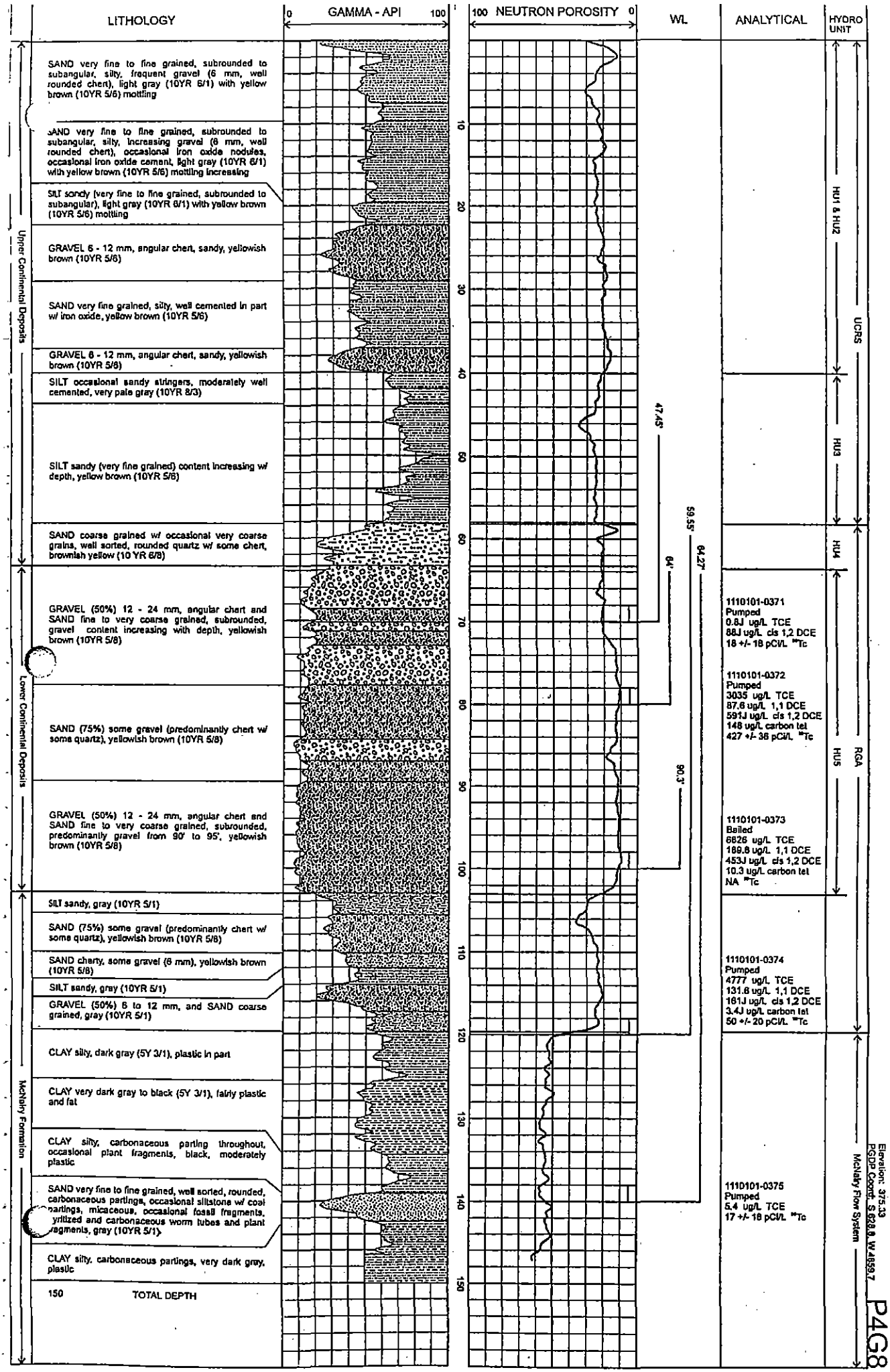
Elevation: 378.88
PGDP Coord: S 1008.8, W 3813.2

P4G2


LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
FILL predominately clayey silt w/ interbedded sand (fine to medium grained) and gravel (3 mm chert), brown (10YR 5/3) w/ dark gray (10YR 4/1 mottle), firm, slightly moist
SILT (60%) clayey, scattered sand (very fine to fine grained, subangular chert w/ some quartz), sand content increases below 16', thin gravel (3 mm, chert) at 15', micaceous, dark brown (10YR 4/3)
SAND (95%) medium grained, well sorted, subangular to subrounded quartz w/ some chert grading to coarse grained, moderately sorted, common gravel (3 mm to occasional 12 mm), trace silt, light yellow brown (10YR 6/4)
SILT (60%) sandy (medium grained, well sorted, subangular to subrounded quartz w/ some chert), light yellow brown (10YR 6/4)
GRAVEL (70%) 3 to 12 mm, angular to subangular chert w/ occasional quartz, some sand, brown yellow (10YR 6/8)
SILT (50%) and CLAY (45%), common sand (very fine to fine grained quartz w/ some chert), occasional mica, light yellowish brown (10YR 6/4), soft
GRAVEL (70%) 6 to 12 mm, subangular to subrounded chert w/ occasional limestone, some sand (medium to very coarse grained, moderately sorted, subrounded to rounded quartz and chert), light yellowish brown (10YR 6/4)
SILT (60%) clayey, trace sand (fine to medium grained, subangular to subrounded quartz w/ some chert), sand content increases w/ depth, yellow brown (10YR 5/8) w/ light-gray mottle (10YR 7/1), firm, moderate plasticity
SILT and CLAY (85%) little sand (fine grained quartz), occasional iron oxide nodules, light gray (10YR 6/1) with yellowish brown (10YR 5/8) staining
SAND (75%) fine to predominantly medium grained, moderately sorted, subrounded quartz w/ occasional chert, some silt, scattered gravel (3 mm chert), brownish yellow (10YR 6/6)
CLAY (60%) silty, occasional sand (fine grained) and mica, brownish yellow (10YR 6/8), soft, very plastic
SAND (95%) medium grained, well sorted, clean, subrounded to rounded, quartz, trace chert, trace silt, trace dark accessory minerals, light yellowish brown (2.5Y 6/4)
SAND (90%) medium grained, well sorted, clean, subrounded to rounded quartz, trace gravel (6 mm), trace silt, trace dark accessory minerals, light yellowish brown (2.5Y 6/4)
GRAVEL (70%) 6 to 30 mm w/ fragments of larger pieces, angular to subrounded chert, little sand (medium to coarse grained, subrounded quartz w/ some chert), light yellow brown (2.5Y 6/4)
GRAVEL (95%) 6 to 30 mm w/ fresh fractures indicating larger material, angular to subrounded chert w/ occasional sandstone, trace sand (medium to very coarse grained, poorly sorted, subangular to subrounded quartz), brown yellow (7.5YR 5/8)
SAND (80%) fine grained, well sorted, subangular to subrounded quartz w/ occasional chert, little silt, common gravel (6 mm chert), very pale brown (10YR 7/4)
SILT (60%) sandy (fine grained, well sorted, subangular to subrounded -quartz w/ occasional chert), iron oxide staining, yellowish brown (10YR 5/8)
SAND (60%) fine grained, well sorted, subangular to subrounded quartz w/ scattered chert, silty, abundant reddish brown sandstone fragments (fine grained, well sorted, subangular to subrounded quartz w/ scattered chert) with iron oxide cement, very pale brown (10YR 7/4)
SAND (60%) very fine to fine grained, moderate to well sorted, angular to subangular, silty increasing w/ depth, abundant black lignitic wood fragments, some w/ subwaxy texture, dark gray (5Y 4/1), coaly
SILT (60%) sandy (very fine to fine grained, moderate to well sorted, angular to subangular), scattered carbonaceous material, occasional wood fragments, dark gray (5Y 4/1)
SILT clayey, abundant mica, scattered sand (fine grained), very dark gray (5Y 3/1)
SILT (50%) and SAND very fine grained, well sorted, subangular to subrounded quartz), micaceous, common carbonaceous debris, dark gray (5Y 4/1), sand content increasing w/ depth
SILT clayey, abundant mica, scattered sand (fine grained), pyrite, massive w/ scattered interbedded sand and carbonaceous laminations, very dark gray (5Y 3/1)
SAND (90%) very fine grained, well sorted, subangular to subrounded, abundant mica, common carbonaceous debris, trace silt, gray (5Y 5/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
49.43'
49.32'
49.30'
88.8'
98.45'
1110101-0329
Pumped
138.8 ug/L TCE
17.8 ug/L 1,1 DCE
268.1J ug/L cis1,2 DCE
289 +/- 31 pCi/L 99Tc
1110101-0330
Pumped
243.3 ug/L TCE
33.5 ug/L 1,1 DCE
463.8J ug/L cis1,2 DCE
712 +/- 45 pCi/L 99Tc
1110101-0331
Pumped
0.3J ug/L TCE
0 +/- 13 pCi/L 99Tc
1110101-0332
Pumped
1U ug/L TCE
0 +/- 0 pCi/L 99Tc
1110101-0333
Bailed
1U ug/L TCE
NA 99Tc
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Elevation: 379.20
PSQP Coord: S 2097.0, W 3871.0
P4G3

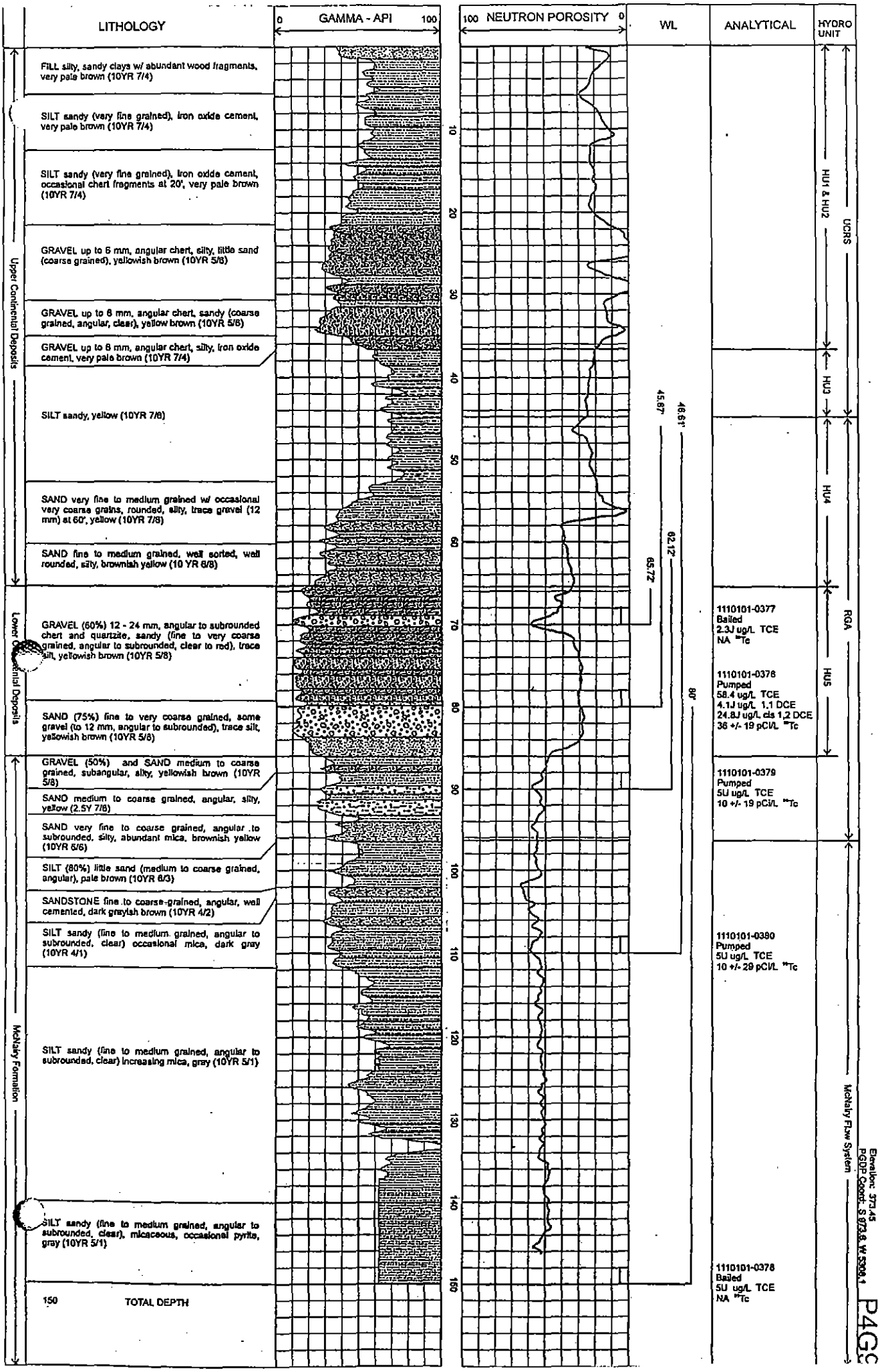

LITHOLOGY
0 GAMMA - API 100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
FILL angular gravel roadbase
SILT clayey, trace sand (very fine to fine grained quartz), brown (10YR 4/3), soft, low plasticity
SILT clayey, trace sand (very fine grained, moderate to well sorted, subangular quartz), occasional gravel (3 mm, chert), light yellow brown (10YR 6/4)
GRAVEL (60%) 3 to 6 mm, angular to subrounded chert, sandy (very fine to coarse grained, subrounded to rounded quartz w/ some chert), silty, light yellow brown (10YR 6/4)
GRAVEL (75%) 3 to 12 mm, subangular to subrounded chert, some sand (medium to coarse grained, poorly sorted, subangular to rounded quartz w/ some chert), brown yellow (10YR 6/8)
CLAY silty, scattered sand (very fine grained), scattered gravel (3 mm chert), light gray (10YR 6/1) to light yellow brown (10YR 6/4), soft, moderate plasticity
SILT clayey, trace sand (very fine to fine grained quartz), occasional gravel (3 mm), light yellowish brown (10YR 6/4) to brown yellow (10YR 6/6)
GRAVEL (70%) 6 to 12 mm, subangular to subrounded chert w/ occasional limestone, some sand (medium grained, subangular quartz and chert), some silt, yellowish brown (10YR 5/6)
SILT clayey, common sand (very fine to fine grained quartz w/ some chert), occasional limonite nodules, common to abundant iron oxide staining, light yellow brown (10YR 6/4) to gray (10YR 6/4)
SILT clayey, scattered sand (very fine to fine grained quartz w/ some chert), abundant iron oxide staining, yellow brown (10 YR 5/8), firm, low plasticity
SAND (60%) fine to medium grained, moderately sorted, subangular to subrounded quartz w/ occasional chert, silty, scattered gravel (6 to 12 mm, subangular chert) at 60', yellowish brown (10YR 5/8)
SILT clayey, occasional sand (fine grained) and mica, light yellow brown (10YR 6/4), soft
SAND (95%) medium grained w/ some fine grains, well sorted, clean, subangular to rounded, trace silt, trace dark accessory minerals, carbonaceous material and iron oxide nodules (coarse grain), light olive gray (5Y 6/2)
GRAVEL (80%) 6 to 30 mm w/ fragments of larger pieces, angular to subrounded chert, little sand (medium to very coarse grained, moderately sorted, subangular to rounded quartz w/ some chert), yellow brown (10YR 5/8) to dark yellow brown (10YR 4/6)
GRAVEL (60%) 6 to 16 mm angular to subrounded chert, sandy (medium to very coarse grained, moderately sorted, subangular to rounded quartz w/ some chert), yellow brown (10YR 5/6) to dark yellow brown (10YR 4/6)
SAND (75%) medium to coarse grained, moderate to well sorted, subangular to subrounded quartz w/ occasional chert, some gravel (6 mm chert), yellowish brown (10YR 5/8)
SAND (75%) fine grained, well sorted, subrounded to rounded quartz w/ occasional chert and black accessory minerals, some silt, micaceous, red (2.5YR 5/8)
CLAY silty, trace sand (very fine grained quartz), micaceous, occasional iron oxide staining, brown (10YR 4/3) and gray (10YR 5/1), soft, moderate to high plasticity
CLAY silty, very dark gray (2.5YR 3/0), micaceous, sticky, very plastic
PYRITE massive, very carbonaceous, pyritized wood fragments, common black lignite, common sand (fine grained), scattered gravel (3 to 6 mm chert)
SILT sandy (very fine to fine grained, subrounded), abundant mica, scattered carbonaceous debris, very dark gray (5Y 3/1)
SAND (80%) very fine w/ some fine grained, moderate to well sorted, subangular to subrounded quartz, little silt, micaceous, scattered carbonaceous debris, occasional glauconite, gray (5Y 5/1)
SAND (70%) very fine grained, well sorted, subangular to subrounded, abundant mica, occasional iron oxide nodules, some silt, dark gray (5Y 4/1)
SAND (80%) very fine grained, well sorted, subangular to subrounded, common carbonaceous material, dark gray (5Y 4/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
52.15'
69.5'
80.94'
115.42'
1110101-0342
Pumped
420.2 ug/L TCE
88.7J ug/L cis 1,2 DCE
58 +/- 20 pCi/L 99Tc
1110101-0347
Pumped
353.8 ug/L TCE
89.8J ug/L cis 1,2 DCE
5.5 ug/L carbon tet
61 +/- 20 pCi/L 99Tc
1110101-0348
Pumped
485.8 ug/L TCE
60 +/- 20 pCi/L 99Tc
1110101-0351
Pumped, Duplicate
500 ug/L TCE
74.3J ug/L cis 1,2 DCE
51 +/- 20 pCi/L 99Tc
1110101-0352
Bailed
11.8 ug/L TCE
23J ug/L cis 1,2 DCE
NA 99Tc
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Elevation: 381.98
PSCP Coord.: S 2078.3, W 3440.1
P4G5

