2026 NACTA JUDGING CONFERENCE
ILLINOIS STATE UNIVERSITY

NORTH AMERICAN COLLEGES AND TEACHERS OF AGRICULTURE

2-YEAR SOILS CONTEST OFFICIAL RULES

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2-Year Soil Contest Official Rules

1. Each team will consist of four (4) members judging four (4) sites. Four (4) alternates may accompany the team and compete for individual awards only. The top three (3) scores per site will be used to tabulate teamscores.

2. A tiebreaker system for individuals will involve estimates of the percent sand and clay for the surface horizon. Ties will be broken using the estimates in the order of clay then sand. Individual total score ties will be broken by using site scores in pit order (i.e. pit 1, then pit 2, etc.) Tabulating all four (4) members'cumulative scores will break team ties.

3. Contestants will be allowed sixty (60) minutes to judge each site. The time in and out of the pit will be as follows:5 minutes in/out, 5 minutes out/in, 10 minutes in/out, 10 minutes out/in, 5 minutes in/out, 5 minutes out/in, and 20minutes free time for all to finish. The contestants who are first "in" and "out" will switch for the next pit to allow equal opportunity for all contestants to be first in or first out. NOTE: This timing schedule may be modified depending on the number of teams and contestants participating. However, each individual will have at minimum 60 minutes at each site.

4. Contestants may use a clipboard, hand level, containers for soil samples, pencil (no ink pens), knife, water andacid bottles, Munsell color book (Hue 1OR to Hue 5Y, Gley 1 & 2), simple calculator, and ruler or tape (metric preferred since all depths will be in cm). A textural triangle may be used to assist contestants in completing the percent sand, silt and clay tiebreaker. Triangles will be supplied at the contest. One is enclosed for your use prior to the contest in Attachment 1. A 2 mm sieve for estimating rock fragments may be used. Rating charts, but not their written explanations, for use in the interpretations section of the scorecardwill be supplied at each site. You do not have to memorize the charts, but you should know how to use them.

5. In each pit, a control zone will be clearly marked and is to be used only for the measurement of horizon depths/boundaries. This area will be the officially scored profile and must not be disturbed. The profile depth to be considered, number of layers to be described, and any other relevant data, will be provided at each site. A marker will be placed somewhere in the third horizon to assist contestants in keeping in line withthe official description. The depth in centimeters from the surface to the marker will be given on the site card. Since 2-year colleges focus on different aspects of soil science than their 4-year counterparts, there have historically been two different rule books for the NACTA Soils Contest. Consequently, the host institution is strongly encouraged to provide a separate control zone for 2-year judgers in the contest pits; these control zones should be scored by contest officials using the 2-year rule book.

6. Stakes with flagging will be set near each site for slope measurement. Slopes will be measured between the stakes that are set at approximately the same height.

7. Contestants will not be allowed to communicate with other contestants or coaches during the contest. Nocell phones are allowed to be used at any time during the contest

8. Pit monitors will be present to enforce rules and keep time. The official judges for the contest will beNRCS soil scientists.

9. Each contestant must give his or her score card to the pit monitor before moving to the next site. Write yourname, contestant number, college, and site number on each card. Use abbreviations for all columns exceptdepth.

SCORE CARD INSTRUCTIONS

I. **SOIL MORPHOLOGY:**

In each pit, you will be asked to evaluate up to six horizons, and describe them using standard terminology. The number of horizons to be judged will be on a card at each pit. For each horizon,evaluate layer depth, boundary distinctness, texture, rock fragments, color, structure, moist consistency, and accumulations. Be sure to write clearly. Then, based on your understanding of soils, your description, and these instructions, complete the back side of the score card (Parts II and III). A complete list of acceptable abbreviations is in these instructions.

1. HORIZON: (See SSM 3-117-122) Students should label each layer with the abbreviation for one mineral genetic horizon/layer (A, B, C, E, or R). If a horizon is a transitional horizon (e.g. AB, BA) or a combination horizon (e.g. A/B, B/A), students should record the genetic horizon whose properties dominate the layer (e.g. an AB or A/B would be A, a BA or B/A would be B).Official judges may decide to allow more than one correct answer for such horizons.

   - A Horizon – Horizon formed at the surface that exhibits either an accumulation of humified organic matter, or properties resulting from cultivation or pasturing.
   - E Horizon – Horizon in which the main feature is loss of silicate clay, iron, aluminum, orsome combination of these, leaving a concentration of sand and silt particles.
   - B Horizon – Horizon formed below an A or E, that shows one or more of the following: illuvial concentration of silicate clay, iron, aluminum, humus, carbonates, gypsum, or silica; evidence of removal of carbonates; residual concentration of sesquioxides; coatingsof sesquioxides; alteration that forms silicate clay or liberates oxides and forms granular, blocky, or prismatic structure; or brittleness.
   - C Horizon – Horizons, excluding hard bedrock, that are little affected by pedogenesis andlack properties of A, B, or E horizons.
   - R Layer – Hard bedrock. The layer is sufficiently coherent when moist to make hand digging with a spade impractical.

2. BOUNDARY - DEPTH: (see SSM 3-134-135) Horizon depths often cause problems. Inorder for the students and judges to have a common base, we will use the following guidelines.

   Up to six horizons will be described within a specified depth. You should determine the depth in cm, from the soil surface to the lower boundary of each layer. Thus, for a layer that occurs 23-37 cm below the surface, you should enter 37. To receive credit for the last horizon's lower boundary, students are to write down the lower depth given on the site card. Depth measurements should be made in the control zone. The allowed range for answers will depend on the distinctness, and to a lesser degree, the topography of the boundary, as determined by the judges.

   Please note the following: In the past, if a lithic or paralithic contact (hard or soft bedrock)occurs anywhere in the exposed control zone (within 150 cm) you needed to consider it in answering several sections in Part II as well as in any rating charts used in Part III. This isno longer the case. We will only describe features that occur within the specified judging depth. If a lithic or paralithic contact occurs below the specified judging depth, it should beignored and considered to not be exposed.

If the contact is within the specified description depth, it should be indicated on the score card. Morphological features need not be recorded for Cr or R horizons. If they are, graders will ignore them and no points will be deducted (only the first three boxes in the row will be graded, for a total of 6 points possible for that row.

