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I. INTRODUCTION

This manual presents a procedure for describing rock core samples, obtained for the New York State Department of Transportation, by State work forces and/or private drilling companies, for foundation, rockslope, and other engineering purposes. The evaluation is intended to provide a comprehensive word description of the core samples to those involved in the planning, design, construction, and maintenance processes.

The procedure involves visual and manual examination of core samples with respect to rock type, color, composition, bedding, structure, hardness and degree of weathering. This information will be used to generate an official Rock Core Log, for each evaluated boring, which will be made available to interested parties, including designers and prospective bidders. NYSDOT obtains large quantities of rock core samples but only those samples necessary to advance the required geologic designs are evaluated and the corresponding Rock Core Logs developed.

The standardized charts and tables herein, used as descriptive aids in the evaluation procedures, are adopted from various organizations, such as the U.S. Department of Interior, Geological Survey, the American Institute of Professional Geologists (AIPG), the U. S. Department of the Navy, Naval Facilities Engineering Command, etc.). It should be understood, however, that the final core descriptions and rock quality assessments are based on the judgment of the individual performing the evaluation. Additional tests that may be performed, such as Point Load tests and/or Unconfined Compressive Strength tests, are not intended to be used to verify the descriptions but to provide further information that will be reported separately.
II. BRIEF GLOSSARY OF GEOLOGIC TERMS

**Banding:** Layering in the rock. The layers may be bedding, parallel to bedding, or be at an angle to bedding in sedimentary rock.

In metamorphic rock, the layering is called foliation. The foliation is a result of the alignment of platy (flat) and/or elongated minerals due to the heat and pressure of metamorphism. The foliations may be parallel with or at an angle to the original bedding. Sometimes the original bedding has been obliterated and only the foliations can be observed.

Igneous rocks normally do not exhibit banding except in cases of differential settlement during hardening.

**Bedding:** The layers in sedimentary rock parallel to the original surface of deposition. The original bedding planes were often, but not always, horizontal. The rock will often tend to break along bedding planes.

**Cement:** The material, usually chemically precipitated, which binds the particles of some sedimentary rocks together (see grains and matrix).

**Cleavage:** Closely spaced parallel planes along which rock can break. The cleavage may be a result of weakness along bedding planes in sedimentary rock (fracture cleavage) or may be a secondary development by alignment of platy minerals in metamorphic rock (slaty cleavage). Slaty cleavage may be parallel with or at an angle to original bedding.

**Diagenesis:** The process of chemical, physical and/or biological change in deposited sediment during its conversion into rock, exclusive of metamorphosis and weathering (see lithification).

**Effervescence:** The fizzing action that occurs when a carbonate rock (containing CaCO₂ or CaCO₃) is placed in contact with hydrochloric acid (HCl).

**Fault:** A fracture in rock along which there has been observable movement (see joint). In rock cores, a fault can sometimes be recognized by the displacement of mineral veins.

**Foliation:** The alignment of platy (flat) or elongate minerals, usually in metamorphic rocks, giving the rock a banded appearance. The foliation is usually a result of the heat and pressure rock is subjected to during metamorphism.
**Fracture:** Breakage in rock. The fracture may be parallel with or at an angle to banding, bedding, cleavage, foliation or lamination. Faults and joints are examples of fracture.

**Grains:** The particles of which a rock or sediment is composed (see cement and matrix).

**Joint:** A fracture in rock along which there has been no observable movement (see fault).

**Lamination:** Very thin layering in rock, less than 0.4 in. (10 mm). The layers may be a result of physical or chemical variations. Laminations may be parallel with or at an angle to bedding (cross-laminations) in sedimentary rock.

**Lithification:** The process by which loose sediment becomes rock (see diagenesis).

**Lithology:** The character of a rock described in terms of its structure, color, mineral composition, grain-size, and arrangement of its component parts.

**Matrix:** The fine-grained portion, not necessarily cement, of some sedimentary rocks (sandstone, conglomerate, etc.) in which the coarser particles are embedded. The matrix may or may not be cemented (see cement).