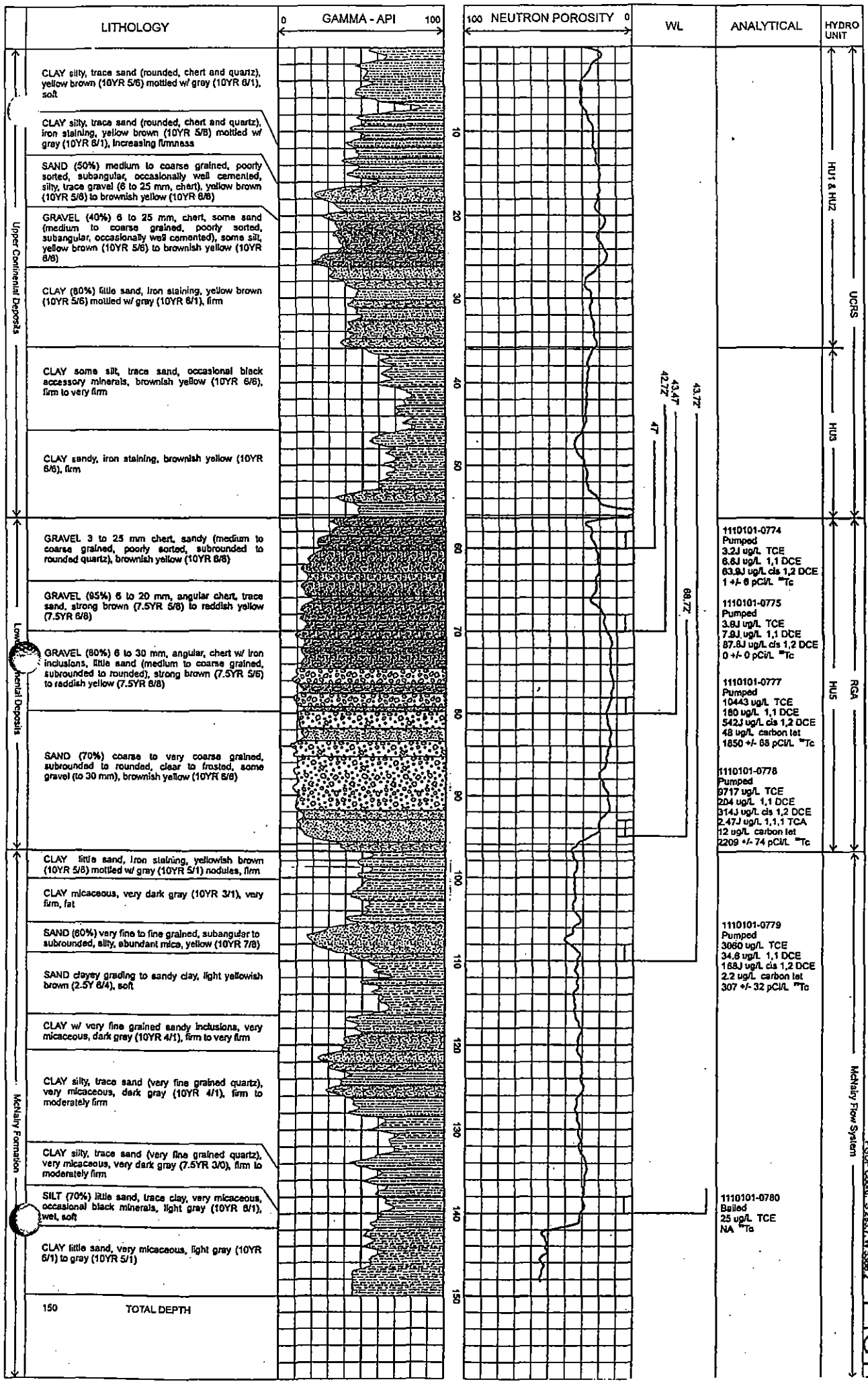

LITHOLOGY
GAMMA - API
0
100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
FILL gravel limestone
CLAY (70%) some silt, trace black accessory minerals, brownish yellow (10YR 7/8), soft
CLAY (80%) little silt, abundant black minerals, yellowish brown (10YR 5/6) mottled w/ gray (10YR 6/1), firm
SAND (60%) medium to coarse grained, poorly sorted, subrounded to rounded, silty, trace gravel, very pale brown (10YR 7/4)
GRAVEL (75%) 3 to 6 mm, subangular to subrounded chert, some sand (medium to coarse grained, poorly sorted, subangular), very pale brown (10YR 7/4)
CLAY (80%) little silt and sand, strong brown (7.5YR 4/6) mottled w/ gray 7.5YR 6/0)
CLAY (70%), some silt, trace sand, abundant iron staining, strong brown (7.5YR 4/6) mottled w/ gray (7.5YR 6/0), gray increasing
CLAY (75%) some silt, abundant iron staining, brownish yellow (10YR 6/8) mottled w/ gray (10YR 6/1), firm
CLAY (80%) little sand (quartz), brownish yellow (10YR 6/8)
SAND (60%) medium to coarse grained, poorly sorted, subangular, silty, yellow (10YR 7/8)
GRAVEL 3 to 38 mm, subangular chert, silty, trace sand (coarse grained quartz), white (10YR 8/2) to brownish yellow (10YR 6/8)
CLAY very homogeneous, slightly micaceous, very dark gray (7.5YR N 3/), firm to very firm
CLAY trace silt, trace gravel (12 mm chert), very dark gray (10YR N 3/), firm to medium firm
CLAY very homogeneous, slightly micaceous, very dark gray (10YR N 3/), firm to very firm
CLAY very homogeneous, increasing mica, very dark gray (10YR N 3/), firm
CLAY silty, abundant black accessory minerals, occasional quartz, very dark gray (10YR N3/), medium firm
SAND fine grained, well sorted, subangular to subrounded, silty, yellow (2.5Y 7/8) to olive yellow (2.5Y 6/6)
SAND fine grained, well sorted, subangular to subrounded, silty, brownish yellow (10YR 6/6)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
Porters Creek Clay
McNairy Formation
52.41'
66.43'
76.48'
137.48'
No Recovery
No Recovery
1110101-0770
Bailed
1.3J ug/L TCE
5.5J ug/L 1,1 DCE
183J ug/L cis 1,2 DCE
2.5J ug/L carbon tet
NA pCi/L Tc
1110101-0771
Pumped
7.2 ug/L TCE
50.1 ug/L 1,1 DCE
988J ug/L cis 1,2 DCE
24.6J ug/L carbon tet
19 +/- 17 pCi/L Tc
1110101-0772
Bailed
5U ug/L TCE
NA pCi/L Tc
1110101-0773
Pumped
5U ug/L TCE
11 +/- 18 pCi/L Tc
HU1 & HU2
UCRS
HU4
HU5
RGA
McNairy Flow system
Elevation: 381.68
PSDP Coord: S 3970.6, W 2277.0
P4G7

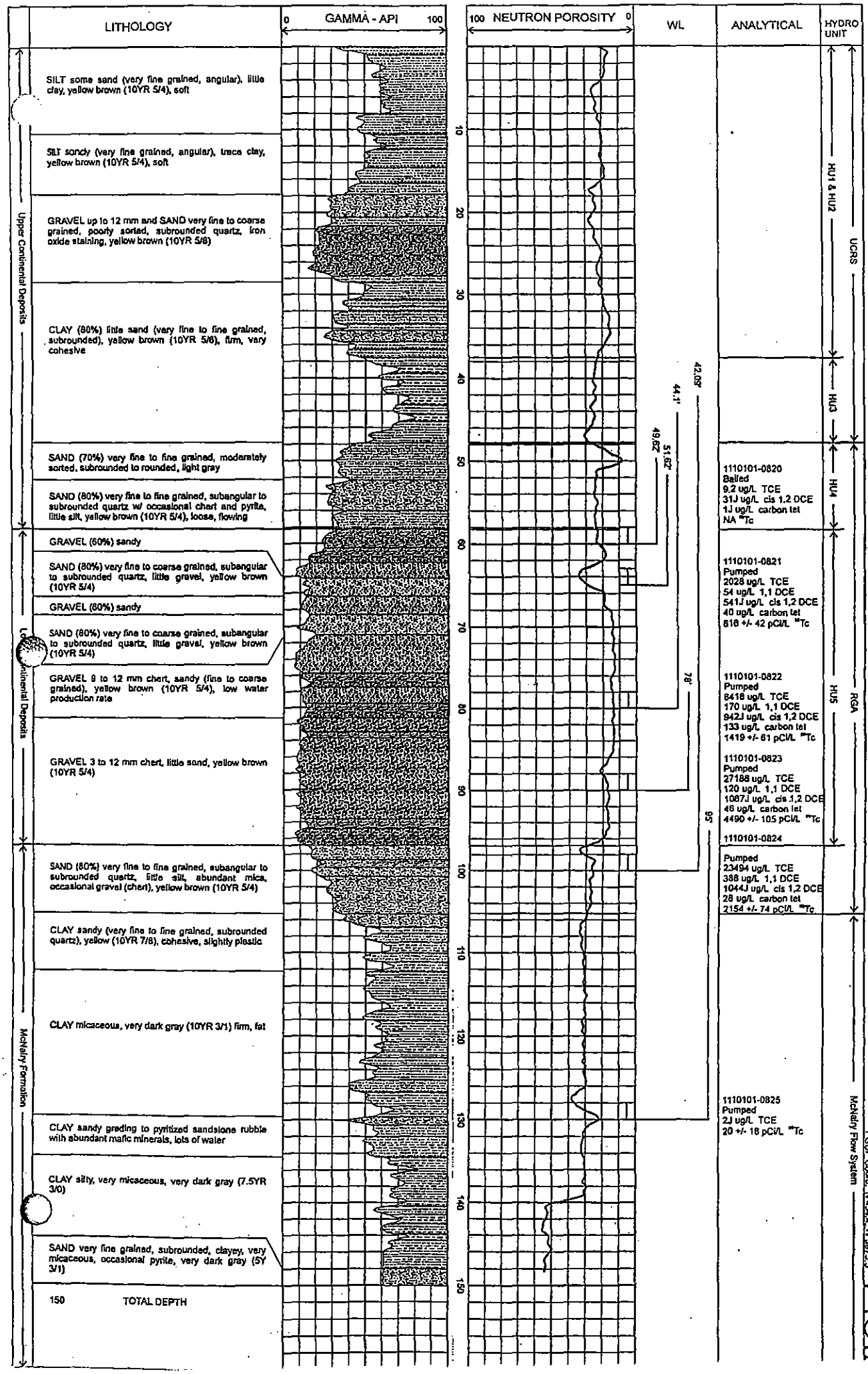


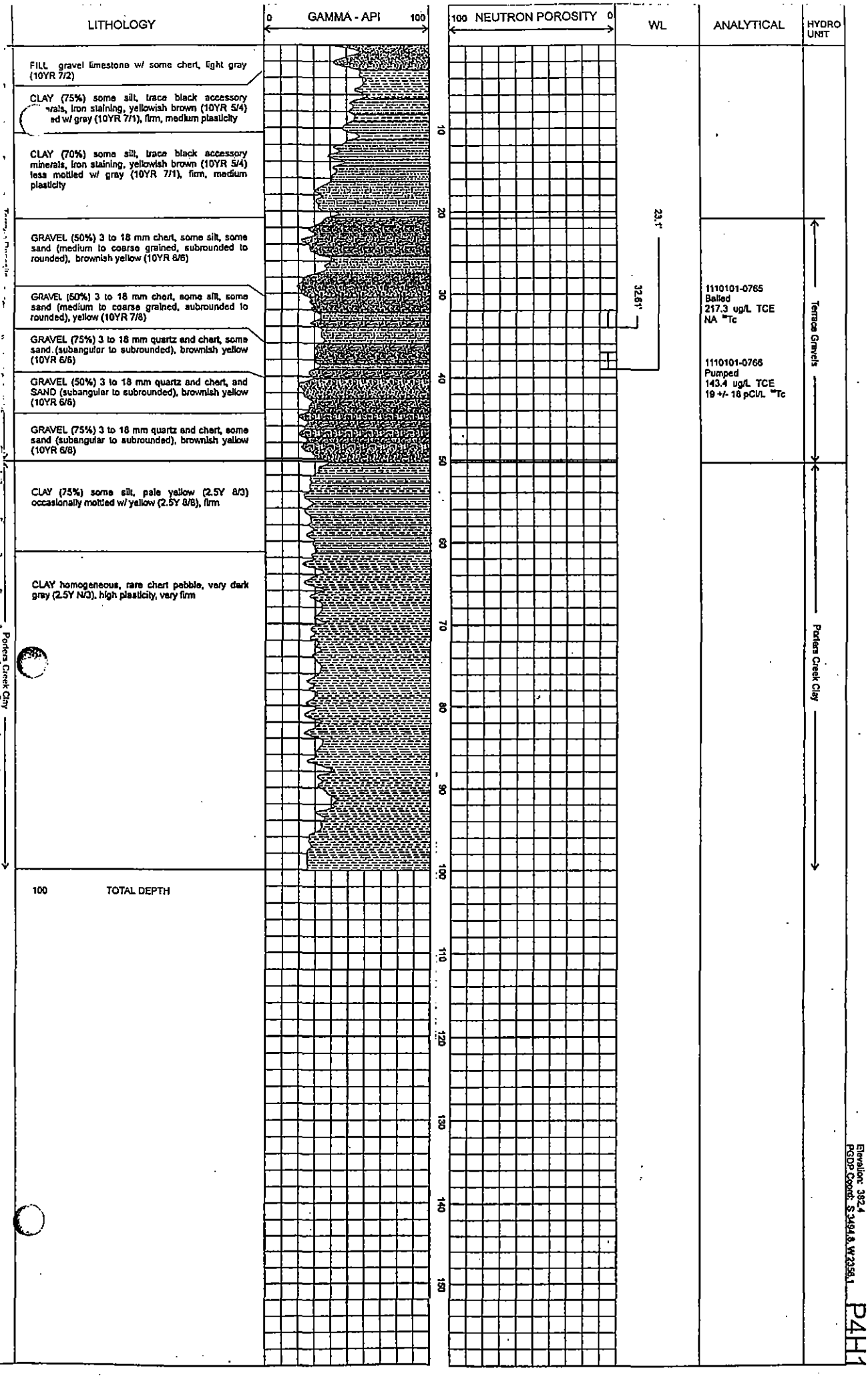
Elevation: 375.33
PGDP Coord: S 6628.8, W 4859.7