3. BOUNDARY - DISTINCTNESS: The distinctness of horizon boundaries is to be evaluated as described in SSM 3-133. The distinctness of the lower boundary of the last layer is not to be determined and the contestant is to mark none (-) as the boundary distinctness to receive credit.The topography, or shape, of the boundaries will not be directly considered, but it could influence contest officials.

As a guide, the following system will relate distinctness of boundary for full credit.

Distinctness	Abbreviation	Lower Depth Range	
Abrupt	A	+/-	1 cm
Clear	C	+/-	3 cm
Gradual	G	+/-	8 cm
Diffuse	D	+/-	15 cm

This method of determining full credit may be modified on a given site by contest officials.

4. COLOR: (See SMM 3-146-154)

Munsell soil color charts are used to determine the moist soil matrix color for each horizondescribed. Color must be designated by hue, value, and chroma. Space is provided to enter the hue, value, and chroma for each horizon separately on the scorecard. At the discretion ofthe official judges, more than one color may be given full credit. Color is to be judged for each horizon by selecting soil material to represent that horizon. The color of the surface horizon will be determined on a moist, rubbed (mixed) sample. For lower horizons (in somesoils this will also include the lower portion of the epipedon), selected peds should be collected from near the central part of the horizon and broken to expose the matrix. If peds are dry, they should be moistened before the matrix color is determined. Moist color is thatcolor when there is no further change in soil color when additional water is added. For Bt horizons with continuous clay films, care should be taken to ensure that the color of a ped interior rather than a clay film is described for the matrix color.

5. MOIST CONSISTENCE: (see SSM 3-172-177)

Soil consistence refers to the resistance of the soil to deformation or rupture at a specified moisture level and is a measure of internal soil strength. Consistence is largely a function of soil moisture, texture, structure, organic matter content, and type of clay, as well as adsorbed cations. As field moisture will affect consistence, contestants should use their personal judgment to correct for either wet or dry conditions on the day of the contest. These corrections also will be made by the official judges. Contestants should judge the consistence of moist soil (midway between air-dry and field-capacity) for a ped or soil fragment from each horizon as outlined in the *Field Book for Sampling and Describing Soils, 2012* and modified in Table 1.

Table 1. Soil moist consistencies, symbols and descriptions.

Consistence	Symbol	Description
Loose	**L**	Soil is non-coherent (e.g., loose sand).
Very friable	**VFR**	Soil crushes very easily under very slight force (gentle pressure) between thumb and finger but is coherent when pressed.
Friable	**FR**	Soil crushes easily under slight force (gentle to moderate pressure) between thumb and forefinger and is coherent when pressed.
Firm	**FI**	Soil crushes under moderate force (moderate pressure) between thumb and forefinger, but resistance to crushing is distinctly noticeable.
Very firm	**VFI**	Soil crushes or breaks only when strong force is applied between thumb and all fingers on one hand.
Extremely firm	**EFI**	Soil cannot be crushed or broken by strong force between thumb and all fingers but can be by applying moderate force between hands.

6. TEXTURE - ROCK FRAGMENTS: (see SSM 3-141-144)

   Rock Fragment modifiers should be used if a layer's rock fragment content is > = 15% by volume. This modifier should be listed on the score card. Do not enter your numerical volume estimate. The following abbreviations should be used:

Volume	Modifier	Abbreviation
0 - <15%	None	-
15 - <35%	Gravelly	GR
35 - <60%	Very Gravelly	VGR
≥ 60%	Extremely Gravelly	EGR

7. TEXTURE -CLASS: Texture for each horizon should be designated as one of the 12 basic textural classes, listed in SMM 3-136-140. Textural class names are to be abbreviated. The following are the correct abbreviations for textural classes:

S Sand
LS Loamy Sand
SL Sandy Loam L
Loam
SI Silt
SIL Silt Loam

CL Clay Loam
SICL Silty Clay Loam
SCL Sandy Clay Loam
SC Sandy Clay
SIC Silty Clay
C Clay

8. STRUCTURE: (See SMM 3-157-163) Record the dominant type (shape) of structure for eachlayer. Single grain and massive are terms for structureless soils, but they are included under shape. If different types of structure occur in different parts of the layer, give the type of the one that is most prevalent. If a horizon has compound structure (i.e., prismatic parting to angular blocky), give the primary structure; if both are equivalent, give the structure with thelarger units. Table 2 contains a list of structure types and their abbreviations:

Table 2. Soil structure types, symbols and descriptions.

Type	Symbol	Description
Granular	**GR**	Spheroids or polyhedrons bounded by curved planes or very irregular surfaces, which have slight or no accommodation to the faces of surrounding peds. For the purposes of this contest crumb structure is included with granular structure.
Subangular blocky	**SBK**	Polyhedron-like structural units that are approximately the same size in all dimensions. Peds have mixed rounded and flattened faces with many rounded vertices. These structural units are casts of the molds formed by the faces of the
Angular blocky	**ABK**	Similar to subangular blocky but block-like units have flattened faces and many sharply angular vertices.
Platy	**PL**	Plate-like with the horizontal dimensions significantly greater than the vertical dimension. Plates are approximately parallel to the soil surface**. Note: this does not apply to weathered rock structure.**
Wedge	**WEG**	Elliptical, interlocking lenses that terminate in acute angles, bounded by slickensides. Wedges are not limited to vertic materials.
Prismatic	**PR**	Prism-like with the two horizontal dimensions considerably less than the vertical. Vertical faces are well defined and arranged around a vertical line with angular vertices. The structural units have angular tops.
Columnar	**COL**	Same as prismatic but with rounded tops or caps.
Massive	**MA**	No structure is apparent and the material is coherent. The individual units that break out of a profile have no natural planes of weakness.
Single grain	**SGR**	No structure is apparent. Soil fragments and single mineral grains do not cohere (e.g., loose sand). In some cases where weak cohesive/adhesive forces with water exist, some seemingly cohesive units can be removed. However, under very slight force, they fall apart into individual particles.