**Mineral:** An inorganic substance, not necessarily of inorganic origin, that has (1) a definite chemical composition, or range of composition and (2) distinctive physical properties and/or molecular structure. The basic building block of rock.

**Sediment:** Solid material, either mineral or organic, that has been transported from its site of origin, by air, water, ice or biological activity, and has been re-deposited on the earth's surface, above or below water.

**Weathering:** The process by which rocks are broken down and decomposed by the action of external agencies such as wind, water (rain and/or ground water), temperature change, plants and bacteria.
III. ROCK CORE EVALUATION PROCEDURE

A proper description of rock obtained in drill cores is a valuable aid to the Engineering Geologist in determining the properties of bedrock with regard to rock slope and structure foundation design.

When evaluating rock core, the Engineering Geologist should make note of the following:

A. Recovery,
B. RQD,
C. Rock type,
D. Color,
E. Mineralogy, Grain size & Texture,
F. Bedding,
G. Fractures,
H. Size range of core pieces,
I. Hardness,
J. Weathering,
K. Additional observations,
L. Photographs, and
M. Rock Core Log. The results are to be recorded on a Rock Core Evaluation Sheet (See Appendix A) and used to prepare an official Rock Core Log (See Appendix B).

A. RECOVERY
The recovery of each core run is usually determined by the Driller and recorded on the official Boring Log. Where the recovery is not made available, the Engineering Geologist should record the recovery (in percent) as the length of core recovered divided by the total length of the core run, multiplied by 100. Areas where loss is likely to have occurred (soft seams, fractures with edges that don't match, zones of decay, etc.) should be noted.

B. RQD
The Rock Quality Designation (RQD) is a modified measure of recovery, calculated in order to estimate the quality of the intact rock mass. The Engineering Geologist is responsible for the determination of RQD. The RQD (in percent) is obtained by dividing the sum of all the recovered pieces of core equal to or greater than 4 in. (100 mm) in length by the total length of the core run, then multiplying by 100. In effect, the RQD is a measure of the spacing of the discontinuities (bedding, fractures, faults, joints, shear zones, etc.) in the rock mass. When calculating RQD, it is important to try to distinguish between naturally occurring discontinuities and mechanical breaks which occur during coring procedure. Only naturally occurring discontinuities will be considered when calculating RQD. When there is uncertainty about a break, it should be considered as natural in order to be conservative in the calculation of RQD. In addition, only sound bedrock is used in the calculation of RQD. Weak and/or weathered rock core is not included in the RQD calculation.
Note: RQD was originally developed for use with NX-size (2.16 in. (54.9 mm)) core drilled in crystalline rock and used to describe rock quality for tunneling conditions. It has since become virtually standard practice in drill core logging for a variety of core sizes and rock types. ASTM International indicates core sizes from BX (1.44 in. (36.6 mm)) to PX (3.35 in. (85.1 mm)) are normally acceptable for measuring RQD. RQD calculated for cores smaller than BX, e.g., AX-size (1.19 in. (30.2 mm)), may not be representative of the true quality of the rock mass.

C. ROCK TYPE
Geologists divide rocks into three groups based on origin and then subdivide them into smaller groups on the basis of composition and texture.

1. IGNEOUS ROCKS
Rocks formed from the solidification of molten material (magma or lava). Igneous rocks can be intrusive (solidifying below the surface from magma) or extrusive (solidifying at the surface from lava).

Intrusive igneous rocks are generally composed of larger crystals/grains (coarser texture) while extrusive igneous rocks are generally composed of smaller crystals/grains (finer texture).

In general, igneous rocks tend to have an interlocking, crystalline texture with little to no appearance of layering, banding, or bedding.

2. METAMORPHIC ROCKS
Metamorphic rocks are Igneous and/or Sedimentary rocks whose textures and/or mineral content have been changed by heat, pressure and/or chemically active solutions (invading gases and/or liquids). In some instances, metamorphic rocks have been re-metamorphosed into other higher or lower grade metamorphic rocks.