P4G8


LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
FILL silty, sandy clays w/ abundant wood fragments, very pale brown (10YR 7/4)
SILT sandy (very fine grained), iron oxide cement, very pale brown (10YR 7/4)
SILT sandy (very fine grained), iron oxide cement, occasional chert fragments at 20', very pale brown (10YR 7/4)
GRAVEL up to 6 mm, angular chert, silty, little sand (coarse grained), yellowish brown (10YR 5/8)
GRAVEL up to 8 mm, angular chert, sandy (coarse grained, angular, clear), yellow brown (10YR 5/8)
GRAVEL up to 8 mm, angular chert, silty, iron oxide cement, very pale brown (10YR 7/4)
SILT sandy, yellow (10YR 7/6)
SAND very fine to medium grained w/ occasional very coarse grains, rounded, silty, trace gravel (12 mm) at 60', yellow (10YR 7/8)
SAND fine to medium grained, well sorted, well rounded, silty, brownish yellow (10 YR 6/8)
Upper Continental Deposits
GRAVEL (60%) 12 - 24 mm, angular to subrounded chert and quartzite, sandy (fine to very coarse grained, angular to subrounded, clear to red), trace silt, yellowish brown (10YR 5/8)
SAND (75%) fine to very coarse grained, some gravel (to 12 mm, angular to subrounded), trace silt, yellowish brown (10YR 5/8)
Lower Continental Deposits
GRAVEL (50%) and SAND medium to coarse grained, subangular, silty, yellowish brown (10YR 5/8)
SAND medium to coarse grained, angular, silty, yellow (2.5Y 7/6)
SAND very fine to coarse grained, angular to subrounded, silty, abundant mica, brownish yellow (10YR 6/6)
SILT (80%) little sand (medium to coarse grained, angular), pale brown (10YR 6/3)
SANDSTONE fine to coarse-grained, angular, well cemented, dark grayish brown (10YR 4/2)
SILT sandy (fine to medium grained, angular to subrounded, clear) occasional mica, dark gray (10YR 4/1)
SILT sandy (fine to medium grained, angular to subrounded, clear) increasing mica, gray (10YR 5/1)
SILT sandy (fine to medium grained, angular to subrounded, clear), micaceous, occasional pyrite, gray (10YR 5/1)
McNairy Formation
150
TOTAL DEPTH
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
45.87'
46.61'
62.12'
65.72'
80'
1110101-0377
Bailed
2.3J ug/L TCE
NA pCi/L 99Tc
1110101-0378
Pumped
58.4 ug/L TCE
4.1J ug/L 1,1 DCE
24.8J ug/L cis 1,2 DCE
36 +/- 19 pCi/L 99Tc
1110101-0379
Pumped
5U ug/L TCE
10 +/- 19 pCi/L 99Tc
1110101-0380
Pumped
5U ug/L TCE
10 +/- 29 pCi/L 99Tc
1110101-0378
Bailed
5U ug/L TCE
NA pCi/L 99Tc
HU1 & HU2
UCRS
HU3
HU4
RGA
HU5
McNairy Flow System
Elevation: 373.45
PGDP Coord: S 9728.6 W 9309.1
P4GS

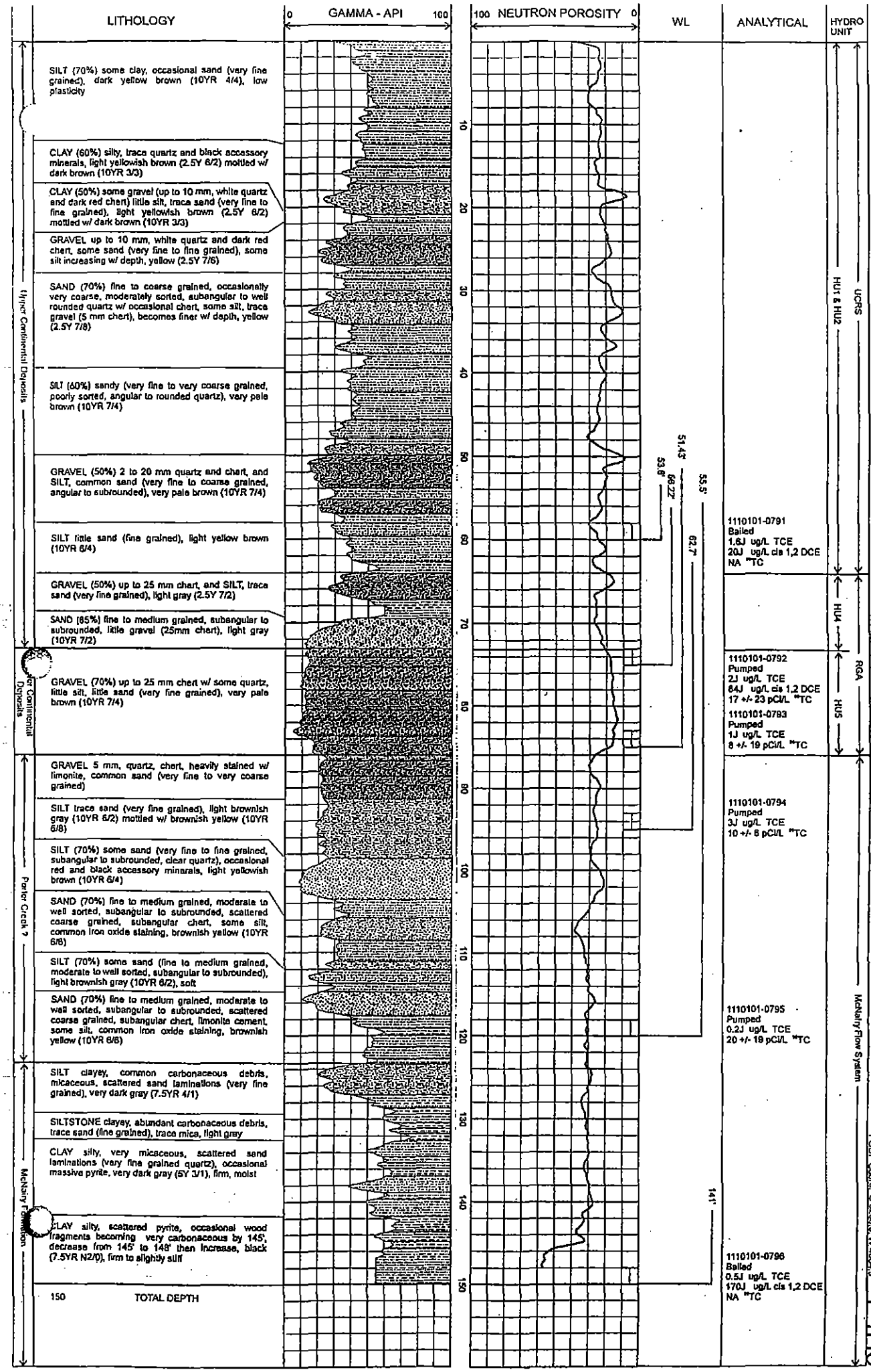

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
CLAY silty, trace sand (rounded, chert and quartz), yellow brown (10YR 5/6) mottled w/ gray (10YR 6/1), soft
CLAY silty, trace sand (rounded, chert and quartz), iron staining, yellow brown (10YR 5/8) mottled w/ gray (10YR 6/1), increasing firmness
SAND (50%) medium to coarse grained, poorly sorted, subangular, occasionally well cemented, silty, trace gravel (6 to 25 mm, chert), yellow brown (10YR 5/8) to brownish yellow (10YR 6/8)
GRAVEL (40%) 6 to 25 mm, chert, some sand (medium to coarse grained, poorly sorted, subangular, occasionally well cemented), some silt, yellow brown (10YR 5/6) to brownish yellow (10YR 6/8)
CLAY (80%) fitlle sand, iron staining, yellow brown (10YR 5/6) mottled w/ gray (10YR 6/1), firm
CLAY some silt, trace sand, occasional black accessory minerals, brownish yellow (10YR 6/6), firm to very firm
CLAY sandy, iron staining, brownish yellow (10YR 6/6), firm
GRAVEL 3 to 25 mm chert, sandy (medium to coarse grained, poorly sorted, subrounded to rounded quartz), brownish yellow (10YR 6/8)
GRAVEL (95%) 6 to 20 mm, angular chert, trace sand, strong brown (7.5YR 5/8) to reddish yellow (7.5YR 6/8)
GRAVEL (80%) 6 to 30 mm, angular, chert w/ iron inclusions, little sand (medium to coarse grained, subrounded to rounded), strong brown (7.5YR 5/6) to reddish yellow (7.5YR 6/8)
SAND (70%) coarse to very coarse grained, subrounded to rounded, clear to frosted, some gravel (to 30 mm), brownish yellow (10YR 6/8)
CLAY little sand, iron staining, yellowish brown (10YR 5/8) mottled w/ gray (10YR 5/1) nodules, firm
CLAY micaceous, very dark gray (10YR 3/1), very firm, fat
SAND (60%) very fine to fine grained, subangular to subrounded, silty, abundant mica, yellow (10YR 7/8)
SAND clayey grading to sandy clay, light yellowish brown (2.5Y 6/4), soft
CLAY w/ very fine grained sandy inclusions, very micaceous, dark gray (10YR 4/1), firm to very firm
CLAY silty, trace sand (very fine grained quartz), very micaceous, dark gray (10YR 4/1), firm to moderately firm
CLAY silty, trace sand (very fine grained quartz), very micaceous, very dark gray (7.5YR 3/0), firm to moderately firm
SILT (70%) little sand, trace clay, very micaceous, occasional black minerals, light gray (10YR 8/1), wet, soft
CLAY little sand, very micaceous, light gray (10YR 6/1) to gray (10YR 5/1)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
42.72'
43.47'
47'
43.72'
69.72'
1110101-0774
Pumped
3.2J ug/L TCE
6.6J ug/L 1,1 DCE
63.9J ug/L cis 1,2 DCE
1 +/- 6 pCi/L 99Tc
1110101-0775
Pumped
3.8J ug/L TCE
7.9J ug/L 1,1 DCE
87.8J ug/L cis 1,2 DCE
0 +/- 0 pCi/L 99Tc
1110101-0777
Pumped
10443 ug/L TCE
180 ug/L 1,1 DCE
542J ug/L cis 1,2 DCE
48 ug/L carbon tet
1850 +/- 68 pCi/L 99Tc
1110101-0778
Pumped
9717 ug/L TCE
204 ug/L 1,1 DCE
914J ug/L cis 1,2 DCE
2.47J ug/L 1,1,1 TCA
12 ug/L carbon tet
2209 +/- 74 pCi/L 99Tc
1110101-0779
Pumped
3060 ug/L TCE
34.6 ug/L 1,1 DCE
168J ug/L cis 1,2 DCE
2.2 ug/L carbon tet
307 +/- 32 pCi/L 99Tc
1110101-0780
Bailed
25 ug/L TCE
NA 99Tc
HU1 & HU2
UCRS
HU3
HU5
RGA
McNairy Flow System
Elevation: 370.71
PSDP Coord: S 2937, W 3382
P4G11