9. SOIL FEATURES (REDOX CONCENTRATIONS AND DEPLETIONS AND MATRIX CONCENTRATIONS)**:** (see SSM 3-154-157): For this contest, soil features will be considered as subdominant colors (high or low chroma) on ped interiors or surfaces that are the results of oxidation - reduction. The following items will not be considered as soil features; clay skins, skeletans (sand or silt coats)or other ped coatings, krotovinas, rock fragment colors, roots, and mechanical mixtures of horizons such as Bmaterials in the Ap. More than one answer is possible in each layer; all applicable colors must be listed to receive credit. If no features are present, a "-" should be entered on the scorecard to receive credit. The score card choices are as follows:

A. <u>Redox concentrations</u> – These are zones of apparent pedogenic accumulation of Fe-Mnoxides, and include: nodules and concretions (firm, irregular shaped bodies with diffuse to sharp boundaries; masses (soft bodies of variable shapes in the soil matrix; zones of high chroma color ("red" for Fe and "black" for Mn); and pore linings (zones of accumulation along pores). Dominant processes involved are chemical dissolution and precipitation; oxidation and reduction; and physical and/or biological removal, transport and accrual. **Presence: C RMF concentrations are present**

B. <u>Redox depletions</u> – These are zones of low chroma (2 or less) and normally high value (4 or more) where either Fe-Mn oxides alone or Fe-Mn oxides and clays have been removed by eluviation.
Presence: D RMF depletions are present

C. <u>Other Matrix Concentrations</u>
These are visible pedogenic concentrations that can occur in the soil matrix (including soft,non-cemented masses or other bodies; excluding soft rock fragments) for each horizon.
Concentrations are identifiable bodies found in the soil matrix. They contrast sharply with surrounding soil material in terms of color and composition. Water movement and the extentof soil formation can be related to concentration location and abundance within the soil profile as well as orientation within a horizon. In the contest area, three main types of concentrations (based on composition) can occur: carbonates, gypsum, or other salts.
Presence: W Other matrix concentrations are present

II. SITE AND SOIL CHARACTERISTICS

1. PARENT MATERIAL: Mark the appropriate parent material from the list on the scorecard. Contestants must identify the parent material with each profile. If more than one parent material is present, all should be recorded, partial credit may begiven. However, at least 25 cm. of a parent material must be present to be recognized in the parentmaterial section of the scorecard. Parent material, like soils, do not always lend themselves to easy classification, so the contest officials may need to take the complexity of the situation intoaccount in scoring alternative interpretations. The following are definitions of parent materials.

Eolian sand - Primarily fine and medium sand that has accumulated through wind action, normally on a dune topography.

Loess – Fine-grained, wind deposited materials that are dominantly silt size. Where loess mantles are thin (<75 cm) there may be some larger particles toward the base of the loess deposit. A small amount of larger particles can be incorporated through plant or animal activity.

Glacial till – Relatively unsorted, unstratified glacial age material, ranging in particlesize from boulders to clay, deposited directly by ice without significant reworking bymelt water. Glacial till can be almost any texture.

Glacial outwash – A type of glacial age fluvial deposit characteristic of heavily loaded streams with highly variable discharge that were fed by glacial melt waters. Glacial outwash is stratified and may be variable in texture. Glacial outwash has been in place long enough for development of a soil profile. Strata containing medium or coarser sand and/or gravel are present. It is this coarser material that distinguishes glacial outwash from lacustrine sediments. Glacial outwash may occur on outwash plains, stream terraces, kames, eskers or relatively coarse material separating loess from glacial till. In some areas, abrupt changes in texture in outwash are considered a change in parent material.

Residuum – the unconsolidated and partially weathered mineral materials accumulated by disintegration of bedrock including depressions and sinkholes in karst areas. This materialhas been thought to be weathered in place, but some interpretations would call for significant movement prior to the onset of soil formation.

Colluvium - A mixed deposit of rock fragments and soil material accumulated on, and especially, at the base of hill slopes. Colluvium results from the combined forces of gravity and water, in the local movement and deposition of materials. Colluvium is generally poorly sorted. Material deposited locally in the form of alluvial fans will also beconsidered colluvium.

Volcanic deposit – Materials derived from volcanic ash or cinder deposits. Volcanic deposits can vary greatly in composition, chemistry and particle size.

Alluvium - Unconsolidated sediments that have been deposited by streams in floodplains. Stratification in alluvium may, or may not be evident. Deposits can be of any age. Soil formation in recent alluvium is typically limited to no more than some development of soil structure, and this is not always present.

Beach deposit – Sandy material deposited near the shore of a lake primarily by waveaction.

Lacustrine / marine deposit - Relatively fine-textured, well-sorted, stratified materials deposited in lake or slack water environments (lacustrine) or sediments derived from a variety of sources and deposited by ocean waters (marine)

Unconsolidated Coastal Plain Sediments - Unconsolidated Coastal Plain sediments include Tertiary-aged or younger materials deposited by wind and water in both marine and nonmarine environments that have not undergone compaction to the extent that they would be classified as a rock. The sediments are usually stratified and may be any size. Some soils contain secondary precipitated minerals that cement horizons or layers such as ironstone, plinthite, or ortstein. Diagnostic evidence is needed to distinguish the unconsolidated Coastal Plain sediments from more recent alluvium found on floodplains and stream terraces and would be provided by judges if applicable.

2. LOCAL LAND FORM: Select the local land form of the site from the choices on the score card. In a situation where two parent materials are present, the land form will be selected on the basis of the process that controls the shape of thelandscape. In most cases, this will be the lower parent material. For example, if alluvium is underlain by residuum which is exposed in the pit, then an upland land form should be used. Only one land form is to be identified at each site. Select the one that best describes the situation. Dual credit may be awarded by the contest officials.

Depression – A depression refers to the nearly level bottom of a closed basin landform which has no visible external surface drainage. Ponding of water may occur following periods of heavy rainfall. If the soil pit occurs in the bottom of a closed basin that is within an upland or floodplain site, the students should check only the "depression" position on the scorecard. Depressions may include such features as limestone sinks and sink holes, or low closed basins on floodplains or coastal plains. A depression should be a natural feature, and may be altered by but not be formed as the result of some man-made structure. For example, if an embankment crosses a drainage way and creates a closed basin, or if humans excavate a pond, they are not considered natural features. Parent material is variable.