Metamorphic rocks can appear banded or layered (due to the alignment of platy, tabular, or elongated mineral grains or the concentration of different minerals into distinct bands).

3. SEDIMENTARY ROCKS
Sedimentary rocks are formed by lithification of accumulated sediments that were transported and deposited by water, wind, ice, biological activity and/or chemical precipitation. In general, sedimentary rocks are composed of the weathering products of pre-existing rocks.

Sedimentary rocks usually, but not always, have a layered appearance due to the presence of bedding planes. The grains of sedimentary rocks can range from sharply angular to well-rounded and from very fine to very coarse. Sedimentary rocks may contain fossils.
Two important processes in the formation of sedimentary rocks from original sediments are compaction and cementation.

a. **Compaction** is the physical process by which the volume of a sediment is reduced by pressure. The weight of overlying deposits compact the underlying sediments, forcing out water and air and decreasing the porosity by squeezing the grains of sediment closer together. When muds are compacted in this manner, weak attractive forces may cause the grains to adhere to one another, converting the loose sediment into rock. Claystone, mudstone and shale are examples of sedimentary rocks which may be formed in this manner.

b. **Cementation** occurs as water circulates through the sediment and dissolved elements in the water precipitate out and bind the grains of sediment together. Changes in the physical and/or chemical environment initiate the precipitation. Common cementing agents include silica compounds and calcium carbonate (calcite or aragonite, $\text{CaCO}_3$). Various iron compounds (such as $\text{FeCO}_3$, $\text{FeS}_2$, and $\text{Fe}_2\text{O}_3$) can also act as cements. The cement may partially or completely fill the pore spaces in the sediment. Rocks formed by cementation of sediments can range from very soft to very hard. Cemented claystone, mudstone, shale, siltstone, sandstone and limestone are examples of rocks which may be formed by cementation.

**Note:** For engineering purposes, rocks formed by cementation (with or without compaction) are more durable than rocks formed by compaction alone.
### Table 1: Common Igneous Rocks

<table>
<thead>
<tr>
<th>ROCK NAME</th>
<th>COLOR GROUP</th>
<th>TEXTURE</th>
<th>MINERALS</th>
<th>PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEGMATITE</td>
<td></td>
<td>Very coarse grained.</td>
<td>Quartz, Feldspar, Mica</td>
<td>Quartz and feldspar predominate but can contain many minerals. Feldspar is white, pink or green. Moderately difficult to drill.</td>
</tr>
<tr>
<td>GRANITE</td>
<td>Light colored</td>
<td>Coarse to fine interlocking grains.</td>
<td>Quartz, Feldspar, Mica, Hornblende, Pyroxene</td>
<td>White, gray or pink. Quartz is a major constituent. Can have a salt and pepper texture. Feldspar is white, pink or green. Moderately difficult to drill.</td>
</tr>
<tr>
<td>SYENITE</td>
<td></td>
<td>Coarse to fine interlocking grains.</td>
<td>Feldspar, Mica, Hornblende, Pyroxene</td>
<td>Little or no quartz. Feldspar is white or pink. Can have a salt and pepper texture. Moderately difficult to drill.</td>
</tr>
<tr>
<td>DIORITE</td>
<td></td>
<td>Coarse to fine interlocking grains.</td>
<td>Feldspar, Biotite, Hornblende, Pyroxene</td>
<td>Often greenish in appearance. Often contains quartz (quartz diorite). Feldspar is white or gray. Moderately difficult to drill.</td>
</tr>
<tr>
<td>GABBRO</td>
<td>Dark colored</td>
<td>Coarse interlocking grains.</td>
<td>Feldspar, Hornblende, Pyroxene</td>
<td>No quartz. Feldspar is white or gray. Difficult to drill. The intrusive variety of basalt.</td>
</tr>
<tr>
<td>DIABASE</td>
<td></td>
<td>Medium to fine interlocking grains.</td>
<td>Feldspar, Hornblende, Pyroxene</td>
<td>No quartz. Commonly called traprock. Moderately difficult to drill.</td>
</tr>
<tr>
<td>BASALT</td>
<td></td>
<td>Fine interlocking grains.</td>
<td>Feldspar, Hornblende, Pyroxene</td>
<td>No quartz. Feldspar is white or gray. Difficult to drill. The extrusive variety of gabbro.</td>
</tr>
</tbody>
</table>
# Table 2: Common Metamorphic Rocks