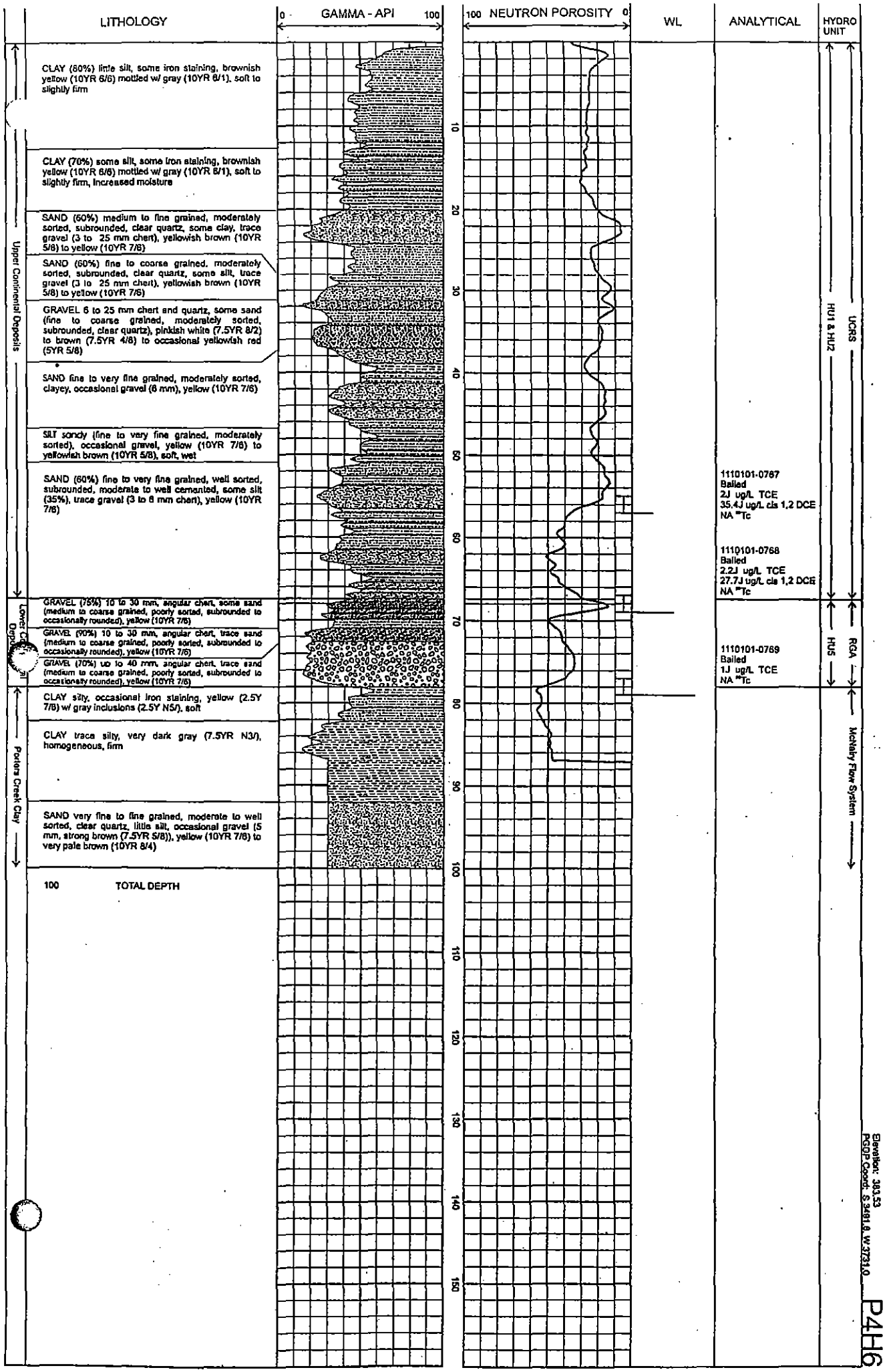

LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SILT some sand (very fine grained, angular), little clay, yellow brown (10YR 5/4), soft
SILT sandy (very fine grained, angular), trace clay, yellow brown (10YR 5/4), soft
GRAVEL up to 12 mm and SAND very fine to coarse grained, poorly sorted, subrounded quartz, iron oxide staining, yellow brown (10YR 5/8)
CLAY (80%) little sand (very fine to fine grained, subrounded), yellow brown (10YR 5/6), firm, very cohesive
SAND (70%) very fine to fine grained, moderately sorted, subrounded to rounded, light gray
SAND (80%) very fine to fine grained, subangular to subrounded quartz w/ occasional chert and pyrite, little silt, yellow brown (10YR 5/4), loose, flowing
GRAVEL (60%) sandy
SAND (80%) very fine to coarse grained, subangular to subrounded quartz, little gravel, yellow brown (10YR 5/4)
GRAVEL (60%) sandy
SAND (80%) very fine to coarse grained, subangular to subrounded quartz, little gravel, yellow brown (10YR 5/4)
GRAVEL 9 to 12 mm chert, sandy (fine to coarse grained), yellow brown (10YR 5/4), low water production rate
GRAVEL 3 to 12 mm chert, little sand, yellow brown (10YR 5/4)
SAND (80%) very fine to fine grained, subangular to subrounded quartz, little silt, abundant mica, occasional gravel (chert), yellow brown (10YR 5/4)
CLAY sandy (very fine to fine grained, subrounded quartz), yellow (10YR 7/8), cohesive, slightly plastic
CLAY micaceous, very dark gray (10YR 3/1) firm, fat
CLAY sandy grading to pyritized sandstone rubble with abundant mafic minerals, lots of water
CLAY silty, very micaceous, very dark gray (7.5YR 3/0)
SAND very fine grained, subrounded, clayey, very micaceous, occasional pyrite, very dark gray (5Y 3/1)
150
TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
42.09'
44.1'
49.52'
51.62'
78'
93'
1110101-0820
Bailed
9.2 ug/L TCE
31J ug/L cis 1,2 DCE
1J ug/L carbon tet
NA Tc
1110101-0821
Pumped
2028 ug/L TCE
54 ug/L 1,1 DCE
541J ug/L cis 1,2 DCE
40 ug/L carbon tet
618 +/- 42 pCi/L Tc
1110101-0822
Pumped
8418 ug/L TCE
170 ug/L 1,1 DCE
842J ug/L cis 1,2 DCE
133 ug/L carbon tet
1419 +/- 81 pCi/L Tc
1110101-0823
Pumped
27188 ug/L TCE
120 ug/L 1,1 DCE
1087J ug/L cis 1,2 DCE
46 ug/L carbon tet
4490 +/- 105 pCi/L Tc
1110101-0824
Pumped
23494 ug/L TCE
388 ug/L 1,1 DCE
1044J ug/L cis 1,2 DCE
28 ug/L carbon tet
2154 +/- 74 pCi/L Tc
1110101-0825
Pumped
2J ug/L TCE
20 +/- 18 pCi/L Tc
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
Elevation: 370.14
PGDP Coord: N 434,4, W 5975.5
P4G1



Elevation: 382.4
PGDP Coord: S 3494.8, W 2358.1

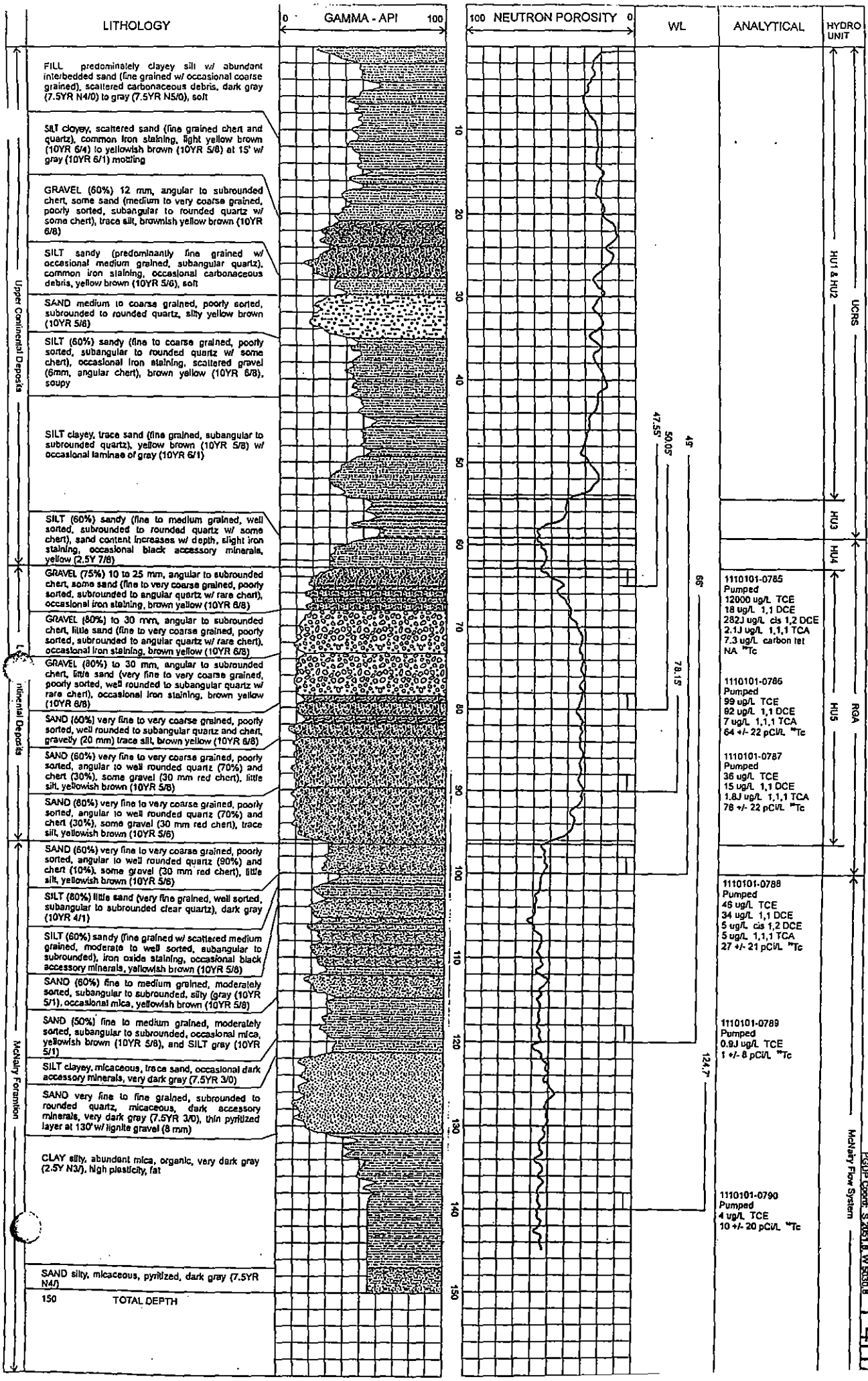
P4H1


LITHOLOGY
GAMMA - API
0
100
NEUTRON POROSITY
100
0
WL
ANALYTICAL
HYDRO UNIT
SILT (70%) some clay, occasional sand (very fine grained), dark yellow brown (10YR 4/4), low plasticity
CLAY (60%) silty, trace quartz and black accessory minerals, light yellowish brown (2.5Y 6/2) mottled w/ dark brown (10YR 3/3)
CLAY (50%) some gravel (up to 10 mm, white quartz and dark red chert) little silt, trace sand (very fine to fine grained), light yellowish brown (2.5Y 6/2) mottled w/ dark brown (10YR 3/3)
GRAVEL up to 10 mm, white quartz and dark red chert, some sand (very fine to fine grained), some silt increasing w/ depth, yellow (2.5Y 7/6)
SAND (70%) fine to coarse grained, occasionally very coarse, moderately sorted, subangular to well rounded quartz w/ occasional chert, some silt, trace gravel (5 mm chert), becomes finer w/ depth, yellow (2.5Y 7/8)
SILT (60%) sandy (very fine to very coarse grained, poorly sorted, angular to rounded quartz), very pale brown (10YR 7/4)
GRAVEL (50%) 2 to 20 mm quartz and chert, and SILT, common sand (very fine to coarse grained, angular to subrounded), very pale brown (10YR 7/4)
SILT little sand (fine grained), light yellow brown (10YR 6/4)
GRAVEL (50%) up to 25 mm chert, and SILT, trace sand (very fine grained), light gray (2.5Y 7/2)
SAND (85%) fine to medium grained, subangular to subrounded, little gravel (25mm chert), light gray (10YR 7/2)
GRAVEL (70%) up to 25 mm chert w/ some quartz, little silt, little sand (very fine grained), very pale brown (10YR 7/4)
GRAVEL 5 mm, quartz, chert, heavily stained w/ limonite, common sand (very fine to very coarse grained)
SILT trace sand (very fine grained), light brownish gray (10YR 6/2) mottled w/ brownish yellow (10YR 6/8)
SILT (70%) some sand (very fine to fine grained, subangular to subrounded, clear quartz), occasional red and black accessory minerals, light yellowish brown (10YR 6/4)
SAND (70%) fine to medium grained, moderate to well sorted, subangular to subrounded, scattered coarse grained, subangular chert, some silt, common iron oxide staining, brownish yellow (10YR 6/8)
SILT (70%) some sand (fine to medium grained, moderate to well sorted, subangular to subrounded), light brownish gray (10YR 6/2), soft
SAND (70%) fine to medium grained, moderate to well sorted, subangular to subrounded, scattered coarse grained, subangular chert, limonite cement, some silt, common iron oxide staining, brownish yellow (10YR 6/8)
SILT clayey, common carbonaceous debris, micaceous, scattered sand laminations (very fine grained), very dark gray (7.5YR 4/1)
SILTSTONE clayey, abundant carbonaceous debris, trace sand (fine grained), trace mica, light gray
CLAY silty, very micaceous, scattered sand laminations (very fine grained quartz), occasional massive pyrite, very dark gray (5Y 3/1), firm, moist
CLAY silty, scattered pyrite, occasional wood fragments becoming very carbonaceous by 145', decrease from 145' to 148' then increase, black (7.5YR N2/0), firm to slightly stiff
150 TOTAL DEPTH
51.43'
53.6'
56.22'
55.5'
62.7'
141'
1110101-0791
Bailed
1.6J ug/L TCE
20J ug/L cis 1,2 DCE
NA pCi/L
1110101-0792
Pumped
2J ug/L TCE
84J ug/L cis 1,2 DCE
17 +/- 23 pCi/L
1110101-0793
Pumped
1J ug/L TCE
8 +/- 19 pCi/L
1110101-0794
Pumped
3J ug/L TCE
10 +/- 8 pCi/L
1110101-0795
Pumped
0.2J ug/L TCE
20 +/- 19 pCi/L
1110101-0796
Bailed
0.5J ug/L TCE
170J ug/L cis 1,2 DCE
NA pCi/L
HU1 & HU2
UCRS
HU4
RGA
HU5
McNairy Flow System
Upper Continental Deposits
Lower Continental Deposits
Porter Creek ?
McNairy Formation
Elevation: 380.08
PGDP Coord: S 3288.0 W 4094.3
P4H5



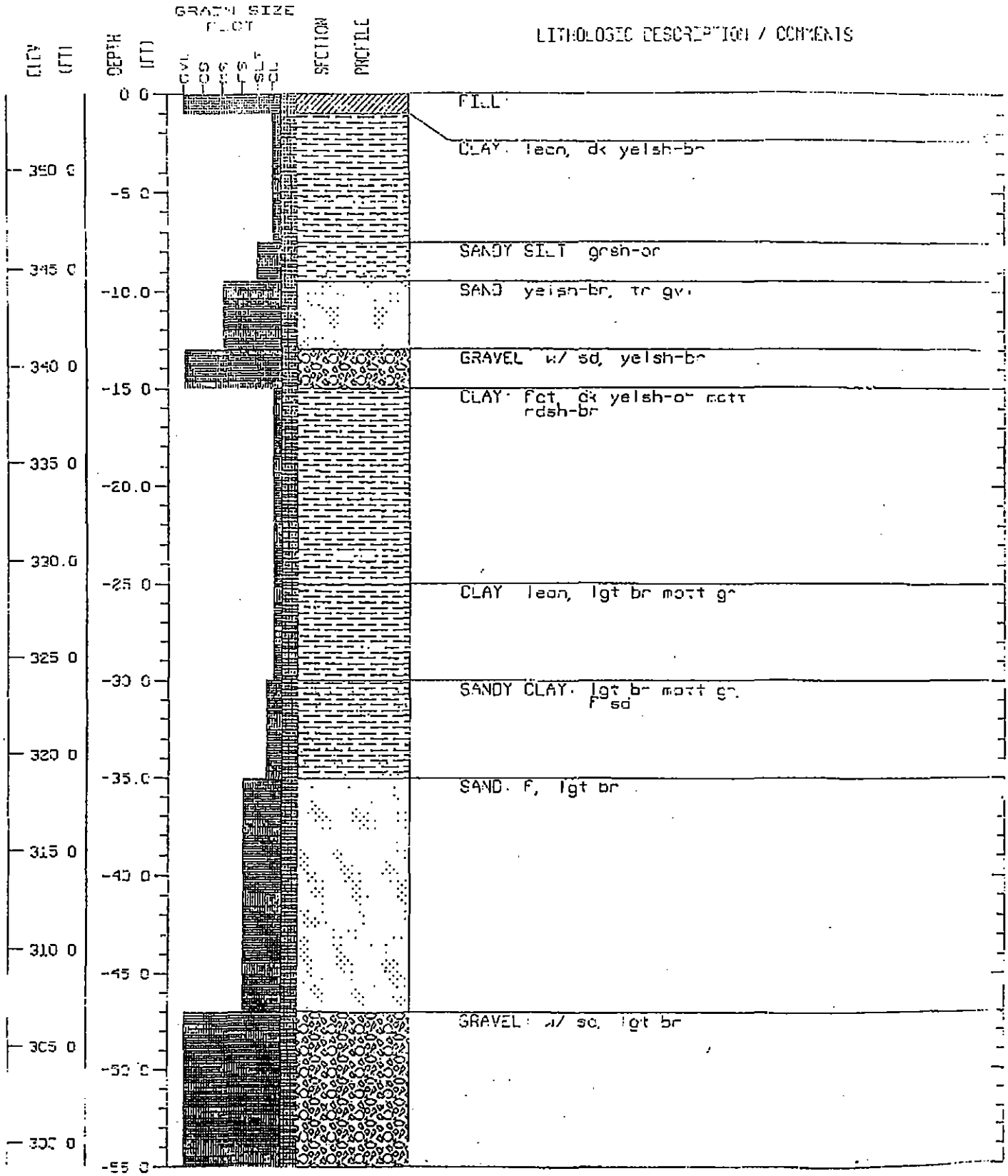
Elevation: 383.53
PGDP Coord: S 3481.9 W 3731.0