Coastal & Lacustrine – formed from constructional processes. Coastal or lacustrine landforms are used when parent materials were deposited through oceanic or lake processes.

Beach - A more or less continuous ridge of sandy material along the present or former shoreline of a lake or ocean. The parent material is beach deposit.

Lakebed / playa – A level landform located on the bed of a former lake or pond and underlain by stratified lacustrine sediments. The deepest parent material is lacustrine deposit. May have alluvial, glaciofluvial and/or eolian sediments above the lacustrine sediments. Includes ice-walled lake plains.

Eolian – formed from constructional processes where sediments were deposited locally or regionally by wind.

Dune - A hill or ridge, of wind-blown sand. The parent material is eolian sand.

Loess bluff / hill / plain - A landform consisting of windblown silt deposits that are thick enough that the entire solum is developed in the loess. The parent material is loess.

Erosional - formed by erosional processes. Erosional landforms are used when residuum is thedeepest parent material, or when bedrock is observed or denoted at any depth on the site card.

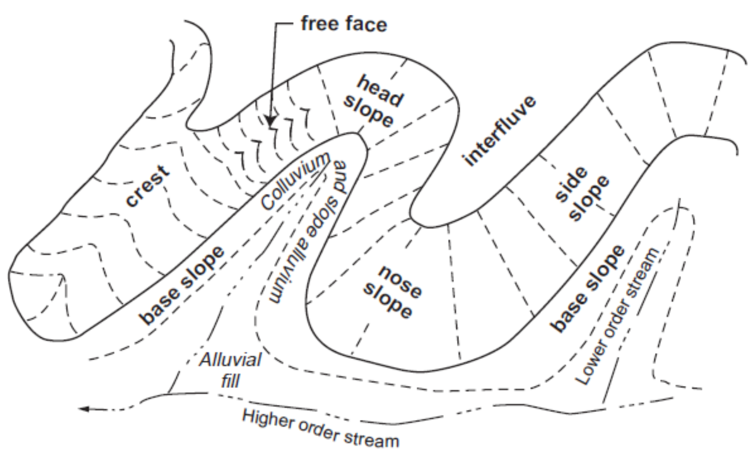
Upland headslope - The concave portion of a slope at the head of a drainageway on whichslope lengths converge downward.

Upland sideslope - The generally linear portion of slope along the side of a drainageway.

Upland noseslope - The convex portion of a slope at the open end of a drainageway on whichslope lengths diverge downward.

Interfluve/Crest - The high area (including divides) between adjacent drainage ways.

Base Slope - A base slope is a linear or concave landform downhill from an inflection point where the slope angle decreases and upslope eroding sediment collects. Older or highly dissected base slopes may be found in steep or in mountainous terrain on uplands. Weak to strong subsoil development is usually evident, depending on the upslope stability and age of thedeposit.



(adapted from Wysocki, et al., 2000)

Fluvial – constructional process resulting in landforms constructed through the processes of rivers orstreams.

Alluvial fan - A low, cone-shaped deposit formed by material deposited from a tributary stream of steep gradient flowing into an area with less gradient. This includes colluvial andalluvial foot slopes. The parent material is colluvium.

Back swamp – The section of a floodplain where deposits of fine silts and clays settle after aflood. Backswamps usually lie behind a stream's natural levees. The parent material is alluvium.

Floodplain - Land bordering on an active stream, builds up sediment from overflow of a stream. Although flooding may or may not occur frequently, this landform is subject to inundation, when the stream is at flood stage. The parent material is alluvium.

Natural levee - Elongated ridges of sediment that form on the floodplain immediately adjacent to the cut banks. The parent material is alluvium.

Stream terrace - A landform in a stream or river valley, below the upland and above the current floodplain, consisting of a nearly level surface, and hill slope leading downward fromthe surface.

Glacial – constructional landform created through the deposition of ice derived sediments.

Drumlin / moraine / plain - A landform that is underlain by glacial till. The topography can vary from relatively flat to undulating and for our purposes consists of ground, recessional or end moraines and includes drumlins. This landform is selected even if the landscape is covered by loess as long as soil development extends into the till. The parent material is glacial till.

Esker / kame / crevasse filling - a conical shaped hill (kame) or a sinuous ridge (esker) composed of stratified sand and gravel deposited by melt waters in contact with glacial ice. Theparent material is glacial outwash.

Outwash plain / terrace - A landform of low relief, when considered regionally, composed of glacio-fluvial debris spread away from the margins of the glacier by melt waters that were not confined to a river valley. The parent material is glacial outwash.

Mass Movement

Landslide / debris flow - Thick, debris deposits on valley floors. Deposited as geologic and soil materials become saturated and move downhill due to gravity. Parent material is colluvial.

Solution

Sinkhole – Circular, often funnel shaped topographic depression created by subsidence of soil, sediment, or rock as underlying strata are dissolved by groundwater.

Tectonic / Volcanic

Lava flow / plain – A broad area of level or nearly level land that is underlain by a relatively thin succession of basaltic lava flows resulting from eruptions at fissures, cinder cones and/or shield volcanoes.

Volcanic feature – An opening in the surface that issued hot magma, ash and gasses and accumulated nearby, forming a stratovolcano, shield volcano, cinder cone, caldera, fissure, dome or other landform or group of landforms.

3. SLOPE: (see SSM 3-64-66) Slope refers to the inclination of the ground surface and has length,shape, and gradient. Gradient is usually expressed in percent slope and is the difference in elevation, in length units, for each one hundred units of horizontal distance. Slope may be measured by an Abney level or by a clinometer. Slope classes are based on the gradient, with the exception of the “concave” class. Concave should be used when the site is located within an enclosed depression with no outlet. The percentage limits for slope classes are indicated on thescorecard and below in table 5. Stakes or markers will be provided at each site for determiningslope and the slope should be measured between these two markers. The tops of the markers will be placed at approximately the same height, but it is the responsibility of the contestant to make sure that they have not been disturbed. If the slope measurement falls on the boundary between two slope classes, contestants should mark the steeper class on the scorecard. *Note: Contestants are encouraged to write the actual slope value in the space provided on the scorecard to aid in the completion of the interpretations section, but points will be awarded only for checking the correct class.*

Table 3. Slope classes used in this contest.