<table>
<thead>
<tr>
<th>ROCK NAME</th>
<th>COLOR</th>
<th>STRUCTURE</th>
<th>MINERAL COMPOSITION</th>
<th>PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARBLE</td>
<td>White, Gray</td>
<td>Massive</td>
<td>Calcite, Dolomite</td>
<td>Often distinctly crystalline. Can be scratched with a knife or nail. Can contain flakes of graphite. Effervesces in dilute (5%) hydrochloric acid. Drills easily.</td>
</tr>
<tr>
<td>GNEISS</td>
<td>Gray, Green, Pink</td>
<td>Banded</td>
<td>Quartz, Feldspar, Mica</td>
<td>Banded appearance due to alignment of elongate and platy minerals. Usually moderately difficult to drill.</td>
</tr>
<tr>
<td>SCHIST</td>
<td>Green, Gray, Brown</td>
<td>Foliated (coarse-grained)</td>
<td>Mica, Quartz, Feldspar</td>
<td>Foliation due to alignment of platy minerals. Contains a lot of mica. Drills easily.</td>
</tr>
<tr>
<td>SLATE/PHYLLITE</td>
<td>Gray, Red, Green, Purple</td>
<td>Foliated (fine-grained)</td>
<td>Mica, Quartz, Feldspar</td>
<td>Foliation due to alignment of platy minerals. Can be distinguished from shale by its usually shiny surface. Moderately easy to drill.</td>
</tr>
</tbody>
</table>
Table 3: Common Sedimentary Rocks

<table>
<thead>
<tr>
<th>ROCK NAME</th>
<th>STRUCTURE</th>
<th>COLOR</th>
<th>PARTICLE SHAPE AND SIZE</th>
<th>PREDOMINANT MINERAL COMPOSITION</th>
<th>CEMENT/MATRIX</th>
<th>PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONGLOMERATE</td>
<td>Massive or layered.</td>
<td>Red Gray Brown</td>
<td>Very coarse to fine grains.</td>
<td>Rock fragments.</td>
<td>Iron Calcite Silica Clay</td>
<td>Major portion composed of pebbles up to or more than an inch in diameter. Moderate to difficult to drill (depending on type of fragments &amp; matrix).</td>
</tr>
<tr>
<td>LIMESTONE</td>
<td>Light Gray To Black</td>
<td>Angular to rounded grains.</td>
<td>Calcite</td>
<td>Calcite Silica Clay</td>
<td>Often dense. Effervesces freely in dilute (5%) hydrochloric acid. Often fossiliferous. May contain veins of calcite. Can be scratched with a knife or nail. Easy to drill. May contain chert (microcrystalline quartz) which is very difficult to drill. May contain Dolomite.</td>
<td></td>
</tr>
<tr>
<td>DOLOSTONE</td>
<td>White To Dark Gray</td>
<td>Angular to rounded grains.</td>
<td>Dolomite</td>
<td>Dolomite Silica Clay</td>
<td>Similar to limestone but effervesces feebly in dilute (5%) hydrochloric acid. Can be scratched with a knife or nail. Drills easily. May contain chert which is very difficult to drill. May contain Calcite.</td>
<td></td>
</tr>
<tr>
<td>SILTSTONE MUDSTONE SHALE CLAYSTONE</td>
<td>Laminated</td>
<td>Red Black Gray Green Purple</td>
<td>Fine to very fine particles.</td>
<td>Clay Quartz Feldspar</td>
<td>Clay Calcite Silica</td>
<td>Generally dull in appearance. Can be confused with fine-grained limestone but will not effervesce (when pure) in hydrochloric acid. May contain pyrite (fool's gold) crystals. May contain calcite and/or quartz veins. Can be scratched with a knife or nail. Drills easily. The different names (siltstone to claystone) are based on diminishing grain size.</td>
</tr>
</tbody>
</table>
**D. COLOR**
The color of the recovered rock is determined by comparing the core pieces with color chips in the Geological Society of America (GSA) Rock Color Chart. Variations in color, if considered important, are noted.