P4H6

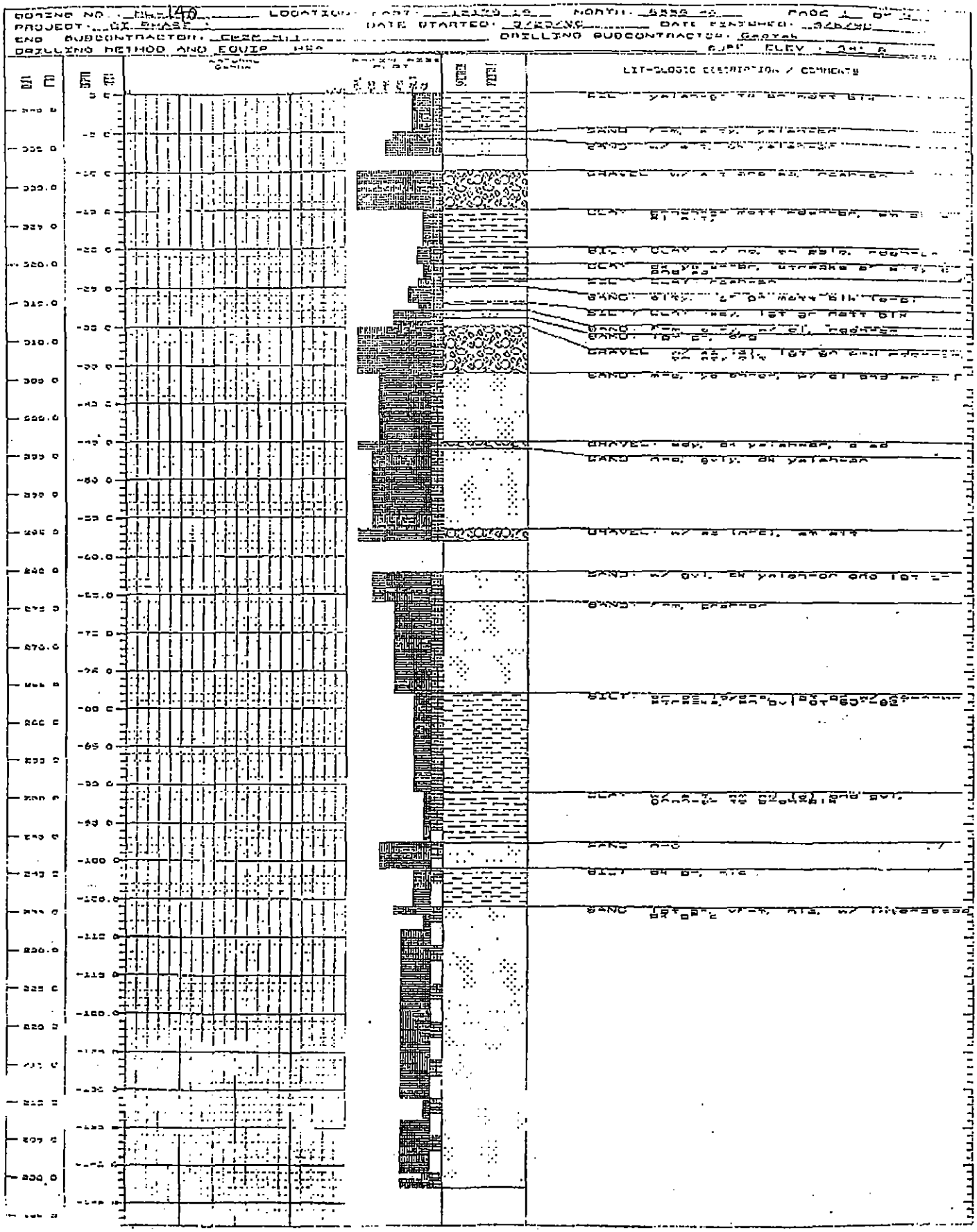

LITHOLOGY
GAMMA - API
0
100
100 NEUTRON POROSITY 0
WL
ANALYTICAL
HYDRO UNIT
FILL predominately clayey silt w/ abundant interbedded sand (fine grained w/ occasional coarse grained), scattered carbonaceous debris, dark gray (7.5YR N4/0) to gray (7.5YR N5/0), soft
SILT clayey, scattered sand (fine grained chert and quartz), common iron staining, light yellow brown (10YR 6/4) to yellowish brown (10YR 5/8) at 15' w/ gray (10YR 6/1) mottling
GRAVEL (60%) 12 mm, angular to subrounded chert, some sand (medium to very coarse grained, poorly sorted, subangular to rounded quartz w/ some chert), trace silt, brownish yellow brown (10YR 6/8)
SILT sandy (predominantly fine grained w/ occasional medium grained, subangular quartz), common iron staining, occasional carbonaceous debris, yellow brown (10YR 5/6), soft
SAND medium to coarse grained, poorly sorted, subrounded to rounded quartz, silty yellow brown (10YR 5/8)
SILT (60%) sandy (fine to coarse grained, poorly sorted, subangular to rounded quartz w/ some chert), occasional iron staining, scattered gravel (6mm, angular chert), brown yellow (10YR 6/8), soupy
SILT clayey, trace sand (fine grained, subangular to subrounded quartz), yellow brown (10YR 5/8) w/ occasional laminae of gray (10YR 6/1)
SILT (60%) sandy (fine to medium grained, well sorted, subrounded to rounded quartz w/ some chert), sand content increases w/ depth, slight iron staining, occasional black accessory minerals, yellow (2.5Y 7/8)
GRAVEL (75%) 10 to 25 mm, angular to subrounded chert, some sand (fine to very coarse grained, poorly sorted, subrounded to angular quartz w/ rare chert), occasional iron staining, brown yellow (10YR 6/8)
GRAVEL (80%) to 30 mm, angular to subrounded chert, little sand (fine to very coarse grained, poorly sorted, subrounded to angular quartz w/ rare chert), occasional iron staining, brown yellow (10YR 6/8)
GRAVEL (80%) to 30 mm, angular to subrounded chert, little sand (very fine to very coarse grained, poorly sorted, well rounded to subangular quartz w/ rare chert), occasional iron staining, brown yellow (10YR 6/8)
SAND (60%) very fine to very coarse grained, poorly sorted, well rounded to subangular quartz and chert, gravelly (20 mm) trace silt, brown yellow (10YR 6/8)
SAND (60%) very fine to very coarse grained, poorly sorted, angular to well rounded quartz (70%) and chert (30%), some gravel (30 mm red chert), little silt, yellowish brown (10YR 5/8)
SAND (60%) very fine to very coarse grained, poorly sorted, angular to well rounded quartz (70%) and chert (30%), some gravel (30 mm red chert), trace silt, yellowish brown (10YR 5/6)
SAND (60%) very fine to very coarse grained, poorly sorted, angular to well rounded quartz (90%) and chert (10%), some gravel (30 mm red chert), little silt, yellowish brown (10YR 5/6)
SILT (80%) little sand (very fine grained, well sorted, subangular to subrounded clear quartz), dark gray (10YR 4/1)
SILT (60%) sandy (fine grained w/ scattered medium grained, moderate to well sorted, subangular to subrounded), iron oxide staining, occasional black accessory minerals, yellowish brown (10YR 5/8)
SAND (60%) fine to medium grained, moderately sorted, subangular to subrounded, silty (gray (10YR 5/1), occasional mica, yellowish brown (10YR 5/8)
SAND (50%) fine to medium grained, moderately sorted, subangular to subrounded, occasional mica, yellowish brown (10YR 5/8), and SILT gray (10YR 5/1)
SILT clayey, micaceous, trace sand, occasional dark accessory minerals, very dark gray (7.5YR 3/0)
SAND very fine to fine grained, subrounded to rounded quartz, micaceous, dark accessory minerals, very dark gray (7.5YR 3/0), thin pyritized layer at 130' w/ lignite gravel (8 mm)
CLAY silty, abundant mica, organic, very dark gray (2.5Y N3/), high plasticity, fat
SAND silty, micaceous, pyritized, dark gray (7.5YR N4/)
150 TOTAL DEPTH
Upper Continental Deposits
Lower Continental Deposits
McNairy Formation
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
47.55'
50.05'
45'
78.15'
66'
124.7'
HU1 & HU2
HU3
HU4
HU5
UCRS
RGA
McNairy Flow System
1110101-0785
Pumped
12000 ug/L TCE
18 ug/L 1,1 DCE
282J ug/L cis 1,2 DCE
2.1J ug/L 1,1,1 TCA
7.3 ug/L carbon tet
NA 99Tc
1110101-0786
Pumped
99 ug/L TCE
82 ug/L 1,1 DCE
7 ug/L 1,1,1 TCA
64 +/- 22 pCi/L 99Tc
1110101-0787
Pumped
36 ug/L TCE
15 ug/L 1,1 DCE
1.8J ug/L 1,1,1 TCA
78 +/- 22 pCi/L 99Tc
1110101-0788
Pumped
46 ug/L TCE
34 ug/L 1,1 DCE
5 ug/L cis 1,2 DCE
5 ug/L 1,1,1 TCA
27 +/- 21 pCi/L 99Tc
1110101-0789
Pumped
0.9J ug/L TCE
1 +/- 8 pCi/L 99Tc
1110101-0790
Pumped
4 ug/L TCE
10 +/- 20 pCi/L 99Tc
Elevation: 373.81
PSGP Coord: S 2051.8, W 5030.8
P4H

MW-194

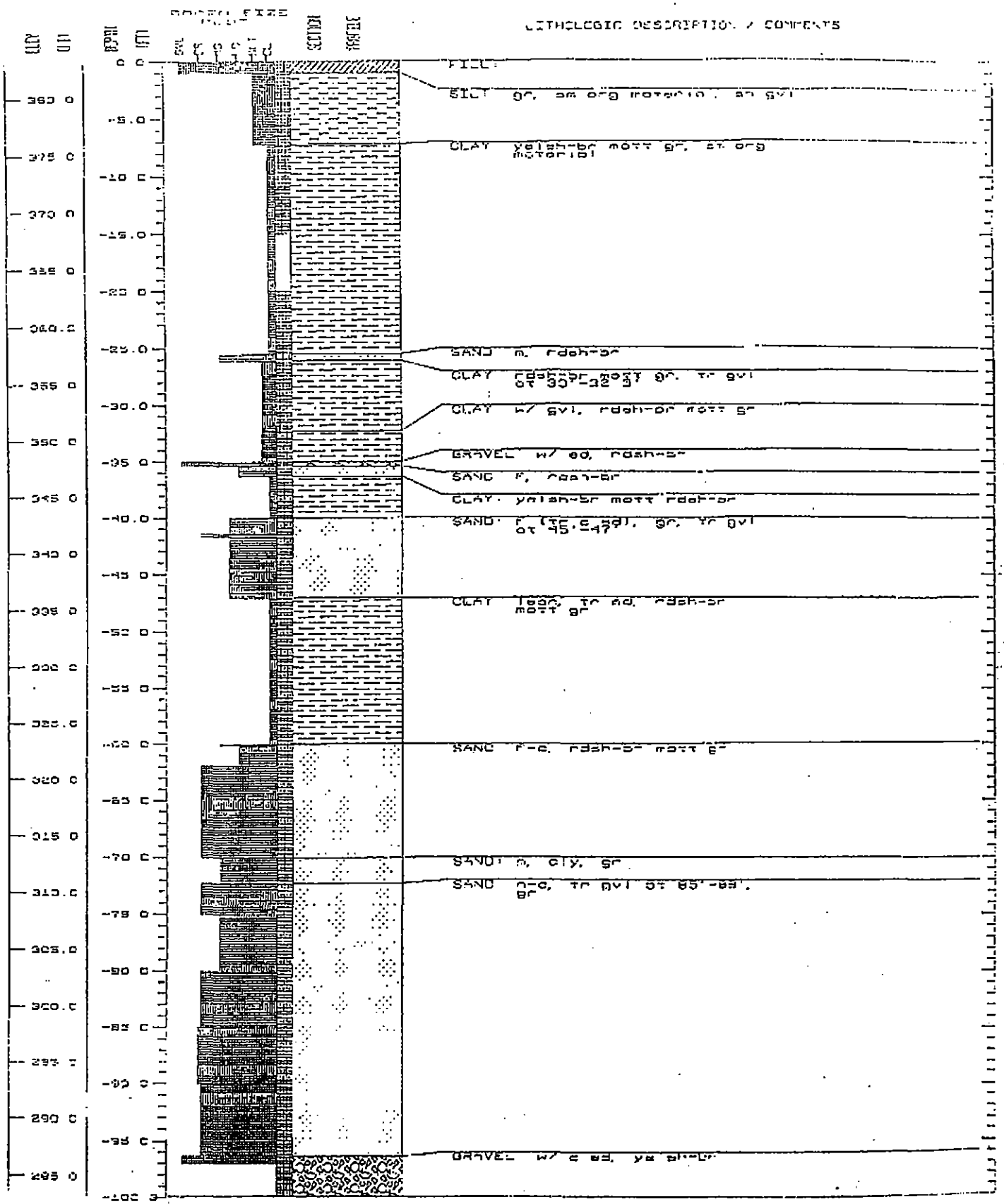
353 S


ELEV (FT)
DEPTH (FT)
GRAIN SIZE PLOT
GVL
CS
MS
FS
SLT
CL
SECTION
PROFILE
LITHOLOGIC DESCRIPTION / COMMENTS
350 0
345 0
340 0
335 0
330.0
325 0
320 0
315 0
310 0
305 0
300 0
0 0
-5 0
-10.0
-15 0
-20.0
-25 0
-30 0
-35.0
-40 0
-45 0
-50 0
-55 0
FILL
CLAY lean, dk yelsh-br
SANDY SILT grsh-or
SAND yelsh-br, tr gv
GRAVEL w/ sd, yelsh-br
CLAY fct, dk yelsh-or mott rdsh-br
CLAY lean, lgt br mott gr
SANDY CLAY lgt br mott gr F sd
SAND F, lgt br
GRAVEL w/ sd, lgt br