Concave
0% - <2%
2% - <5%
5% - <10%
10% - <15%
15% - 20%
>20%

4. HILLSLOPE PROFILE POSITION. Hillslope position (Figure 2, from R. V. Ruhe. 1969. *Quaternary Landscapes in Iowa,* p 130-133) represents the geomorphic segment of the topography on which the soil is located (Table 6). These slope components have characteristicgeometries and greatly influence soils through differences in slope stability, water movement,and other slope processes. Not all profile elements may be present on a given hillslope. The landscape unit considered when evaluating hillslope profile position should be relatively largeand include the soil pit and/or the area between the slope stakes. Minor topographic irregularities are not considered for this contest. Students and coaches should pay particular attention to how hillslope profile positions are described at the practice locations. Illustrationsof simple hillslope profile components can be found in Figure 2.

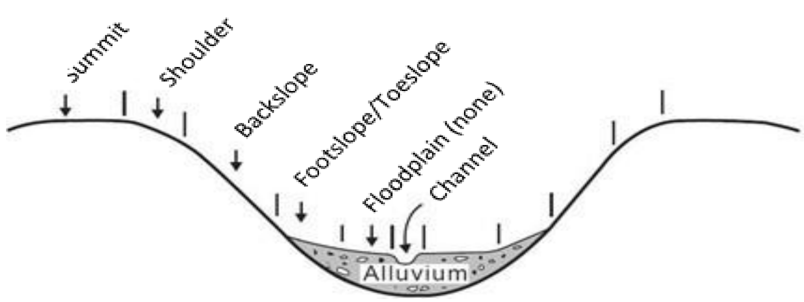


Figure 2. Hillslope profile components, as modified from Ruhe, 1969.

Table 4. Hillslope profile positions and their general descriptions.

Hillslope position	Description
Summit	Highest level of an upland landform with a relatively gentle, planar slope. The summit is often the most stable part of a landscape. If the site is on a summit and has a slope < 2%, the summit position on the scorecard should be selected. Not every hillslope has a summit, as some hillslopes have shoulders at the crest of the hill.
Shoulder	Rounded (convex-up) hillslope component below the summit. The shoulder is the transitional zone from the summit to the backslope and is erosional in origin.
Backslope	Steepest slope position that forms the principal segment of many hillslopes. The backslope is commonly linear along the slope, is erosional in origin, and is located between the shoulder and the footslope positions.
Footslope	Slope position at the base of a hillslope that is commonly rounded, concave-up along the slope. The footslope is transitional between the erosional backslope and depositional toeslope. Accumulation of sediments often occurs within this position.
Toeslope	Lowest landform component that extends away from the base of the hillslope. If the site is a toeslope and has a slope of < 2%, toeslope should beselected on the scorecard.
None (slope <2%)	This designation should only be used when the slope at the site is < 2%, andthe site is not in a well-defined example of one of the slope positions given above (e.g., within a terrace or floodplain of large extent).

5. SURFACE RUNOFF (see SSM 3-113-115). The rate and amount of runoff are determined by soil characteristics, management practices, climatic factors, vegetative cover, and topography. In this contest we will use six (6) runoff classes and we will consider the combined effects of surface texture, vegetation, and slope on runoff rate. Where good vegetative cover is present, contestants should mark the next slower runoff class. (*NOTE: Attention should be paid to howthe official judges handle vegetative cover at the practice sites*.) The following guidelines will be used:

Slope	**Surface Runoff -based on texture of the surface horizon**		
	S, LS	**SI, SIL, SICL, L, CL, SL, SCL**	**C, SIC, SC**
concave	negligible	negligible	negligible
0% - <2%	negligible	slow	moderate
2% - <5%	very slow	slow	rapid
5% – <10%	slow	moderate	very rapid
10% - <15%	slow	rapid	very rapid
15% - 20%	moderate	very rapid	very rapid
>20%	rapid	very rapid	very rapid

6. SOIL EROSION POTENTIAL: The erosion potential is dependent on the factors contributing to surface runoff, as well as organic matter content and physical properties of the surface horizon, including texture and structure. For the purposes of this contest, the following table (adapted from https://mepas.pnnl.gov/mepas/formulations/source_term/source_form.html) will be used to determinesoil erosion potential. The table assumes typical organic matter contents for Midwestern agricultural soils and granular structure or structureless, single-grained in the surface horizon, although there is noadjustment if that is not the case. To simplify the determination of erosion potential, no adjustments will be made on the basis of sand size. However, students should be made aware that in reality sand size can have a significant impact on erosion potential.

Surface Runoff	**Surface Horizon Texture**		
	S, LS	**SL, SCL, CL, SC, C, SIC**	**L, SICL, SIL, SI**
Ponded/Negligible	Low	Low	Low
Very Slow	Low	Low	Medium
Slow	Low	Medium	Medium
Moderate	Low	Medium	High
Rapid	Low	High	High
Very Rapid	Medium	High	High

7. SOIL WETNESS CLASS (previously SOIL DRAINAGE CLASS): Soil drainage classes as defined in the *Soil Survey Manual* (1993) are difficult to define precisely across a wide geographical area and are best applied by someone with extensive experience in a local area. To simplify matters for the contest, we will instead use soil wetness class. Soil wetness is a reflectionof the rate at which water is removed from the soil by both runoff and percolation. Position, slope, infiltration rate, surface runoff, hydraulic conductivity (permeability), and redoximorphic features are significant factors influencing the soil wetness class. The depth to chroma ≤ 2 and value ≥ 4 redox features (depletions) due to wetness will be used as the criterion to determine the depth of the wet state for this contest.

Class	**Depth to wetness features (from soil surface)**
1	>150 cm
2	50 to 150 cm
3	25 to <50 cm
4	<25 cm

Soils that have gray redoximorphic features immediately below a dark surface (10YR 3/3 or darker) should be assumed to be: "Redox depletions < 25 cm," as organic matter often masks redox features. If no evidence of wetness is present above a lithic or paralithic contact, assume “Redox depletions > 150 cm”. If no evidence of wetness exists within the specified depth for judging and that depth is less than 150 cm, assume “Redox depletions > 150 cm.”