**E. MINERALOGY, GRAIN SIZE, AND TEXTURE**
A description of the major minerals composing the rock. If possible, the size of the individual grains/crystals and the texture of the rock (very fine to very coarse) are noted. General descriptions of mineralogy, grain size, and texture for the various rock types are included in the rock type tables.

**F. BEDDING**
The following table lists the categories of bedding used in describing sedimentary rock:

<table>
<thead>
<tr>
<th>BEDDING</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Thick-Bedded</td>
<td>Greater than 4 ft. (&gt; 1.2 m)</td>
</tr>
<tr>
<td>Thick-Bedded</td>
<td>1 ft. to 4 ft. (0.3 m to 1.2 m)</td>
</tr>
<tr>
<td>Medium-Bedded</td>
<td>4 in. to 12 in. (100 mm to 300 mm)</td>
</tr>
<tr>
<td>Thin-Bedded</td>
<td>1.2 in. to 4 in. (30 mm to 100 mm)</td>
</tr>
<tr>
<td>Very Thin-Bedded</td>
<td>0.5 in. to 1.2 in. (13 mm to 30 mm)</td>
</tr>
<tr>
<td>Thickly Laminated</td>
<td>0.1 in. to 0.5 in. (3 mm to 13 mm)</td>
</tr>
<tr>
<td>Thinly Laminated</td>
<td>Less than 0.1 in. (&lt; 3 mm)</td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

For igneous and metamorphic rocks, any observable planar features (foliation, banding, etc.) may be recorded using the same thickness designations as sedimentary bedding.
G. FRACTURES
The spacing, orientation, filling, and degree of healing of the fractures can be important in determining the properties of the rock mass for structure foundation design.

The following tables list the fracture density (FD) and fracture healing (FH) categories:

**Table 5: Fracture Density**

<table>
<thead>
<tr>
<th>DEGREE OF FRACTURING</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfractured</td>
<td>No observed fractures.</td>
</tr>
<tr>
<td>Very slightly fractured</td>
<td>Core recovered in lengths greater than 3 ft. (1 m).</td>
</tr>
<tr>
<td>Slightly to very slightly fractured</td>
<td>Core recovered in lengths from 1 to 3 ft. (0.3 to 1 m).</td>
</tr>
<tr>
<td>Slightly fractured</td>
<td>Core recovered mostly in lengths from 1 to 3 ft. (0.3 to 1 m) with few scattered lengths less than 1 ft. (0.3 m) or greater than 3 ft. (1 m).</td>
</tr>
<tr>
<td>Moderately to slightly fractured</td>
<td>Core recovered mostly in lengths averaging 1 ft. (0.3 m).</td>
</tr>
<tr>
<td>Moderately fractured</td>
<td>Core recovered mostly in lengths from 0.33 to 1 ft. (0.1 to 0.3 m) with most lengths about 0.67 ft. (0.2 m).</td>
</tr>
<tr>
<td>Intensely to moderately fractured</td>
<td>Core recovered mostly in lengths of 0.33 to 0.67 ft. (0.1 to 0.2 m) with most lengths about 0.5 ft. (0.15 m).</td>
</tr>
<tr>
<td>Intensely fractured</td>
<td>Core recovered mostly in lengths from 0.1 to 0.33 ft. (0.03 to 0.1 m) with most lengths less than 0.33 ft. (0.1 m) and with fragmented intervals.</td>
</tr>
<tr>
<td>Very intensely to intensely fractured</td>
<td>Core recovered as short core lengths averaging less than 0.1 ft. (0.03 m).</td>
</tr>
<tr>
<td>Very intensely fractured</td>
<td>Core recovered mostly as chips and fragments with a few scattered short core lengths.</td>
</tr>
</tbody>
</table>
### Table 6: Fracture Healing