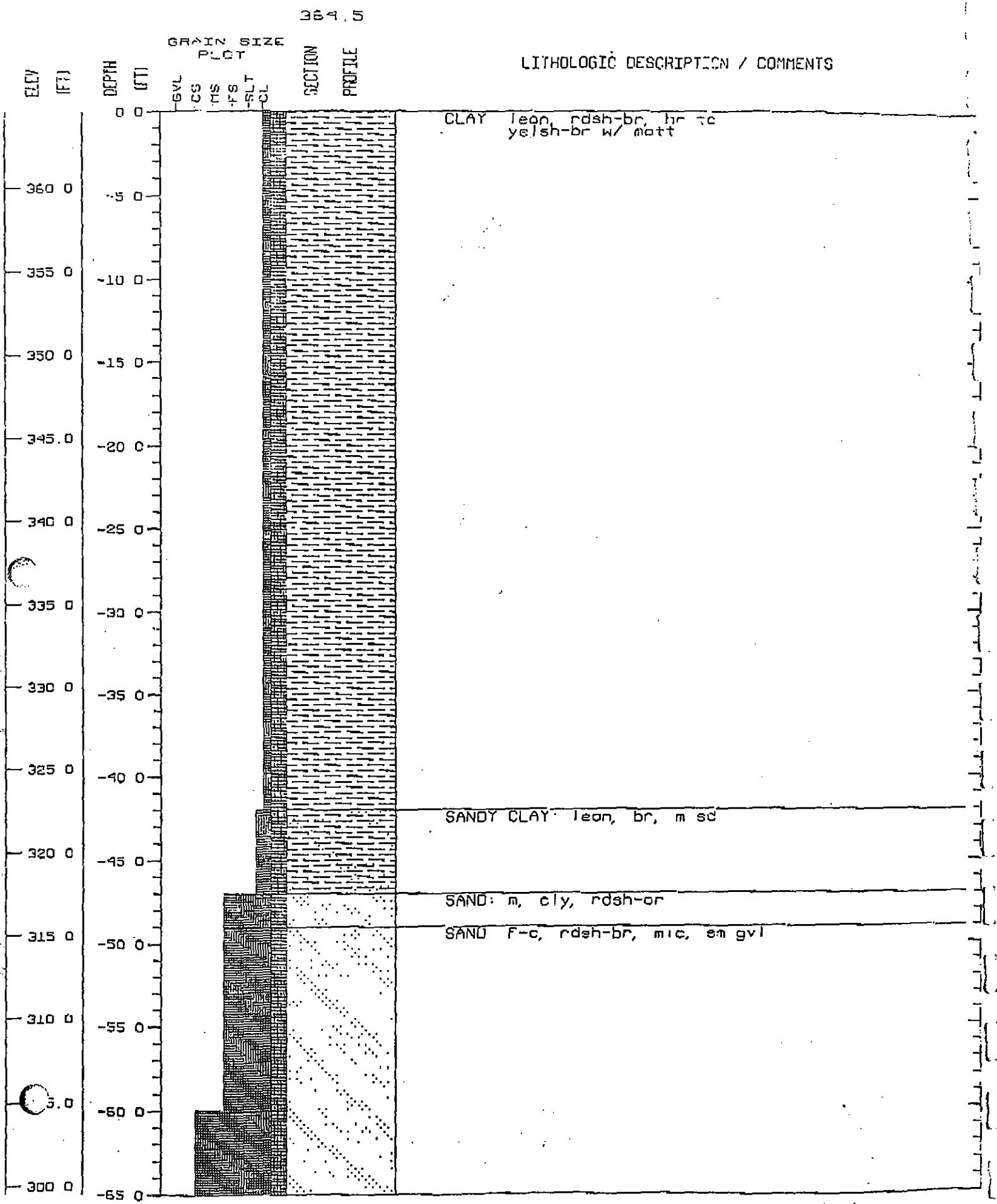
MW-140



MW-163

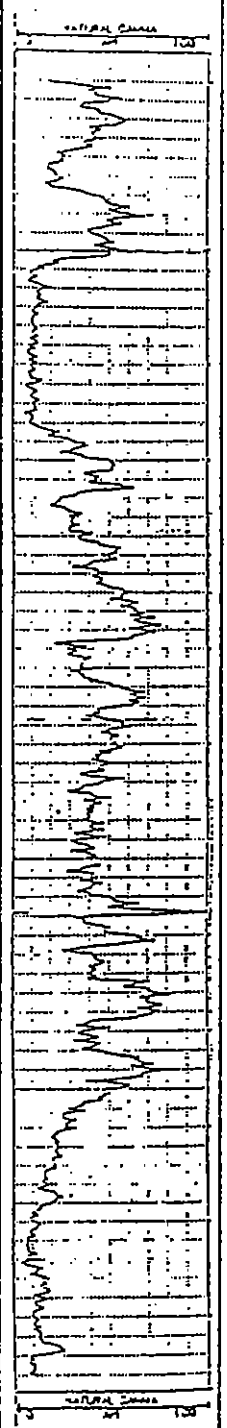

LITHOLOGIC DESCRIPTION / COMMENTS
FILL:
SILT gr, sm org material, tr gvl
CLAY yelsh-br mott gr, tr org material
SAND m, rdsh-br
CLAY rdsh-br mott gr, tr gvl
CLAY w/ gvl, rdsh-br mott gr
GRAVEL w/ sd, rdsh-br
SAND f, rdsh-br
CLAY yelsh-br mott rdsh-br
SAND f
CLAY lean, tr sd, rdsh-br mott gr
SAND f-c, rdsh-br mott gr
SAND m, cly, gr
SAND c-g, tr gvl
gr
GRAVEL w/ c sd, yl sh-br

MW-201

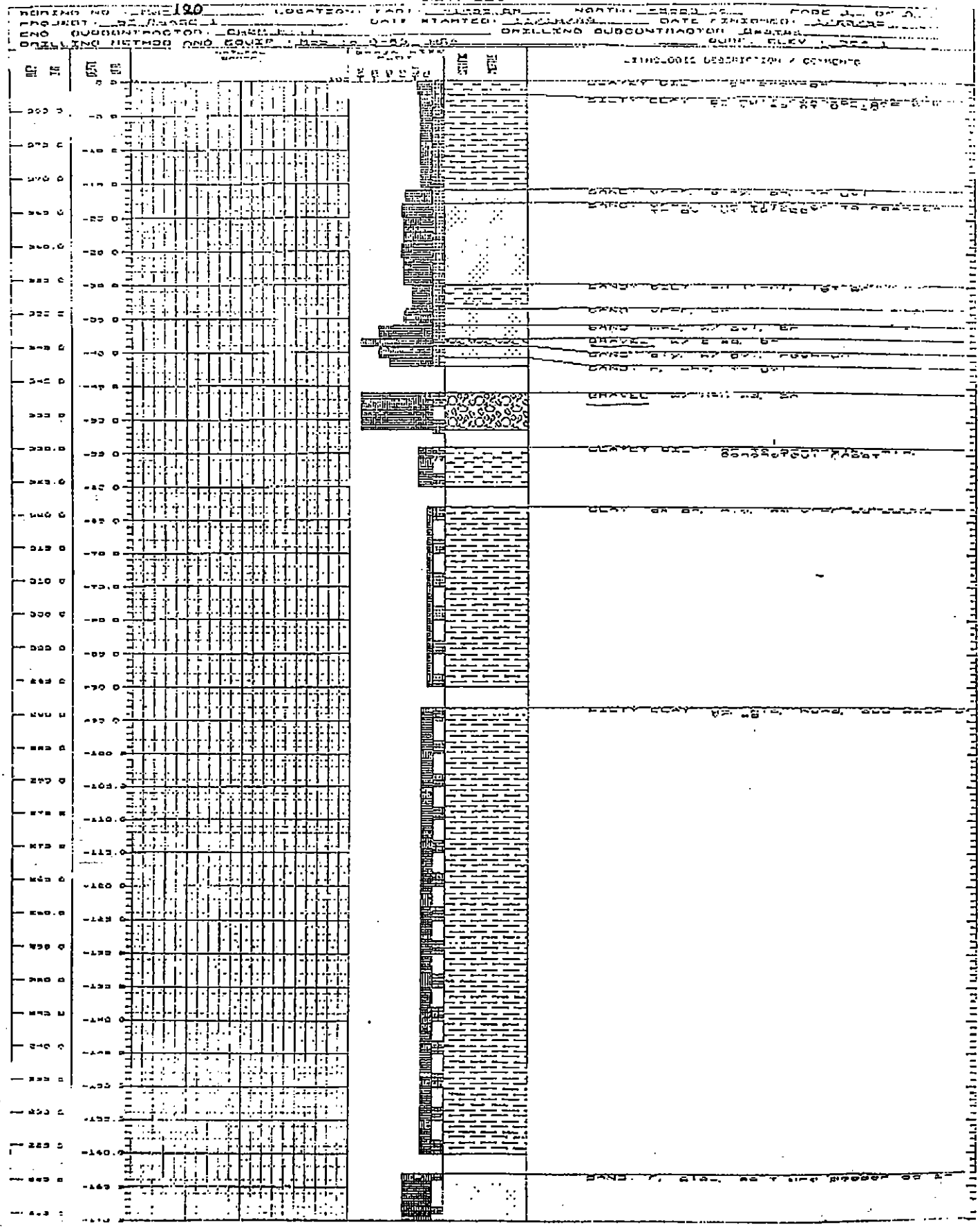

364.5
GRAIN SIZE PLOT
GVL
CS
MS
FS
SLT
CL
SECTION
PROFILE
LITHOLOGIC DESCRIPTION / COMMENTS
ELEV (FT)
DEPTH (FT)
CLAY lean, rdsh-br, hr to yelsh-br w/ matt
SANDY CLAY: lean, br, m sd
SAND: m, cly, rdsh-or
SAND f-c, rdsh-br, mic, sm gvl

PGDP Boring P4-F08
Land Surface = 371.95' AMSL

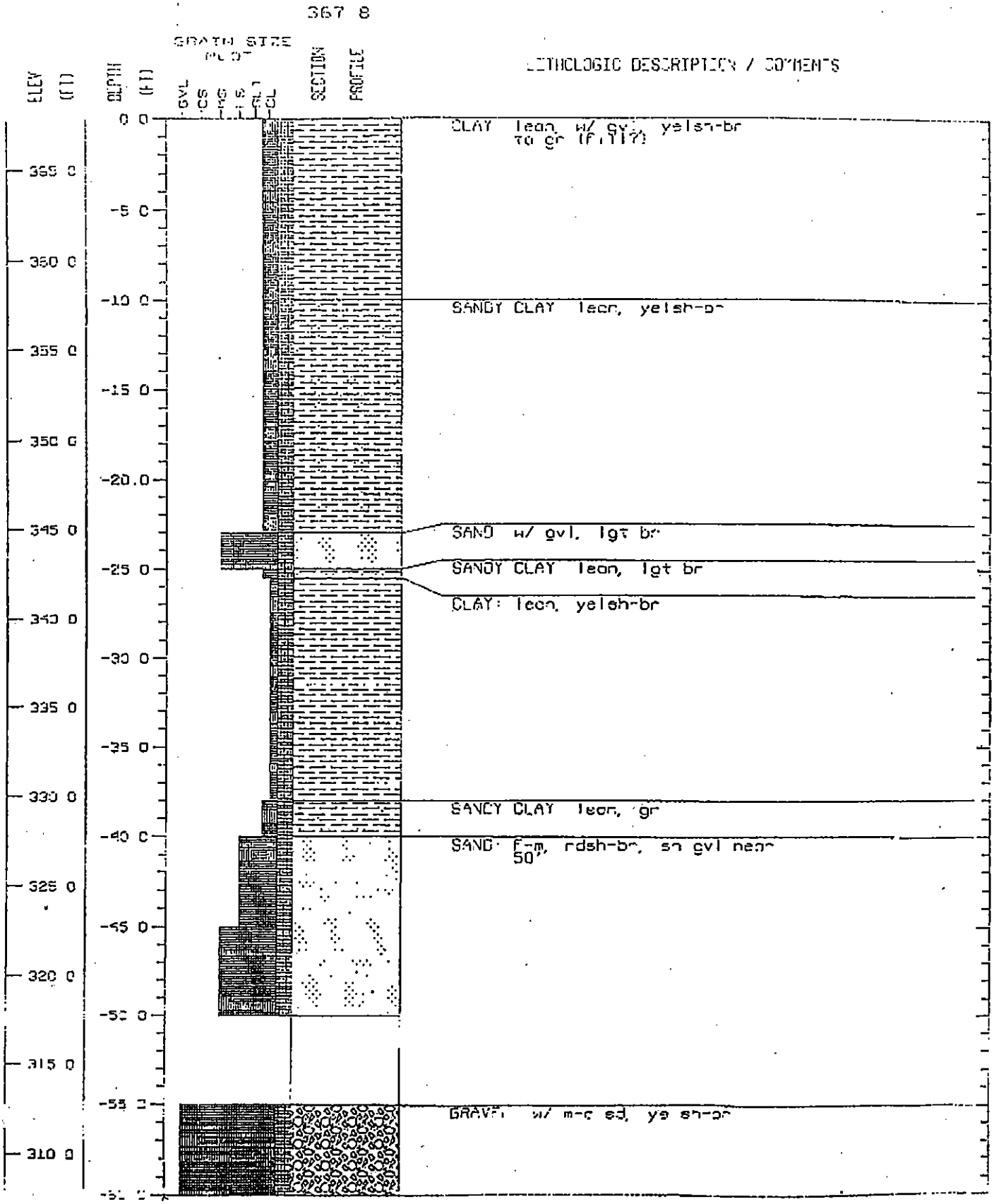
P4-F08

DEPTH (FEET)	GRAPHIC LOG	LITHOLOGY DESCRIPTION	GAMMA LOG
0		Loess & U. Cont. Dep. 0-49'	
50		L. Cont. Dep. 49-90'	
100	UPPER MBR	McNairy Fm. 90-337' Sand: 90-98' Silt: 98-112' Sand & Silt: 112-134'	
150		Clay: 134-148', slty Sand: 148-159'	
	LEVINGS	Silt: 159-185', cly	
200		Silt: 185-215', sdy.	
		Clay & Sand: 215-263', interbd	
250		Silt: 263-269'	
	LOWER MBR	Sand: 269-337'	
300			
350		Rubble Zone: 337-347' Mississippian : 347'-TD TD = 350'	