8. EFFECTIVE SOIL DEPTH: (see SSM 3-134-135) For this contest effective soil depth is considered to be the depth of soil to a root limiting layer as defined in Soil Taxonomy (i.e., duripan, fragipan, dense glacial till, petrocalcic, lithic, or paralithic contact). If there are no limitations evident the soil will be classified as very deep. If the profile is not visible to a depth of 150 cm, or if you are requested to describe a soil only to a shallower depth, then you should assume that the conditions present in the last horizon described extend to 150 cm. The various depth classes are listed on the score card.

9. HYDRAULIC CONDUCTIVITY –SURFACE & LIMITING (formerly PERMEABILITY): Inthis contest we will estimate the hydraulic conductivity of both the surface horizon and the most limiting horizon. In some soils, the surface horizon is the limiting horizon with respect tosaturated hydraulic conductivity. In this case, the surface hydraulic conductivity would be reported in two places on the scorecard. As previously stated under Part I – “Depth”, you will need to consider a root limiting layer if it is within your specific judging depth. Such a contact will be considered to have very slow hydraulic conductivity, and slow will have to bemarked for “hydraulic conductivity/limiting”. "Limiting layer" refers to the horizon or layer with the slowest hydraulic conductivity. We will consider primarily texture, as it is the soilcharacteristic that exerts the greatest control on permeability. The SSM (3-106) lists the following classes of permeability:

CLASS	CM/HOUR	TEXTURES
Very Slow	<0.0036	R, Cr, Cd, Fragipan or Duripan Horizon
Slow	0.0036 - <0.036	Sandy clay, Silty clay, or Clay
Moderately Low	0.036 - <0.36	Silty clay loam, Clay loam, or Sandy clay loam
Moderately High	0.36 - <3.6	Very fine sandy loam, Loam, Silt loam, or Silt
High	3.6 – <36.0	Fine sand, Very fine sand, Loamy sand, Loamy fine sand, Loamy very fine sand, Sandy loam
Very High	≥36.0	Coarse Sand, Sand, or Loamy coarse sand

Rate any natric horizon as two (2) classes slower than texture indicates.

For this contest we will group very slow in with slow, moderately slow and moderately rapid intomoderate, and very rapid with rapid.

10. WATER RETENTION DIFFERENCE: (see SSM 6-292-293) Water retention difference refers to the amount of water, in cm, a soil is capable of holding within the upper 1.5 m., orabove a root limiting layer, whichever is shallower. We will use the following four classeswhich are listed on the score card.

Very Low	< 7.5 cm
Low	7.5 cm to< 15.0 cm
Moderate	15.0 cm to 22.5 cm
High	> 22.5 cm

Texture is an important factor influencing moisture retention and we will employ thefollowing estimated relationships:

cm water/cm soil	**Textures**
0.05	all Sands, Loamy coarse sands, Loamy sands
0.10	Loamy fine sands, Loamy very fine sands, Coarse sandy loams
0.15	Sandy loams, Fine sandy loams, Sandy clay loams, Sandy clays, Silty clays, Clays
0.20	Very fine sandy loams, Loams, Silt loams, Silts, Silty clay loams, Clay loams

For a root limiting layer, you are to assume that no water retention occurs below the contact. If a profile is not exposed to 150 cm. and no root limiting layer is visible, assume the properties ofthe last layer extend to 150 cm. Rock fragments are considered to have negligible (assume zero) moisture retention and you will need to adjust your estimates accordingly (see example).

Example:

Surface (A)	0 - 27 cm L 5% rock fragments
Subsoil (B)	27 - 99 cm SIC
Substratum (BC)	99 - 140 cm SICL
Cr	140 + weathered mudstone

Water Retention Calculations:

Surface (A)	27 cm x 0.20 cm/cm x .95*	=	5.1 cm
Subsoil (B)	72 cm x 0.15 cm/cm	=	10.8 cm
Substratum (BC)	41 cm x 0.20 cm/cm	=	8.2 cm
	10cm x 0.00 cm/cm	=	0.0 cm
	High	=	24.1 cm

* correction for the volume of rock fragments

III. INTERPRETATIONS:

Copies of the rating charts for Roadfill, Septic Tank Absorption Fields, and SewageLagoons can be found in Attachment 2 and will be provided to contestants.