<table>
<thead>
<tr>
<th>DEGREE OF HEALING</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totally Healed</td>
<td>Fracture is completely healed or re-cemented to a degree at least as hard as surrounding rock.</td>
</tr>
<tr>
<td>Moderately Healed</td>
<td>Greater than 50% of fracture material, fracture surfaces or filling is healed or re-cemented and/or strength of the healing agent is less hard than surrounding rock.</td>
</tr>
<tr>
<td>Partly Healed</td>
<td>Less than 50% fracture material, filling or fracture surface is healed or re-cemented.</td>
</tr>
<tr>
<td>Not Healed</td>
<td>Fracture surface(s), fracture zone, or filling is not healed or re-cemented.</td>
</tr>
</tbody>
</table>

### H. SIZE RANGE OF CORE PIECES

Indicate the range of size of pieces of core recovered in the run. The size may range from fragments too small to measure up to a single piece the entire length of the run. Note the locations of significant fragmented zones.
## 1. HARDNESS
The following table lists the rock hardness categories:

### Table 7: Rock Hardness

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>LONG DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very soft rock</td>
<td>Can be scratched with fingernail. Slight indentation produced by light blow of point of geologic pick. Requires power tools for excavation.</td>
</tr>
<tr>
<td>Soft rock</td>
<td>Hand-held specimen crumbles under firm blows with point of geologic pick.</td>
</tr>
<tr>
<td>Moderately soft rock</td>
<td>Shallow indentations (0.04 to 0.12 in. (1 to 3 mm)) can be made by firm blows with point of geologic pick. Can be peeled with pocket knife with difficulty.</td>
</tr>
<tr>
<td>Moderately hard rock</td>
<td>Can't be peeled or scraped with knife. Can be distinctly scratched with a steel nail.</td>
</tr>
<tr>
<td>Hard rock</td>
<td>Intact hand-held specimen requires more than one hammer blow to break it. Can be faintly scratched by steel nail.</td>
</tr>
<tr>
<td>Very hard rock</td>
<td>Cannot be scratched with a steel nail. Intact specimen breaks only by repeated, heavy blows with geologic hammer.</td>
</tr>
<tr>
<td>Extremely hard rock</td>
<td>Intact specimen can only be chipped, not broken, by repeated, heavy blows of a geologic hammer.</td>
</tr>
</tbody>
</table>
**J. WEATHERING**
The following table lists the weathering categories:

<table>
<thead>
<tr>
<th>DEGREE OF WEATHERING</th>
<th>DETAILED DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely weathered</td>
<td>Minerals decomposed to soil but fabric and structure preserved (saprolite). Specimens easily crumbled or penetrated.</td>
</tr>
<tr>
<td>Highly weathered</td>
<td>Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric preserved.</td>
</tr>
<tr>
<td>Moderately weathered</td>
<td>Discoloration throughout. Strength somewhat less than fresh rock but cores cannot be broken by hand or scraped with knife. Texture observed.</td>
</tr>
<tr>
<td>Slightly weathered</td>
<td>Slight discoloration inwards from open fractures.</td>
</tr>
<tr>
<td>Fresh</td>
<td>No visible sign of decomposition or discoloration. Rings under hammer impact.</td>
</tr>
</tbody>
</table>

**K. ADDITIONAL OBSERVATIONS**
Any observed properties of the core not covered in the previous categories (e.g. handling and/or labeling discrepancies, marked difference in recovery calculations between the driller and the evaluator, etc.).