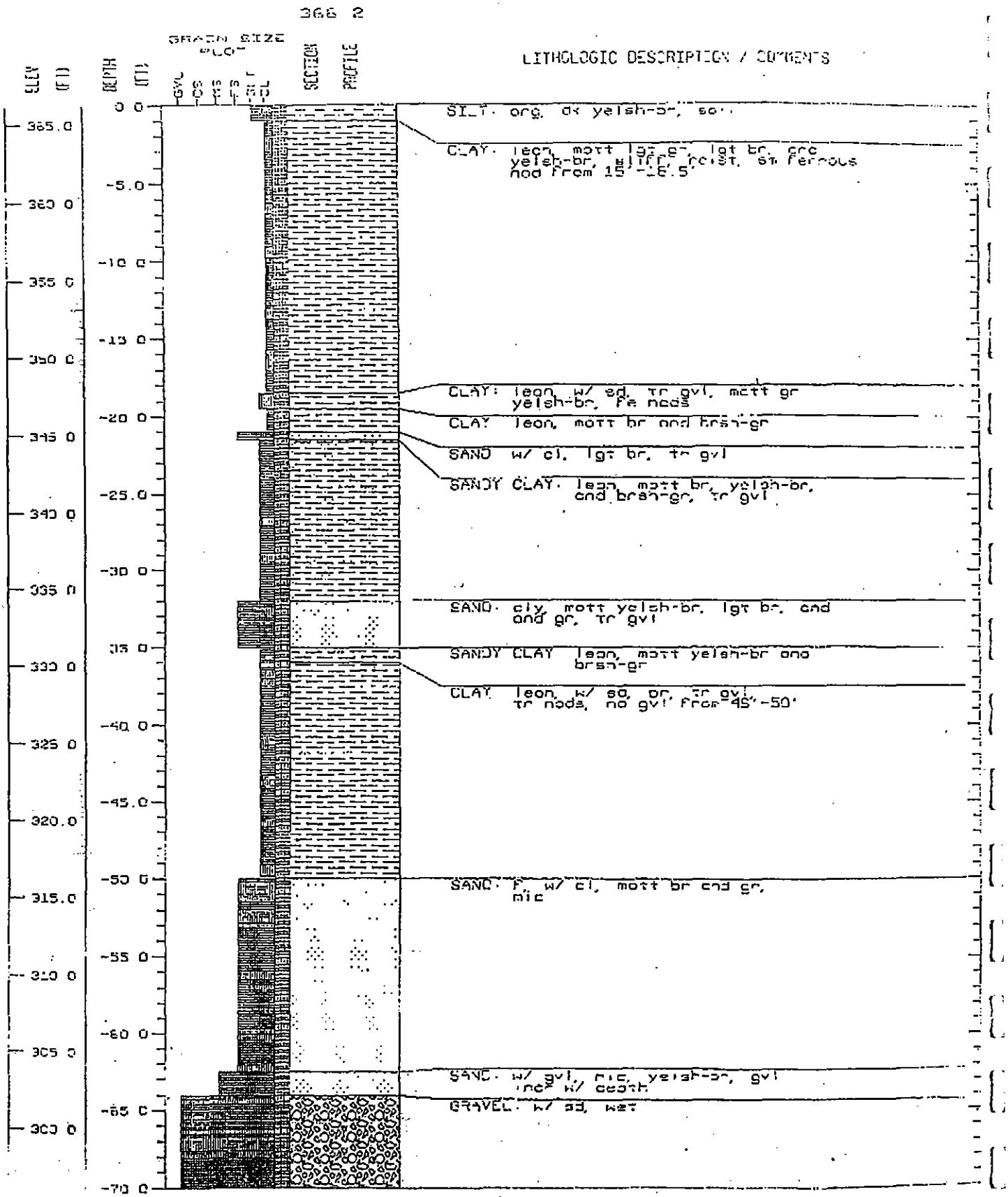
MW-120



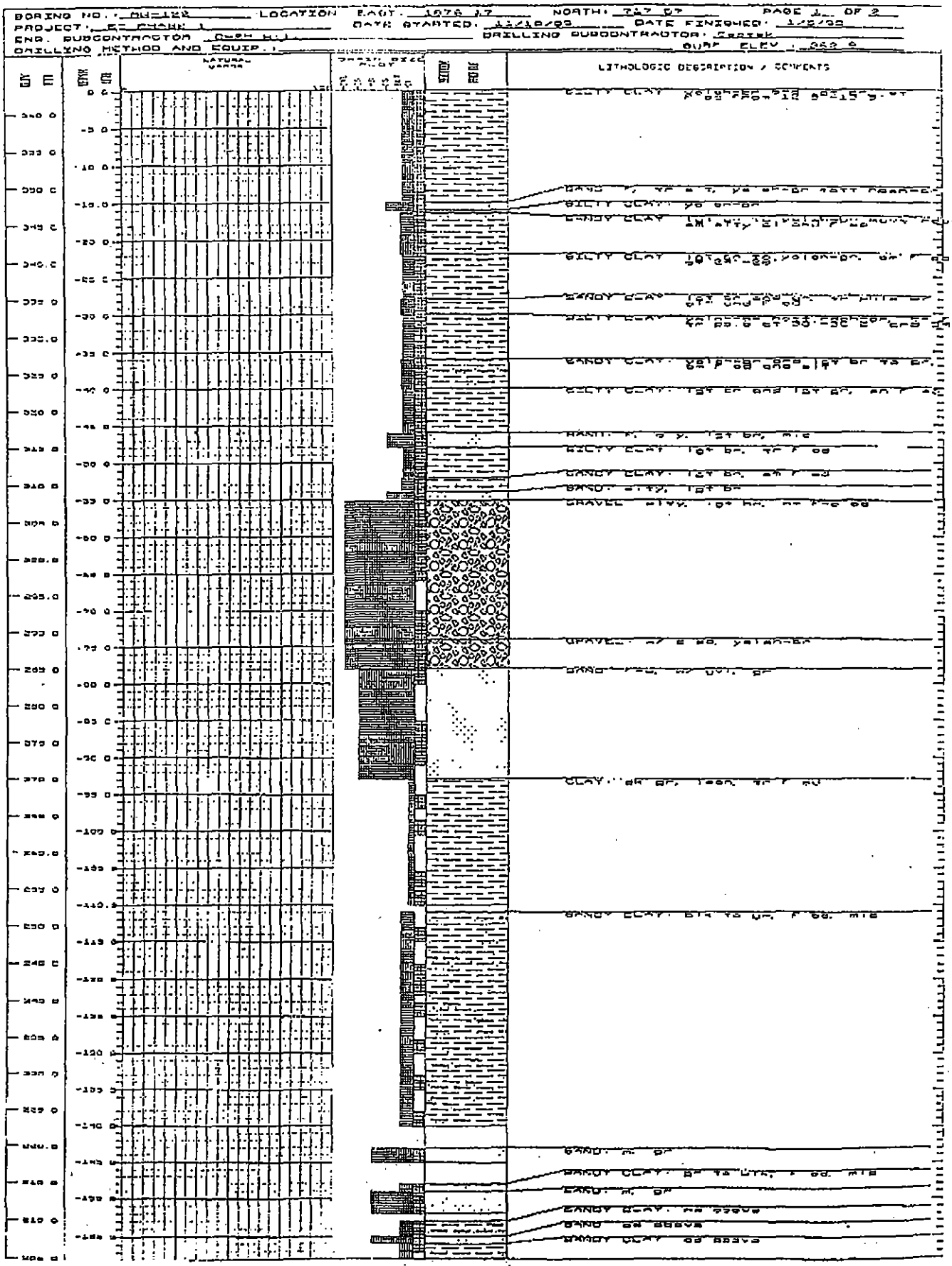
MW-181


367.8
GRAIN SIZE PLOT
GVL
CS
FG
SILT
CLAY
SECTION
PROFILE
LITHOLOGIC DESCRIPTION / COMMENTS
ELEV (FT)
DEPTH (FT)
365.0
360.0
355.0
350.0
345.0
340.0
335.0
330.0
325.0
320.0
315.0
310.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
CLAY lean, w/ gvl, yelsh-br to gr (FILL?)
SANDY CLAY lean, yelsh-br
SAND w/ gvl, lgt br
SANDY CLAY lean, lgt br
CLAY: lean, yelsh-br
SANDY CLAY lean, gr
SAND: f-m, rdsh-br, sm gvl near 50'
GRAVEL w/ m-c sd, ye sh-br

MW-193


366.2
GRAIN SIZE PLOT
GVL
CS
MS
FS
SLT
CL
SECTION PROFILE
LITHOLOGIC DESCRIPTION / COMMENTS
ELEV (FT)
DEPTH (FT)
365.0
360.0
355.0
350.0
345.0
340.0
335.0
330.0
325.0
320.0
315.0
310.0
305.0
300.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
SILT: org, dk yelsh-br, soft
CLAY: lean, matt lgt gr, lgt br, occ yelsh-br, stiff, moist, sl ferrous nod from 15'-18.5'
CLAY: lean, w/ sd, tr gvl, matt gr yelsh-br, Fe nods
CLAY: lean, matt br and brsh-gr
SAND w/ cl, lgt br, tr gvl
SANDY CLAY: lean, matt br, yelsh-br, and brsh-gr, tr gvl
SAND: cly, matt yelsh-br, lgt br, and and gr, tr gvl
SANDY CLAY lean, matt yelsh-br and brsh-gr
CLAY: lean, w/ sd, gr, tr gvl, tr nods, no gvl from 45'-50'
SAND: F, w/ cl, matt br and gr, mic
SAND: w/ gvl, mic, yelsh-br, gvl incr w/ depth
GRAVEL: w/ sd, wet

MW-122



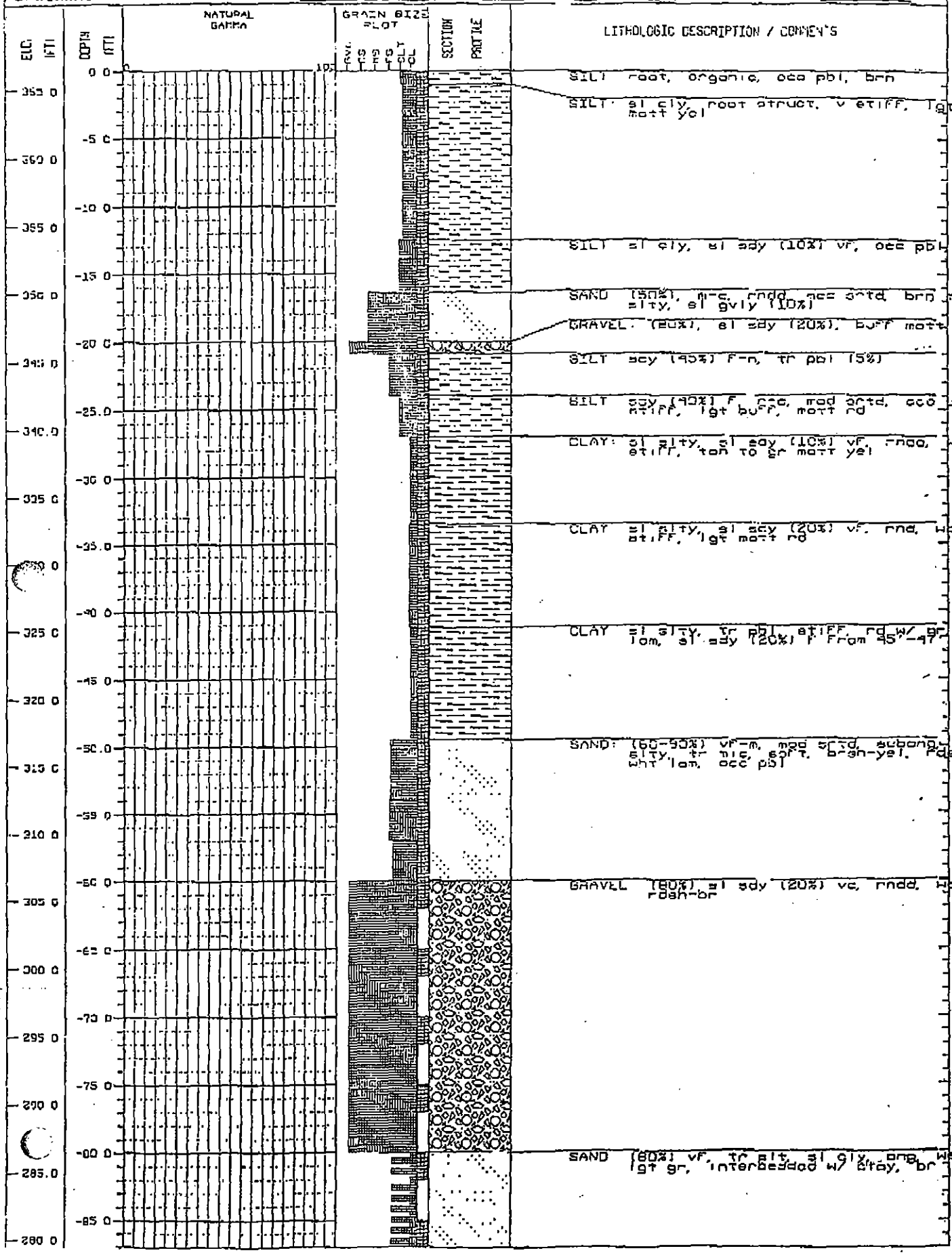
MW-106

BORING NO.: S-22 LOCATION: EAST: -8437.7 NORTH: 980.6 PAGE 1 OF 2

PROJECT: AZ-03% GW Monitoring ProDATE STARTED: 10/29/91 DATE FINISHED: 10/31/91

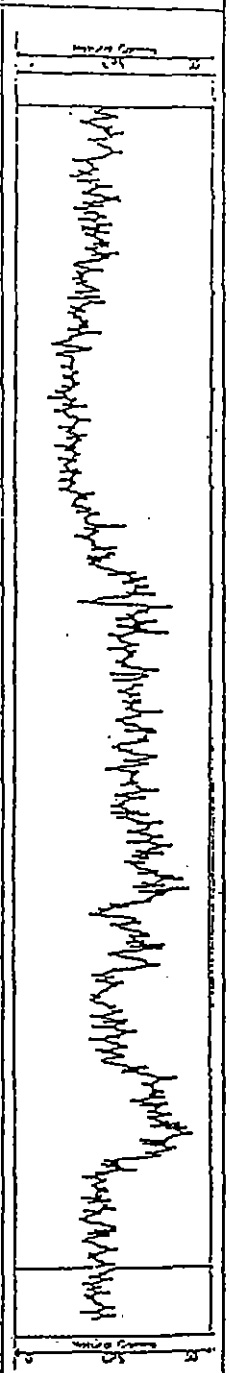
ENG. SUBCONTRACTOR: PGDP DRILLING SUBCONTRACTOR: Concoa Well Drilling

DRILLING METHOD AND EQUIP.: CME-55, HSA to 80' and mud rotary to 95' SURF. ELEV.: 365.9



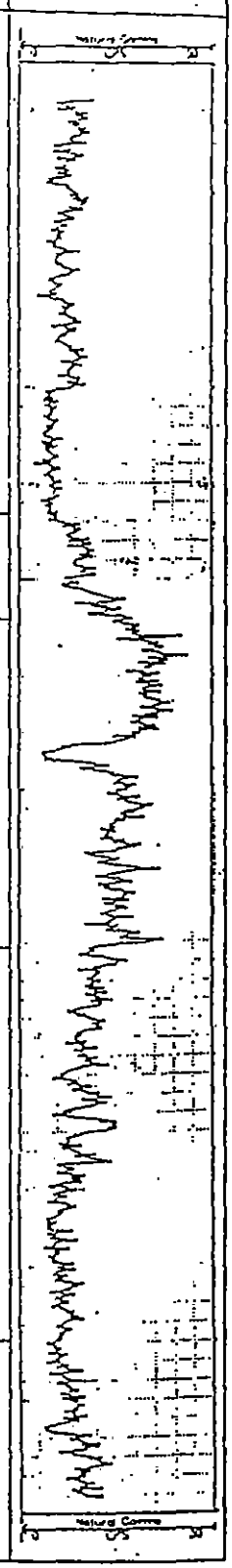
PGDP Boring Z16
Land Surface = 370.9' AMSL

Z16

DEPTH (FEET)	GRAPHIC LOG	LITHOLOGY DESCRIPTION	GAMMA LOG
0		Loess & U. Cont. Dep. 0-62'	
50		L. Cont. Dep. 62-101'	
100			
150 UPPER MDR		McNairy Fm. 101-322' Sand: 101-122' Silt: 122-129' Sand: 129-131', gvly Silt, Sand, & Clay: 131-162' gvly	
200 LEVINGS		Silt, Sand, & Clay: 162-186' Clay & Silt: 186-207' Sand: 207-211' Silt & Clay: 211-224'	
250 LOWER MDR		Sand: 224-248' Clay: 248-272' Sand: 272-322'	
300			
350		Mississippian : 322'-TD TD = 356.5'	