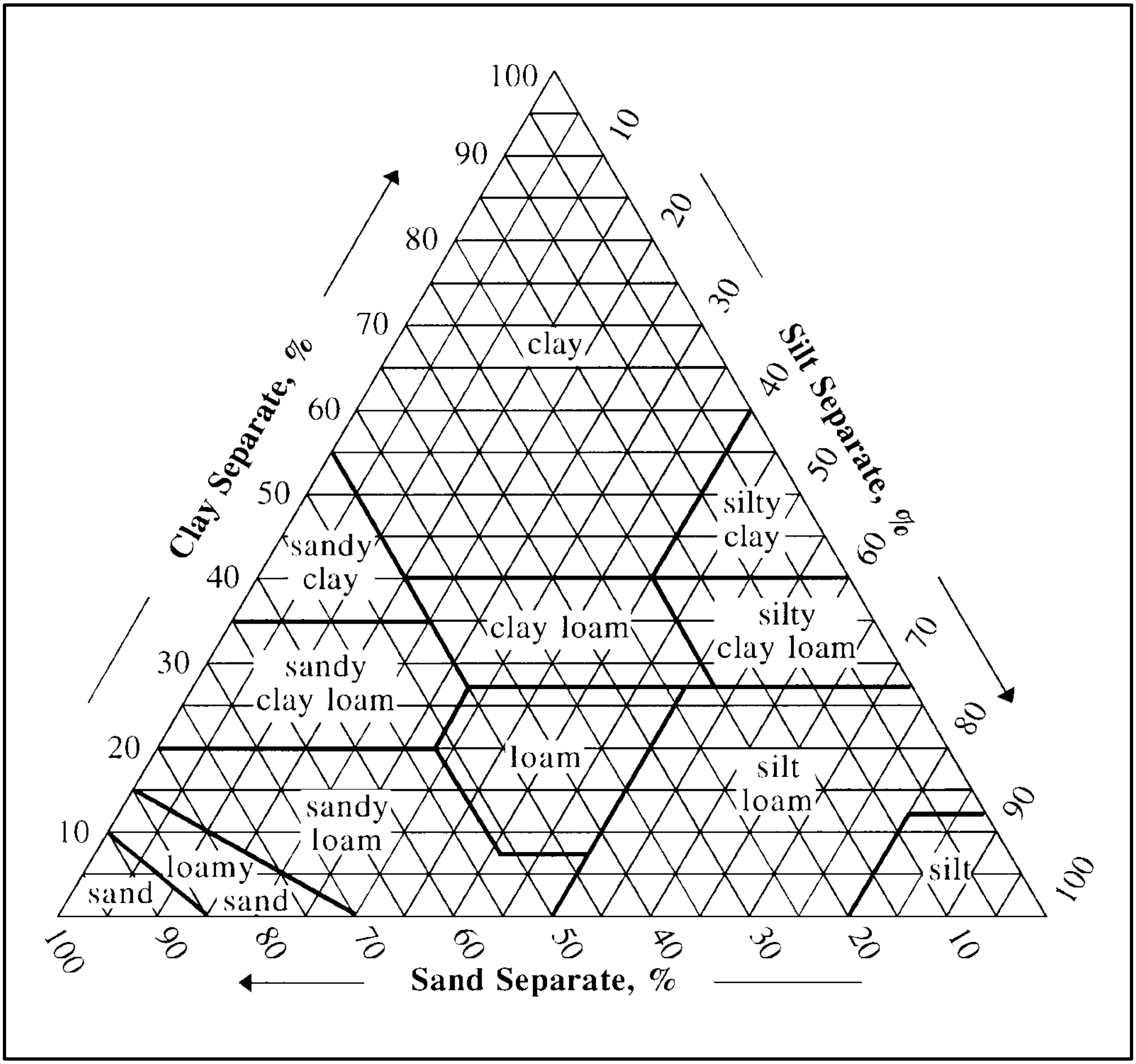
Guidelines for interpretations of Roadfill, Septic Tank Absorption Fields, and Sewage Lagoons are adapted from Part 620 of the revised National Soils Handbook (see attachment 2). In the contest you will be supplied with the rating tables, but not the written material. Therefore, you need to know how to use the tables, not memorize them. Attachment 4 is provided as a guide to assist coaches and contestants in using the ratingcharts and will not be provided at the contest.

Critical depths for each guideline are taken from the control zone. Soil properties and theirrestrictive features are listed in descending order of importance in the tables. On the scorecard, contestants should “x” or check the most severe limitation/worst suitability andwrite the first restrictive feature associated with that rating. For example, when two or more properties give a soil the same rating (for example a soil rated moderate – Seepageand moderate – Slope for Sewage Lagoons), identify the restrictive feature as the one listedclosest to the top of the table (moderate – Seepage for our example). A severe (or poor) rating always takes precedence over a moderate (or fair) rating. If all the evaluations are “slight” or “good” then print “none” as the reason on the scorecard. There may be some instances where the pit does not extend to the necessary depth needed to make the interpretation. In these cases contestants must assume the lowest horizon of the pit extends to the interpretative depth unless a lithic or paralithic contact occurs within the depth to be judged. Each interpretation will be worth ten (10) points total; five (5) for the correct rating and five (5) for the correct feature.

Compiled and edited 2006; Edited ATL, RRM, NEH 2007; Edited LW, SMW Summer 2008, Autumn 2009; Edited LW, SMW, RD Summer 2010, Autumn 2011; Edited SMW, DD, TG Autumn 2012, Edited SMW, JR, TG Autumn 2013; Edited SMW, JR, MR Autumn 2016, Edited SMW, JR Autumn 2017, Summer 2018; Edited Fall 2023, SMW, LL, SS.

Attachment 1 - USDA SOIL TEXTURAL TRIANGLE

This page shall be provided to each student at the contest.



Attachment 2 – NACTA Rating Guides (2-Year Division)

This page shall be provided to each student at the contest.

NACTA Rating Guide for **ROADFILL**

Property	Good	Fair	Poor	Feature
Depth to bedrock	> 150 cm.	100 -150 cm.	< 100 cm.	Depth to Rock
Depth to root limiting layer	> 150 cm.	100 – 150 cm.	< 100 cm.	Limiting Layer
Shrink Swell	< 8 cm. clay	8 – 16 cm. clay	> 16 cm. clay	Shrink Swell
Texture (avg. 25 – 100 cm.)	S, LS, SL	L, SCL	all others	Low Strength
% >8 cm. stones, 0 to 40 cm.	< 25%	25 – 50%	> 50%	Large Stones
Depth to high water table	> 90 cm.	30 – 90 cm.	< 30 cm.	Wetness
Slope	< 15%	15 – 25%	> 25%	Slope

NACTA Rating Guide for **SEPTIC TANK ADSORPTION FIELDS**

Property	Slight	Moderate	Severe	Feature
Flooding	none	Rare	freq. / occas.	Flooding
Depth to bedrock	> 180 cm.	100 – 180 cm.	< 100 cm.	Depth to Rock
Depth to root limiting layer	> 180 cm.	100 – 180 cm.	< 100 cm.	Limiting Layer
Ponding	no	-------	yes	Ponding
Depth to high water table	> 180 cm.	120 – 180 cm.	< 120 cm.	Wetness
Permeability (60 – 150 cm.)	S, LS, SL	SCL, L, SIL, SI	all others	Percs Slowly
Permeability (60 – 150 cm.)	all others	------	S, LS	Poor Filter
Slope	< 8%	8 – 15%	> 15%	Slope
% > 8 cm. stones, 0 to 40 cm.	< 25%	25 – 50%	> 50%	Large Stones

NACTA Rating Guide for **SEWAGE LAGOONS**

Property	Slight	Moderate	Severe	Feature
Permeability (30 – 150 cm.)	all others	SCL, L, SIL, SI	S, LS, SL	Seepage
Depth to bedrock	> 150 cm.	100 – 150 cm.	< 100 cm.	Depth to Rock
Depth to root limiting layer	> 150 cm.	100 – 150 cm.	< 100 cm.	Limiting Layer
Flooding	none, rare	------	occas., freq.	Flooding
Slope	< 2%	2 – 7%	> 7%	Slope
Ponding	no	------	yes	Ponding
Depth to high water table	> 150 cm.	110 – 150 cm.	< 110 cm.	Wetness
% >8 cm. stones, 0 to 40 cm.	< 20%	20 – 35%	> 35%	Large Stones

Attachment 3 – NACTA SOILS CONTEST SITE CARD (2-Year Division)

This page shall be posted at each pit location at the contest.