**L. PHOTOGRAPHS**
The Geotechnical Engineering Bureau (GEB) Geologist will take representative digital photographs of the individual core runs and additional photographs of important portions of the cores (fragmented zones, soft seams, lithology changes, etc.) where applicable.
M. ROCK CORE LOGS
The appropriate information from the Subsurface Exploration Log is imported from the Boring Log Automation Program (BLAP) into the Rock Core database. The results of the Geologist's rock core evaluation (See Appendix A) are entered into the Rock Core database and official Rock Core Logs are then produced (See Appendix B). If the Subsurface Exploration Log information is not available through BLAP, the official Rock Core Logs are produced manually. The final Rock Core Logs, signed by the Geotechnical Engineering Bureau's Engineering Geology section manager, are then sent to the Geotechnical Engineering Bureau's Highway Design & Construction (HD & C) section for distribution.
REFERENCES

American Institute of Professional Geologists (formerly the Association of Professional Geological Scientists), May 1977, Geologic Logging and Sampling of Rock Core for Engineering Purposes (Tentative).


APPENDIX A

ROCK CORE EVALUATION SHEET

PSN ___________________________ Boring ID ______________________

PIN ___________________________ Surface Elevation______________

BIN ___________________________ Depth From________ to________

Project ___________________________ Number of Runs ______________

______________________________ Core Size ______________________

Date Evaluated ________________ Evaluator (s) ________________

Top of Rock _______________ (Depth) _______________ (Elevation)

Top of Sound Rock ____________ (Depth) ______________ (Elevation)

Comments ____________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

RUN #1 Run Length ______________ Depth Range: From __________ To __________

RQD _______ (as measured) _______ % Photo(s) ______________________

Rock Type ________________________________________________________________

Color _________________________________________________________________

Mineralogy, Grain Size, & Texture __________________________________________

Bedding ________________________________________________________________

Fractures ______________________________________________________________

Size Range of Pieces _____________________________________________________

Hardness _______________________________________________________________

Weathering _____________________________________________________________

Additional Comments _________________________________________________

_____________________________________________________________________________________

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**ROCK CORE EVALUATION SHEET (CONTINUED)**

<table>
<thead>
<tr>
<th>PSN</th>
<th>PIN</th>
<th>Boring ID</th>
</tr>
</thead>
</table>

**RUN #** _______  **Run Length** _______  **Depth Range**: From _______ to _______

**RQD** _______ (as measured) _______ %  **Photo(s)**

Rock Type ________________________________

Color ________________________________

Mineralogy, Grain Size, & Texture ________________________________

Bedding ________________________________

Fractures ________________________________

Size Range of Pieces ________________________________

Hardness ________________________________

Weathering ________________________________

Additional Comments ________________________________

**RUN #** _______  **Run Length** _______  **Depth Range**: From _______ to _______

**RQD** _______ (as measured) _______ %  **Photo(s)**

Rock Type ________________________________

Color ________________________________

Mineralogy, Grain Size, & Texture ________________________________

Bedding ________________________________

Fractures ________________________________

Size Range of Pieces ________________________________

Hardness ________________________________

Weathering ________________________________

Additional Comments ________________________________

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### Descriptive Log

<table>
<thead>
<tr>
<th>Run</th>
<th>Depth (m) From To</th>
<th>Core Recovery (%)</th>
<th>ROQ (%)</th>
<th>No of Pieces</th>
<th>Rock Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-1</td>
<td>1.676 - 2.898</td>
<td>75</td>
<td>23</td>
<td>20 pieces</td>
<td>Shale &amp; cross-laminated siltstone. Medium dark gray (shale) to medium light gray (siltstone). Siltstone slightly calcareous. bedding mostly parallel to bedding. A vertical fracture @ 14-16.3 cm below top of recovery, 25 degree fractures @ 36 cm below top of recovery. Several mechanical breaks. Pieces range from 2-16 cm in length. Soft to moderately soft. Fresh (some slight staining on fracture surfaces).</td>
</tr>
<tr>
<td>R-2</td>
<td>2.896 - 4.115</td>
<td>100</td>
<td>93</td>
<td>10 pieces</td>
<td>Shale &amp; cross-laminated siltstone. Medium dark gray (shale) to medium light gray (siltstone). Siltstone slightly calcareous, bedding in shale sub-horizontal. Fractures parallel to bedding. Pieces range from 8 cm to 20.5 cm. Soft to medium soft. Fresh.</td>
</tr>
</tbody>
</table>