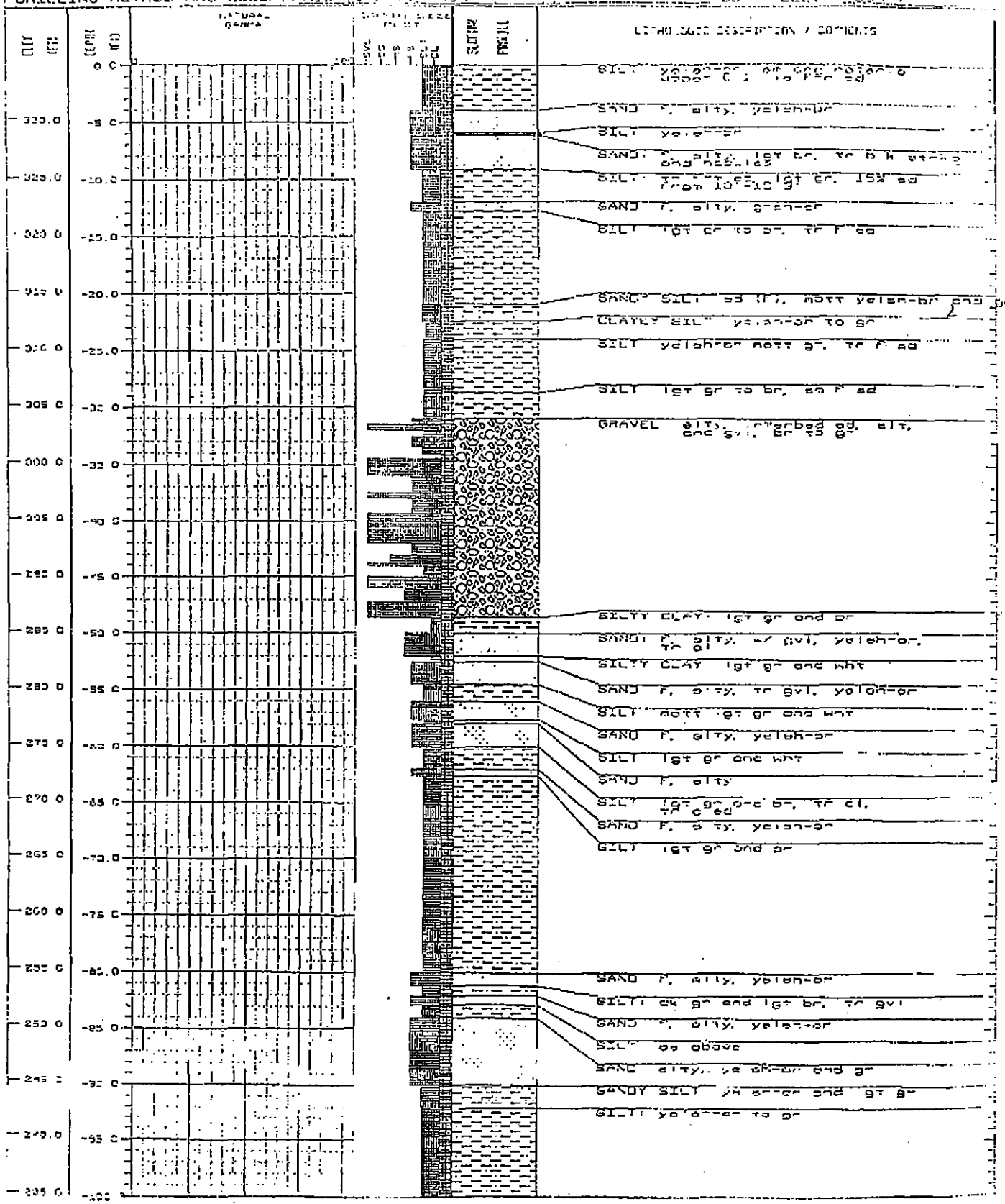
PGDP Boring Z12
Land Surface = 351.1' AMSL

Z12

DEPTH (FEET)	GRAPHIC LOG	LITHOLOGY DESCRIPTION	GAMMA LOG
0		Loess & U. Cont. Dep. 0-75'	
50			
		L. Cont. Dep. 75-110'	
100			
UMMR		McNairy Fm. 110-333' Sand: 110-129' Silt: 129-140'	
150		Clay: 140-168'	
LEVINGS		Sand: 168-175', gvly Silt: 175-229'	
200			
250		Sand & Silt: 229-283'	
LOWER MBR			
300		Sand: 283-333'	
350		Rubble Zone: 333-348' Mississippian : 348'-TD TD = 369'	

MW-133

BORING NO. MW-133 LOCATION: EAST 2215.65 NORTH 9184.7 PAGE 1 OF 2
PROJECT: SE PLUME DATE STARTED 2/25/93 DATE FINISHED 2/28/93
ENG. SUBCONTRACTOR: CH2M DRILLING SUBCONTRACTOR: Geotec
DRILLING METHOD AND EQUIP.: Mod. CME 55, HSA SURF. ELEV. 334.7

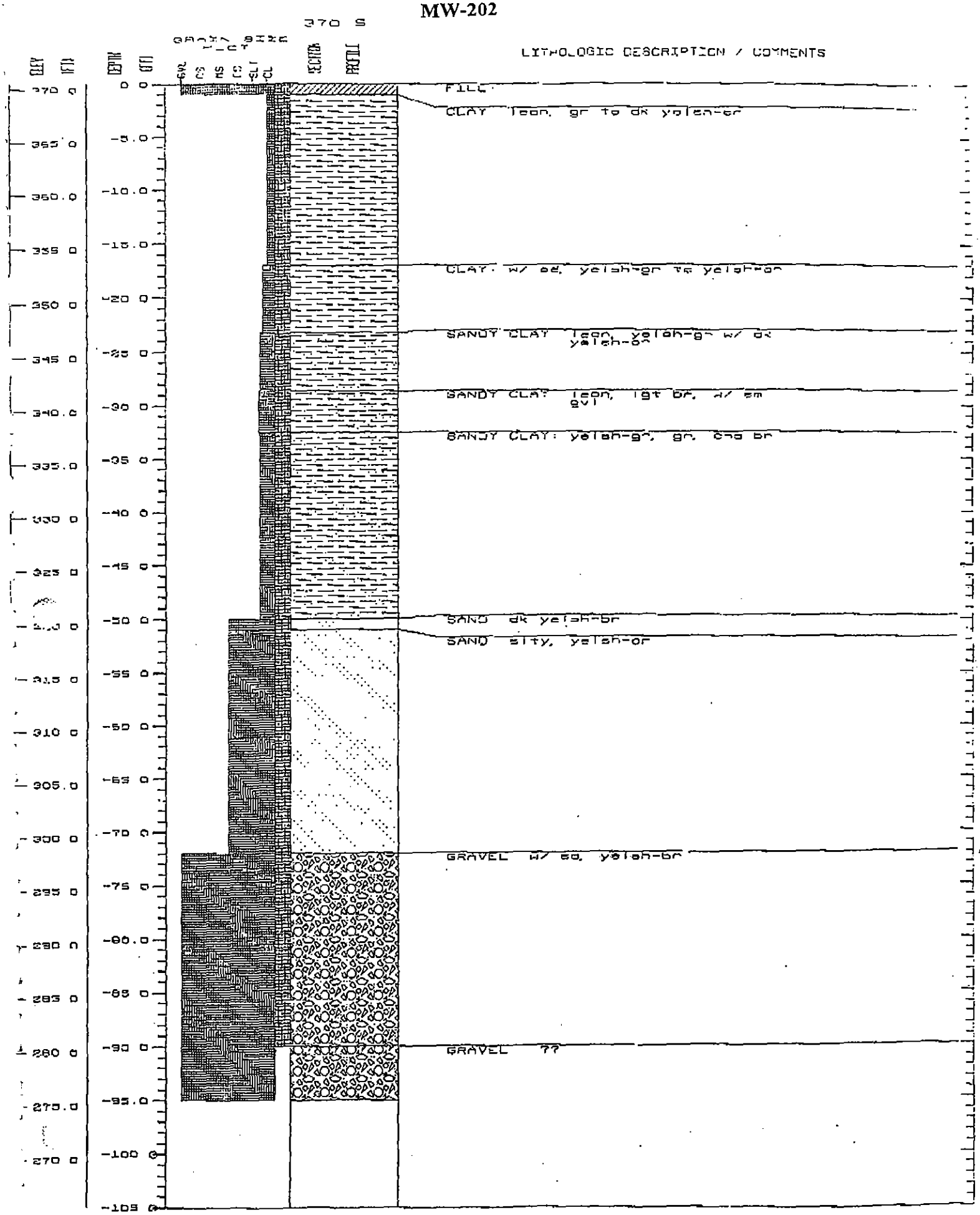


MW-121

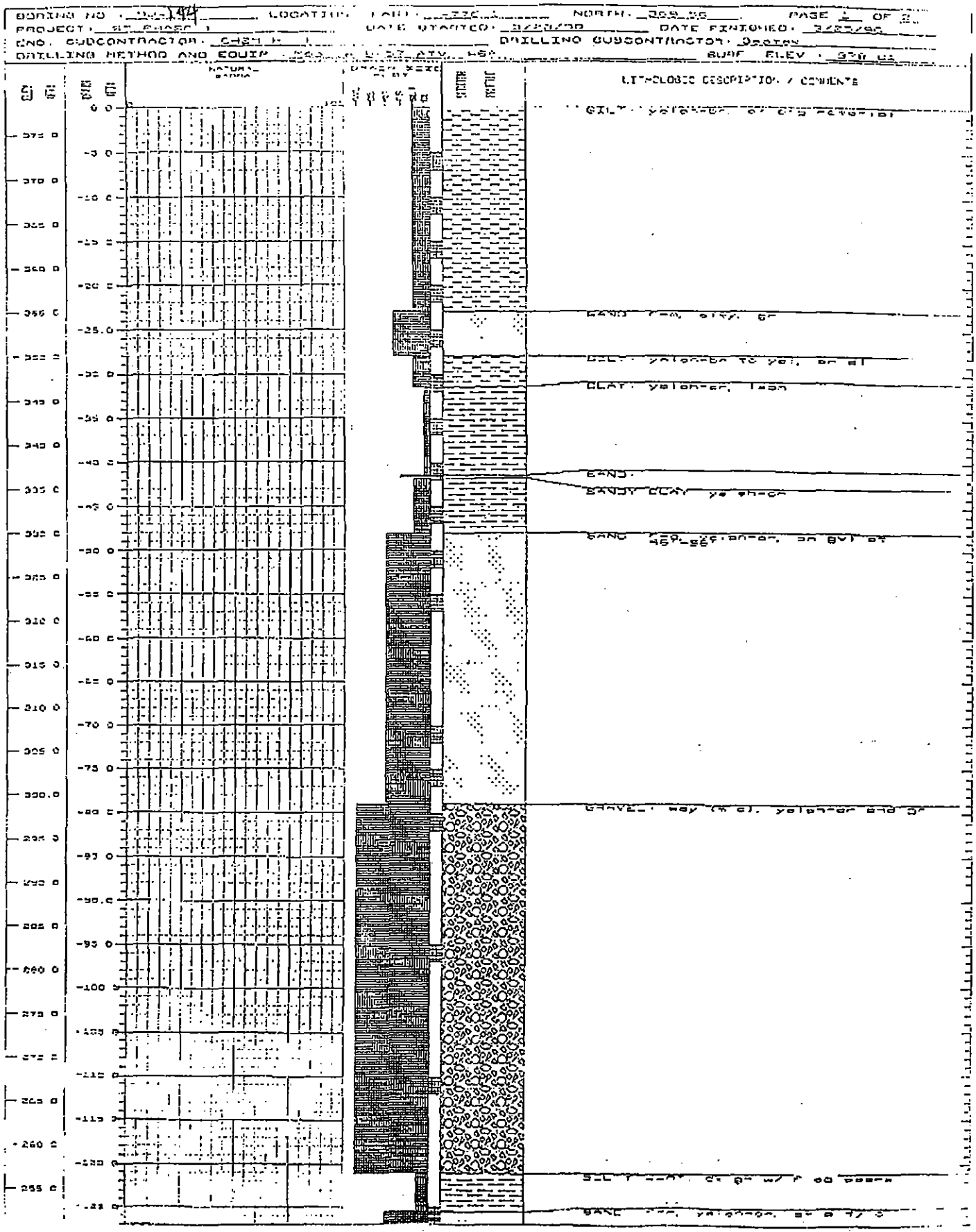
PGDP Well MW121
Land Surface = 372.43 ' AMSL
Drilled by Geotek Engineering in 1989-1990

DEPTH (FEET)	GRAPHIC LOG	LITHOLOGY DESCRIPTION
0		Loess & U. Cont. Dep. 0-52'
50		L. Cont. Dep. 52-88'
100		McNairy Fm. 88'-TD
		Clay: 88-95.5' grysh-pink,lntrbd w/ sd. 95.5-110' slty, mic, yellsh-brn
		Sand: 110-115' cly, yllsh-brn
		115-130' well sort, w/slt, yellsh-brn-gry. 130-135' intrbd w/cl
150 UPPER MBR		Silt: 135-165' olv blk, w/thin sd lens
		165-170' intrbd w/f sd, wht
		170-200.5' olv blk w/thin sd lens
200 LEVINGS		Sand: 200.5'-TD vf, well sort, slty, lt gry
		TD = 211.5'

MW-202


370 S
LITHOLOGIC DESCRIPTION / COMMENTS
FILL
CLAY lean, gr to dk yelsh-or
CLAY: w/ sd, yelsh-gr to yelsh-or
SANDY CLAY lean, yelsh-gr w/ dk yelsh-or
SANDY CLAY: lean, lgt br, w/ sm gvl
SANDY CLAY: yelsh-gr, gr, brs br
SAND dk yelsh-br
SAND silty, yelsh-or
GRAVEL w/ sd, yelsh-br
GRAVEL ??

MW-144


BORING NO : MW-144
LOCATION: EAST : 2264.1
NORTH: 359.35
PAGE 1 OF 2
PROJECT: ST. PHASE 1
DATE STARTED: 3/28/98
DATE FINISHED: 3/28/98
ENG. SUBCONTRACTOR: CHET K.
DRILLING SUBCONTRACTOR: Design
DRILLING METHOD AND EQUIP: HSA - CME 55 ATV - HSA
SURF ELEV: 378.08
LITHOLOGIC DESCRIPTION / COMMENTS
SILT: yellow-br, dry, trace gravel
SAND: f-m, silty, br
SILT: yellow-br to yel, br, sl
CLAY: yellow-br, lean
SAND
SANDY CLAY: ye-br-gr
SAND: med-coarse, gr, gvl, br
GRAVEL: sdy (% c), yellow-gr and br
SILT / CLAY: gr, br w/ f sd layers
SAND: f-m, yellow-br, sl w/ silt

Appendix F

GLOSSARY OF GEOPHYSICAL TERMS

Glossary

(from Sheriff, 1973; Sheriff and Geldart, 1982)

common-depth-point (CDP): having the same midpoint between source and detector. Also called common-midpoint or common-reflection-point.

common-depth-point stack: a sum of the traces corresponding to the same midpoint. The traces from different profiles having different offset distances are gathered together, corrected for statics and normal moveout, and then summed (or stacked). The objective is to attenuate random effects and events whose dependence on offset is different from that of primary reflections.

filter: A part of a system that discriminates against some of the information entering it. Band pass filters are often specified by listing their low-cut and high-cut component filters. Filter characteristics are often specified by the frequencies at which the amplitude is down by 3 dB (70 percent or half power) and by the slope of the cutoff.

f–k plot: A frequency-wavenumber plot, which displays how data sort into distinguishable sets in the frequency-wavenumber domain. The energy density within a given time interval is usually contoured. Used to examine the direction and apparent velocity of seismic waves.

normal moveout: Differences in the arrival time of reflections because of the distance between source and receiver.

velocity analysis: Calculation of stacking or NMO velocity from measurements of normal moveout. In current usage, generally involves common-midpoint data but includes also $T-\Delta T$ analysis and X^2-T^2 analysis. Most analysis schemes assume a normal moveout, measure the coherency at that normal moveout, and then vary the normal moveout in order to maximize the coherency. The stacking velocity value depends somewhat on the amount of data included in the analysis, that is, on the range of offsets and locations analyzed. Where all reflectors are horizontal and where velocity varies only with depth, the stacking velocity is approximately the rms velocity.

stack: A composite record made by combining traces from different records. Stacking involves filtering because of timing errors or waveshape differences among the elements being stacked.

stacking velocity: Velocity calculated from normal-moveout measurements and a constant-velocity model. Used to maximize events in common-midpoint stacking. Sometimes erroneously called "rms velocity". Usually calculated for the best-fit hyperbola to gather data, the value thus depending somewhat on the range of offsets involved. Fitting an NMO equation to CDP data is equivalent to assuming and ellipsoidal wavefront, yielding the stacking velocity of the horizontal component.