SITE NO.____________________

Describe ______________ horizons to a depth of ________________ cm.

Red marker is in the third horizon at _______________ cm.

This site floods ______________ times within ________________ years.

Attachment 4 -APPLICATION FOR SELECTED INTERPRETATIONS

This page is to assist with interpreting Attachment 2 only and shall NOT be provided to each student at the contest.

ROADFILL

PROPERTY	FACTOR	INTERPRETATION
Depth to root limiting layer		Should be interpreted as any root limiting layer not including bedrock
Shrink Swell	Clay	Clay is to be interpreted as Sandy clay, Silty clay, and Clay
Texture (avg. 25 – 100 cm.)	Textural classes	The average between 25 and 100 cm.

SEPTIC TANK ABSORPTION FIELDS

PROPERTY	FACTOR	INTERPRETATION
Flooding	Rare	1-5 times per 100 years
(SSM 3-100)	Occasional	6-50 times per 100 years
	Frequent	More than 50 times per 100 years
Depth to root limiting layer		Should be interpreted as any root limiting layer not including bedrock
Ponding	Yes	Class V would be the best possible Land Class
	------	Not a possible choice
Permeability (60–150 cm)	Textural classes	Any layer of the specified texture class existing between 60 and 150 cm.
	------	Not a possible choice

SEWAGE LAGOONS

PROPERTY	FACTOR	INTERPRETATION
Permeability (30–150 cm.)	Textural classes	Any layer of the specified texture class existing between 30 and 150 cm.
Flooding	Rare	1-5 times per 100 years
(SSM 3-100)	Occasional	6-50 times per 100 years
	Frequent	More than 50 times per 100 years
	------	Not a possible choice
Depth to root limiting layer		Should be interpreted as any root limiting layer not including bedrock
Ponding	Yes	Class V would be the best possible Land Class
	------	Not a possible choice

2026 NACTA Soils Judging Contest 2 Year Division Scorecard

Contestant Name	
Contestant Number	
College	

Pit Number	
Number of Horizons	
Profile Depth	
Nail Depth	

OVERALL SCORE ____________

Part I. Morphology

Part I. Score ____________

	HORIZON-ATION	BOUNDARY		COLOR			MOIST CONSIST	TEXTURE		STRUCTURE	SOIL FEATURES	SCORE
	Master	Depth (cm)	Dist.	Hue	Value	Chroma		Rock Fragment Modifier	Class	Type		
	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(5)	(5)	(2)	(28)
1.												
2.												
3.												
4.												
5.												
6.												
	A B C E R	Record lower depth in cm.	Abrupt (A) Clear (C) Gradual (G) Diffuse (D) None (-)				Loose (L) V. Friable (VFR) Friable (FR) Firm (FI) V. Firm (VFI) Ext. Firm (EFI)	None (-) Gravelly (GR) Very Grav. (VGR) Extrem. Grav. (EGR)	S, LS, SL, L, SCL, SC, C, SIC, SICL, CL, SIL, SI	GR PR SBK CO ABK MA PL SGR WEG	None (-) Concentrations (C) Depletions (D) White (W)	

2 YEAR SCORECARD

II. Site and Soil Characteristics

PARENT MATERIAL (5 each)	LANDFORM (5)			SLOPE (5)	HILLSLOPE PROFILE (5)	SURFACE RUNOFF (5)
____eolian sand ____loess ____glacial till ____glacial outwash ____residuum ____colluvium ____volcanic deposit ____alluvium ____beach deposit ____lacustrine / marine deposit ____unconsolidated coastal plain sediments	***Depression*** ____depression ***Coastal & Lacustrine*** ____beach ____lakebed / playa ***Eolian*** ____dune ____loess bluff / hill / plain ***Erosional*** ____upland head slope ____upland side slope ____upland nose slope ____interfluve/crest base slope	***Fluvial*** ____alluvial fan ____back swamp ____floodplain ____natural levee ____stream terrace ***Glacial*** ____drumlin / moraine / plain ____esker / kame / crevasse filling ____outwash plain / terrace	***Mass Movement*** ____landslide / debris flow ***Solution*** ____sinkhole ***Tectonic / Volcanic*** ____lava flow / plain ____volcanic feature	____Concave ____0 - <2% ____2 - <5% ____5 - <10% ____10 - <15% ____15 - 20% ____> 20%	____Summit ____Shoulder ____Backslope ____Footslope ____Toeslope ____None	____Negligible ____Very Slow ____Slow ____Moderate ____Rapid ____Very Rapid

Part II. Score:__________

SOIL EROSION POTENTIAL (5)	SOIL WETNESS CLASS (5)	EFFECTIVE SOIL DEPTH (5)	HYDRAULIC CONDUCTIVITY - SURFACE (5)	HYDRAULIC CONDUCTIVITY - LIMITING (5)	WATER RETENTION DIFFERENCE (5)
____Low ____Medium ____High	____Wet above 25 cm (PD) ____Wet between 25 - <50 cm (SWPD) ____Wet between 50 - 150 cm (MWD) ____Not wet above 150 cm (WD)	____Very shallow (<25 cm) ____Shallow (25 - <50 cm) ____Moderately deep (50 - <100 cm) ____Deep (100 - 150 cm) ____Very deep (>150)	____ Slow ____ Moderate ____ Rapid	____ Slow ____ Moderate ____ Rapid	____Very low (< 7.5 cm) ____Low (7.5 - < 15 cm) ____Moderate (15 - 22.5 cm) ____High (>22.5 cm)

III. Interpretations

Part III. Score:__________

SUITABILITY AS A ROADFILL MATERIAL (5)	SEPTIC TANK ABSORBTION FIELDS (5)	SEWAGE LAGOONS (5)	Tiebreaker (0)
_______Good _______Fair _______Poor Feature (5): ______________	_______Slight _______Moderate _______Severe Feature (5): ______________	_____Slight _____Moderate _____Severe Feature (5):______________	_____% Clay _____% Sand